Our Ref: CG120569:VG
Contact: Valentine Gnanakone

12 April 2013

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Dear Joe,

690 DERRIMUT ROAD
PROPOSED RESIDENTIAL SUBDIVISION

Further to our discussions, and having reviewed the development plan prepared by Spiire (Project no. 136345, dated 25 January 2013), we accordingly provide the following with respect to traffic and delivery of road infrastructure in the vicinity of the site.

Background – Regional

The subject site is located within the future Truganina Wyndham North Precinct Structure Plan (PSP1090), which is currently being prepared by the Growth Area Authority (GAA). Surrounding PSP1090 are other future PSP areas which comprise significant land parcels contemplated for a mixture of development focussed around residential subdivisions. PSP 1090 in itself envisages the development of in the order of 8,500 lots.

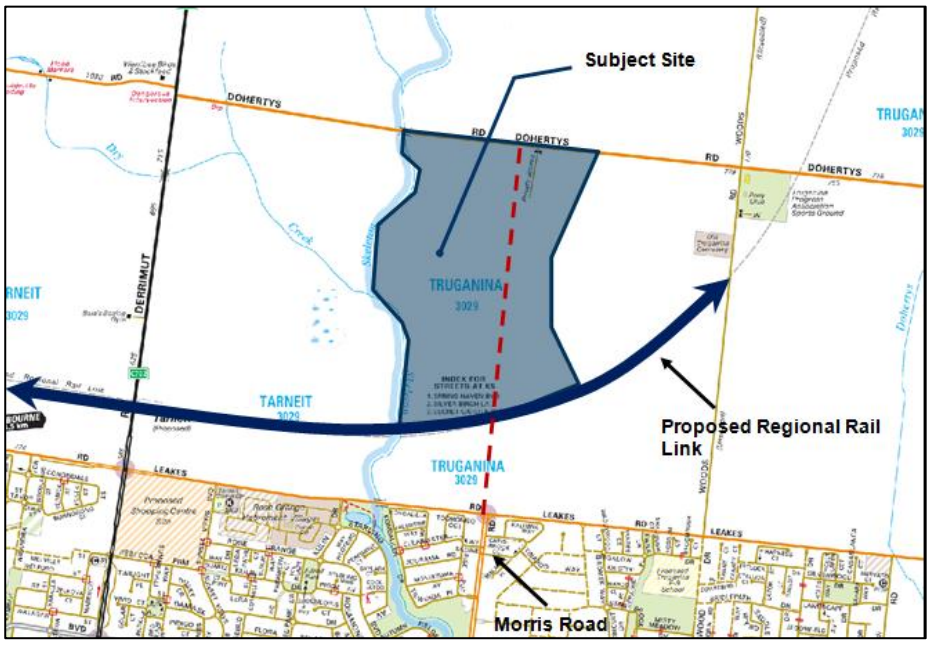
From a greater sense, this north western region is contemplating development for more than 35,000 households in the area surrounding the site over time. To facilitate this level of development which is required as a result of natural and organic growth, planning authorities have prepared road network plans and recommended network improvements.

Background – Local

The subject site is irregular in shape, with a frontage of approximately 1km to Dohertys Road, and has a total area of approximately 97 hectares. The site is located on the side of Dohertys Road, and is bounded by Skeleton Creek to the west and the Regional Rail Link to the south. The future Morris Road reservation bisects the site in a north south direction across the railway line.

Figure 1 illustrates the location of the subject site, in the context of the future Regional Rail Link and Morris Road extension.

Figure 1: Site Location



Adjacent to the southern boundary of the subject site, the Regional Rail Link Authority has acquired a portion of the site for the construction of the Regional Rail Link and associated infrastructure. It is understood that the future Morris Road extension will be grade separated from the train line, via an overpass across the railway tracks.

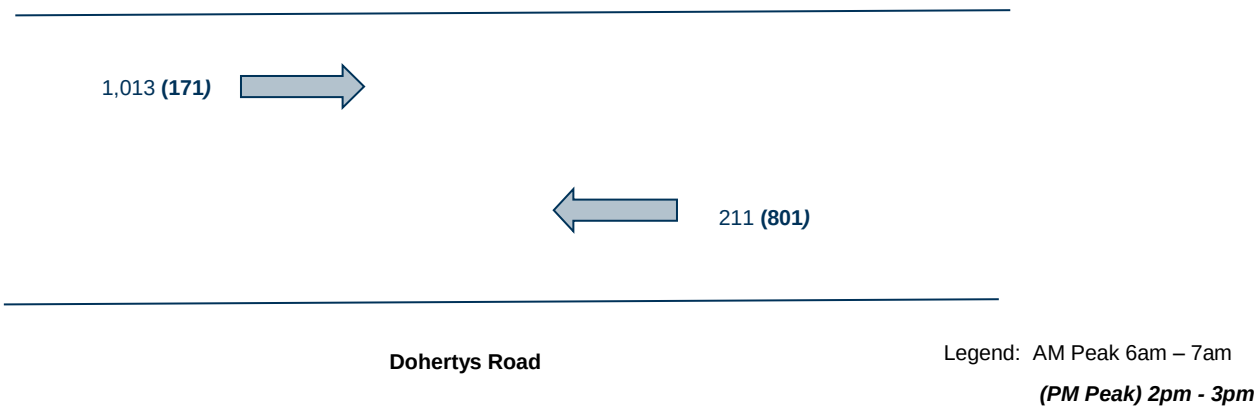
Existing Traffic Volumes

In order to understand current traffic volumes along Dohertys Road, Cardno commissioned traffic volume surveys between Thursday 28th February and Thursday 6th March 2013.

The surveys, located approximately 400 metres west of the Dohertys Road / Woods Road intersection, indicate that the morning peak hour on Dohertys Road was found to occur between 6am-7am with 1,225 vehicles, and the afternoon peak hour from 5pm-6pm with 971 vehicles. Daily weekday traffic volumes are, on average, 12,066 vehicles.

A summary of the 2013 volumes on Dohertys Road is illustrated in Figure 2.

Figure 2: AM and PM Peak Hour Traffic Volumes – 2013



Proposal

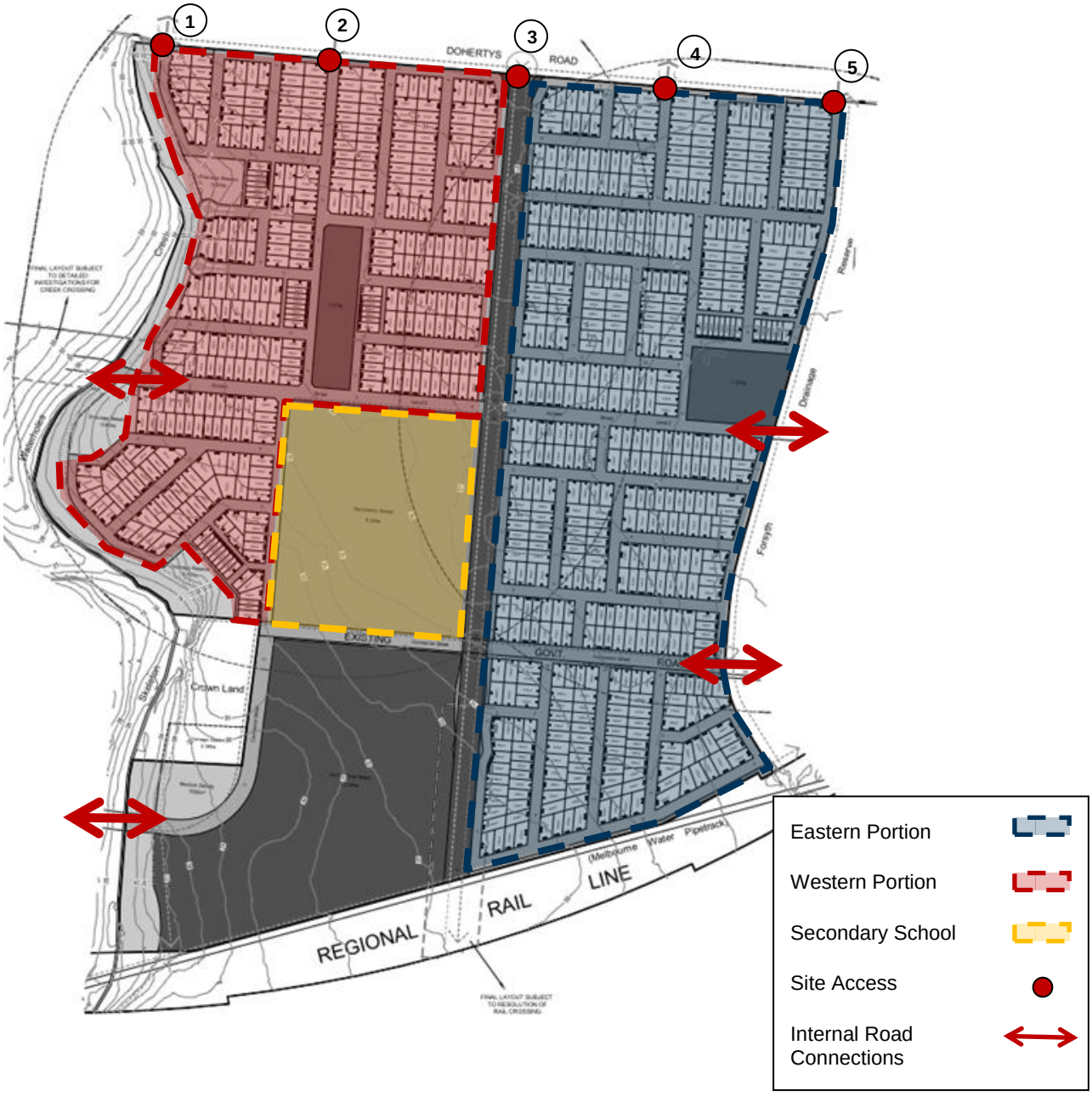
The application plans prepared by Spiire (Project Ref: 136345) illustrates the development of the land for a residential subdivision with a total of 928 residential lots, and a secondary school with an indicative enrolment of approximately 1,100 students.

Ultimately, primary access to the subdivision will be provided to the north from Dohertys Road, to the west via a creek crossing of Skeleton Creek, to the south via Morris Road and to the east across Forsyth Drain. In terms of Dohertys Road, access to the subdivision will be created via 5 access points, with the central access being the proposed Morris Road extension aligned in a north – south direction bisecting the site.

The development plan also illustrates the opportunity for road connections to abutting land to the west, south and east. There are also planned to be 5 access points, two signalised, to Morris Road.

Figure 3 illustrates the proposed residential subdivision lot layout and site access points.

Figure 3: Proposed Residential Subdivision Layout



Staging

The developer is considering two main options for subdivision staging as follows:

- The first option is for access to be created for the first stage from the south via the construction of the grade separation of Morris Road and the Regional Rail Link. Under this option development would commence in proximity to the school and head north.

- The second option is for development to commence at Dohertys Road and head south, eventually linking south of the rail when the grade separation is constructed.

The access strategy is under discussion with Council and the Growth Areas Authority and the developer wishes to retain flexibility to pursue both options until it makes its final decision regarding the development staging.

Access Option 1 – South to North

In view of the subdivision layout, and the access connections available to the external road network, the development of the site has been assessed to occur in 4 stages as described below. These stages generally relate to their geometric location within the site. The final staging is being further considered in detail by the developer.

- Stage 1 (268 Lots)

Stage 1 includes developing the 50% of the land in the eastern portion of the site, for a total area of approximately 13 hectares and 268 residential lots.

- Stage 2 (Secondary School – initial enrolment of 1100 Students)

Stage 4 includes the proposed secondary school in the eastern portion of the site adjacent to the proposed Morris Road extension, with an indicative enrolment of approximately 1100 students.

- Stage 3 (392 Lots)

Stage 1 includes land in the western portion of the site for a total area of approximately 19 hectares and 392 residential lots. It proposes creation of 2 site access points to Dohertys Road.

- Stage 4 (268 Lots)

Stage 4 includes developing the remaining 50% of the land in the eastern portion of the site, between the Forsyth Drainage Reserve and the proposed Morris Road extension for a total area of approximately 13 hectares and 268 additional residential lots. It proposes creation of 2 site access points to Dohertys Road.

Access Option 2 – North to South

- Stage 1 (392 Lots)

Stage 1 includes land in the western portion of the site for a total area of approximately 19 hectares and 392 residential lots. It proposes creation of 2 site access points to Dohertys Road.

- Stage 2 (268 Lots)

Stage 2 includes developing 50% of the land in the eastern portion of the site, between the Forsyth Drainage Reserve and the proposed Morris Road extension for a total area of approximately 13 hectares and 268 additional residential lots. It proposes creation of 2 site access points to Dohertys Road.

- Stage 3 (268 Lots)

Stage 3 includes developing the remaining 50% of the land in the eastern portion of the site, for a total area of approximately 13 hectares and an additional 268 residential lots.

- Stage 4 (Secondary School – initial enrolment of 1100 Students)

Stage 4 includes the proposed secondary school in the western portion of the site adjacent to the proposed Morris Road extension, with an indicative enrolment of approximately 1100 students.

Morris Road Extension & Interim Traffic Signals

Subject to the construction of the Regional Rail Link and the associated grade separation at the southern site boundary, the northerly extension of Morris Road is planned to operate with a 34 metre road reservation. It is proposed that this road cross section will initially comprise a single traffic lane in each direction (the eastern carriageway) with no central median and an off road shared path on one side of the road.

Under Option 1, Morris Road would be constructed from the south to service the first stage of the development.

Under Option 2, the construction of Morris Road is not required to provide access until Dohertys Road reaches its capacity or else if it is duplicated in a timely manner at a later stage. It is noted that Council requires a connection via Morris Road so that residents have good access to the services and facilities that exist south of Leakes Road.

If it is assumed that Dohertys Road is required to be duplicated when its volumes reach around 18,000 vpd, then the trigger for the delivery of Morris Road may be when approximately 800 to 1,000 lots are constructed

In relation to Option 2, an analysis of the development stages to assess the ability for the surrounding road network to accommodate the level of traffic follows.

It is understood by the developer from recent discussion with Council that the Council sees merit in the duplication of Leakes Road proceeding Dohertys Road. Leakes Road provide for a more direct connection to the freeway for east bound traffic and the duplication of Dohertys Road is complicated by the rail project requiring a grade separation at considerable cost.

In this regard, the connection of Morris Road provides an alternative option for traffic to head south and then east in the morning peak. The developer proposes to undertaken further discussions with the Council as directed by the Growth Areas Authority (GAA) in order to settle an agreed delivery strategy for Morris Road. This assessment is preliminary and will be finalised when the strategic issues have been discussed further.

It is also understood that other developments are proposed in the area, for example by Dacland and ID_Land. Consideration would also need to be given to the impacts of those developments on traffic on Dohertys and Derrimut Road – that is beyond the scope of the current assessment and is a topic for discussion between major developers and the authorities.

Ultimately, the Dohertys Road and Morris Road extension intersection will be signalised. It is anticipated that the traffic signals will be constructed at such time as traffic volumes warrant via development contributions associated with the PSP.

Traffic Considerations

- Residential

It is projected that the proposed residential subdivision when fully developed could generate traffic at 0.87 movements per dwelling during the morning and afternoon peak hours, with an average daily traffic generation of 8.7 vehicle movements.

Application of the adopted daily and peak hour generation rates to the 928 lots within the subject site equates to a projected traffic generations of 8,074 daily movements, inclusive of 807 movements in the AM and PM peak hours respectively.

For residential subdivisions, not all trips are external trips. For the purpose of the assessment, about 10% of these trips will be internal to any subdivision associated with local shopping, schools and local social visits, or equivalent to approximately 7,267 external trips and 807 vehicles within the local road network per day.

- Secondary School

For the purposes of this assessment, it is estimated that approximately 25% of students will be dropped off and collected by parents in the morning and afternoon peak period. Application of these rates to the proposed student enrolment of 1,100 students equates to 275 trips during the morning and afternoon peak hour respectively (ie. 275 arrivals and 275 departures).

- Staging

Based on the above and assuming the subject site is developed in stages for in the order of 928 dwellings, the peak hour traffic movements associated with the complete development are set out in Table 1.

Table 1: Staging Development Traffic Generation

Staging	AM Peak Hour			PM Peak Hour			Daily		
	Arrivals	Departures	Total	Arrivals	Departures	Total	Arrivals	Departures	Total
Stage 1 (Western Portion)	68	273	341	205	136	341	1,705	1,705	3,410
Stage 2 (50% Eastern Portion)	47	187	233	140	94	233	1,166	1,166	2,332
Stage 3 (100% Eastern Portion)	47	187	233	140	94	233	1,166	1,166	2,332
Stage 4 Secondary School	275	275	550	275	275	550	550	550	1,100
Total	436	921	1,507	759	598	1,357	4,587	4,587	9,174

Traffic Distribution

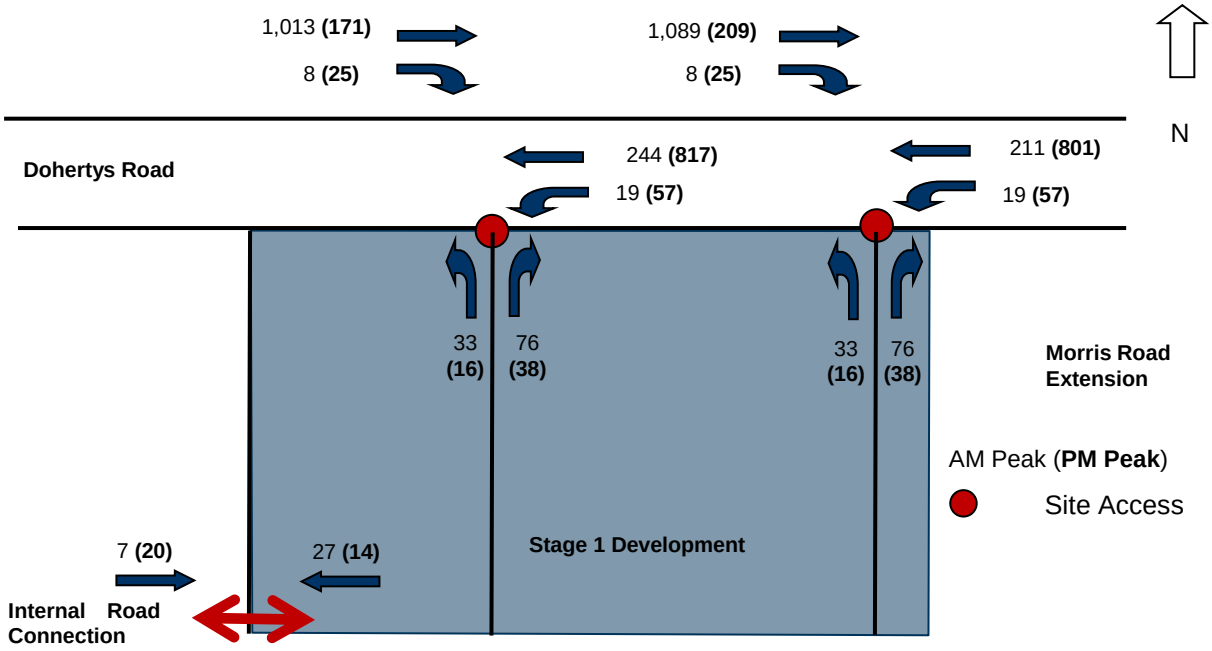
In Option 1 (construction of Morris Road from the south), traffic generated from the development will arrive and depart from the Morris Road extension. Therefore, no traffic will be directed to Dohertys Road in the short term.

In Option 2 and in consideration of the access opportunities on Dohertys Road, the following will be assumed with regard to distribution of traffic.

- Approximately 80% of the traffic generated to / from the development will be directed towards Dohertys Road.
- Approximately 10% of the traffic will have origins/destinations within the subject land.
- Approximately 10% of the traffic generated to / from the development will be directed towards the internal road connections to the west and east.
- Approximately 70% of external traffic will be to / from the east along Dohertys Road.
- Approximately 30% of external traffic will be to / from the west along Dohertys Road.

Based on the above, Figure 4 has been prepared to illustrate the expected peak hour volumes at the Dohertys Road site access points following the completion of Stage 1.

Figure 4: Option 2 - Anticipated Post Development Peak Hour Volumes (Stage 1 – Site access 1 & 2)



Traffic Impact

- Dohertys Road

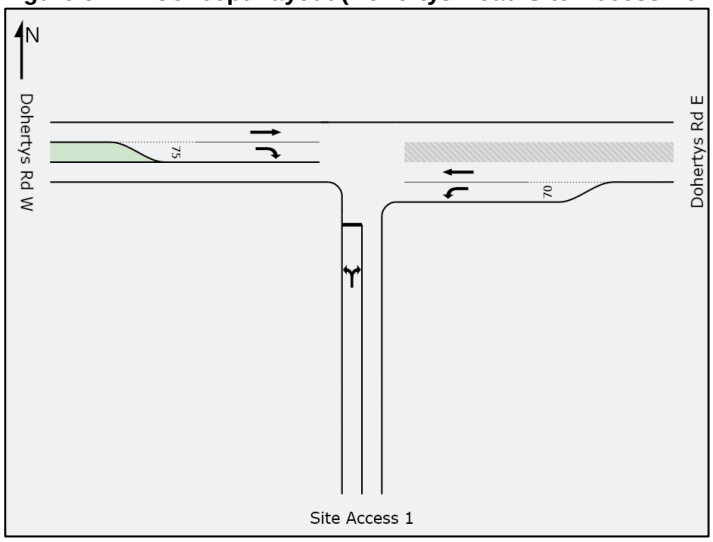
It is projected that the subject site during Stage 1 of the development, will generate in the order of 2,730 vehicle movements per day to Dohertys Road. Based on the 2013 traffic counts, it is our view that the duplication of Dohertys Road is not required in the immediate future. That being said, it is considered that an appropriate reservation should be set aside to provide for the future duplication if and when it is required.

In the short term, it is considered that the retention of a single carriageway will adequately provide for the projected traffic volumes generated, and there is no need to duplicate Dohertys Road as a result of the development of the subject land.

- Dohertys Road Access Points (Post Development Stage 1)

For the purposes of this assessment, it will be presumed that the temporary access strategy will incorporate localised widening at the Dohertys Road access point to provide auxiliary right and left turning lanes to access the site. A concept functional layout illustrating the proposed interim access arrangements is provided in Figure 5.

Figure 5: Concept Layout (Dohertys Road Site Access Points)



To determine the impact of the proposed development, the traffic volumes detailed in Figure 4, and proposed road geometry for the Dohertys Road access have been input into SIDRA and analysed.

SIDRA, a computer package originally developed by the Australian Road Research Board, as a guide for intersection design has been used to assess the operation of the proposed intersections. The package provides information about the capacity, average delay and 95th percentile back of queue of an intersection, as described below.

Degree of Saturation (DOS) is the ratio of the volume of traffic observed making a particular movement compared to the maximum capacity for that movement. Various values of degree of saturation and their rating are shown in Table 2.

Table 2: Rating of Degrees of Saturation

Degree of Saturation	Rating
Up to 0.6	Excellent
0.6 to 0.7	Very Good
0.7 to 0.8	Good
0.8 to 0.9	Fair
0.9 to 1.0	Poor
Above 1.0	Very Poor

Whilst rated as 'poor', it is considered acceptable for some critical movements in an intersection to operate in the range of 0.9 to 1.0 during the high peak periods, reflecting actual conditions in a significant proportion of suburban signalised intersections.

The **95th Percentile (95%ile)** Queue represents the maximum queue length, in metres, that can be expected in 95% of observed queue lengths in the peak hour.

Average Delay (seconds) is the delay time that can be expected for all vehicles making a particular movement in the peak hour.

The results of the SIDRA analysis are summarised in Table 3 and Table 4, and they highlight that Dohertys Road access intersections are expected to operate under 'excellent to very good' conditions after the completion of the proposed Stage 1 development.

Table 3: Dohertys Road / Site Access – Post Development Intersection Analysis (Stage 1 – Site Access 1)

Movement	AM Peak Hour			PM Peak Hour		
	DoS	Av. Delay (s)	95th'ile Back of Queue (m)	DoS	Av. Delay (s)	95th'ile Back of Queue (m)
Site Access S (L)	0.36	24	11	0.17	21	4
Site Access S (R)	0.36	24	11	0.17	20	4
Dohertys Rd E (L)	0.01	8	0	0.03	8	0
Dohertys Rd E (T)	0.14	0	0	0.46	0	0
Dohertys Rd W (T)	0.57	0	0	0.10	0	0
Dohertys Rd W (R)	0.01	10	0	0.05	15	1

Table 4: Dohertys Road / Site Access – Post Development Intersection Analysis (Stage 1 – Site Access 2)

Movement	AM Peak Hour			PM Peak Hour		
	DoS	Av. Delay (s)	95th'ile Back of Queue (m)	DoS	Av. Delay (s)	95th'ile Back of Queue (m)
Site Access S (L)	0.38	25	14	0.17	21	4
Site Access S (R)	0.38	25	14	0.17	21	4
Dohertys Rd E (L)	0.01	8	0	0.03	8	0
Dohertys Rd E (T)	0.12	0	0	0.45	0	0
Dohertys Rd W (T)	0.61	0	0	0.12	0	0
Dohertys Rd W (R)	0.01	10	0	0.05	15	1

The above analysis indicates that at the end of the Stage 1 development, the proposed site access to Dohertys Road will operate within the 'excellent' category with negligible queues and delays to motorists departing the subject site, highlighting that the interim intersection arrangement and the unduplicated Dohertys Road cross section would be an acceptable intersection treatment.

- Dohertys Road Access Points (Stage 1-2 Year 2023)

It is understood that Dohertys Road will be ultimately upgraded to a 4 lane arterial road over time, providing an east-west distribution, which will be transferred to VicRoads to become part of the regional Declared Main Road network.

In accordance with the VicRoads Access Management Policies, the impacts of the proposed developments direct access onto Dohertys Road has been assessed. For the purposes of this assessment, a 3% compound growth rate has been applied to Dohertys Road 10 years post development.

Figure 6 illustrates the development volumes in Year 2023, while Table 5 to Table 8 summarises the future operating conditions during the critical periods.

Figure 6: Post Development Vehicle Volumes (Stage 1&2 – Year 2023)

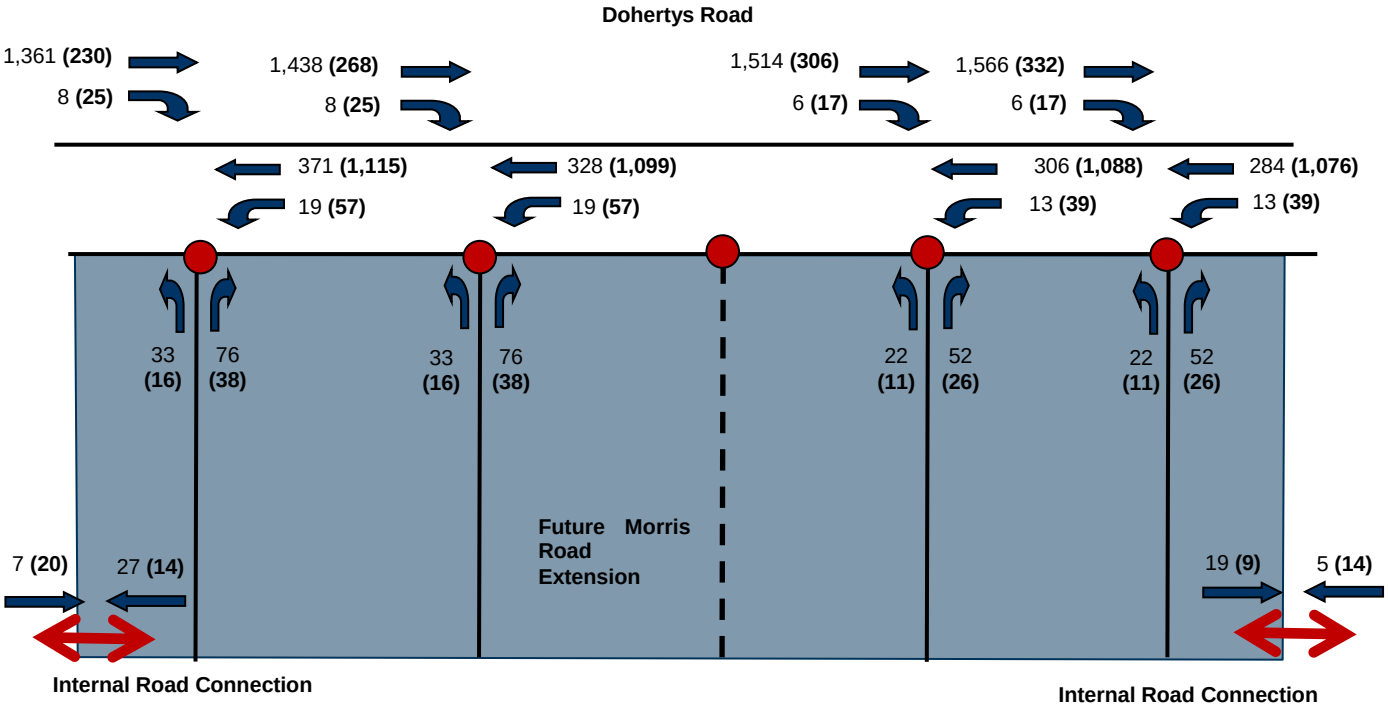


Table 5: SIDRA Analysis (2023) – Dohertys Road/ Site Access 1 (Stage 1-2)

Movement	AM Peak Hour			PM Peak Hour		
	DoS	Av. Delay (s)	95th'ile Back of Queue (m)	DoS	Av. Delay (s)	95th'ile Back of Queue (m)
Site Access S (L)	0.76	63	27	0.29	32	7
Site Access S (R)	0.76	63	27	0.29	32	7
Dohertys Rd E (L)	0.01	8	0	0.03	8	0
Dohertys Rd E (T)	0.21	0	0	0.62	0	0
Dohertys Rd W (T)	0.76	0	0	0.13	0	0
Dohertys Rd W (R)	0.01	10	0	0.09	21	2

Table 6: SIDRA Analysis (2023) – Dohertys Road/ Site Access 2 (Stage 1&2)

Movement	AM Peak Hour			PM Peak Hour		
	DoS	Av. Delay (s)	95th'ile Back of Queue (m)	DoS	Av. Delay (s)	95th'ile Back of Queue (m)
Site Access S (L)	0.79	71	30	0.30	32	7
Site Access S (R)	0.79	71	30	0.30	32	7
Dohertys Rd E (L)	0.01	8	0	0.03	8	0
Dohertys Rd E (T)	0.18	0	0	0.61	0	0
Dohertys Rd W (T)	0.80	0	0	0.15	0	0
Dohertys Rd W (R)	0.01	10	0	0.09	20	2

Table 7: SIDRA Analysis (2023) – Dohertys Road/ Site Access 4 (Stage 1&2)

Movement	AM Peak Hour			PM Peak Hour		
	DoS	Av. Delay (s)	95th'ile Back of Queue (m)	DoS	Av. Delay (s)	95th'ile Back of Queue (m)
Site Access S (L)	0.59	55	17	0.21	30	5
Site Access S (R)	0.59	55	17	0.21	30	5
Dohertys Rd E (L)	0.01	8	0	0.02	8	0
Dohertys Rd E (T)	0.17	0	0	0.61	0	0
Dohertys Rd W (T)	0.84	0	0	0.17	0	0
Dohertys Rd W (R)	0.01	10	0	0.06	19	1

Table 8: SIDRA Analysis (2023) – Dohertys Road/ Site Access 5 (Stage 1&2)

Movement	AM Peak Hour			PM Peak Hour		
	DoS	Av. Delay (s)	95th'ile Back of Queue (m)	DoS	Av. Delay (s)	95th'ile Back of Queue (m)
Site Access S (L)	0.51	45	14	0.21	31	5
Site Access S (R)	0.51	45	14	0.21	31	5
Dohertys Rd E (L)	0.01	9	0	0.03	8	0
Dohertys Rd E (T)	0.16	0	0	0.60	0	0
Dohertys Rd W (T)	0.81	0	0	0.19	0	0
Dohertys Rd W (R)	0.01	10	0	0.06	19	1

The above tables indicates that the proposed access arrangements have been designed with sufficient capacity to accommodate additional traffic growth along Dohertys Road, without adversely impacting the operation of the road network.

- Dohertys Road and Morris Road Extension (Stage 3 Year 2023)

Following the Stage 2 development, it is anticipated that the intersection of Dohertys Road and Morris Road extension will be signalised to facilitate safe access to and from the subject site. Accordingly, Figure 7 has been prepared to illustrate the ultimate development volumes, and a concept functional layout illustrating the proposed interim access arrangements is provided in Figure 8.

The construction of Morris Road will introduce a new north – south connection between Leakes Road and Dohertys Road. It is likely that this new connection will draw some traffic away from Derrimut Road and Dohertys Road providing an overall improvement in traffic conditions in the area in the short term. That being said, Morris Road is not the designated arterial and emphasis should be on Derrimut Road to carry the main north south movement in the area. Morris Road will continue to provide its local function connecting development north of the rail line to existing communities and services to the south.

Figure 7: Post Development Vehicle Volumes (Stage 3)

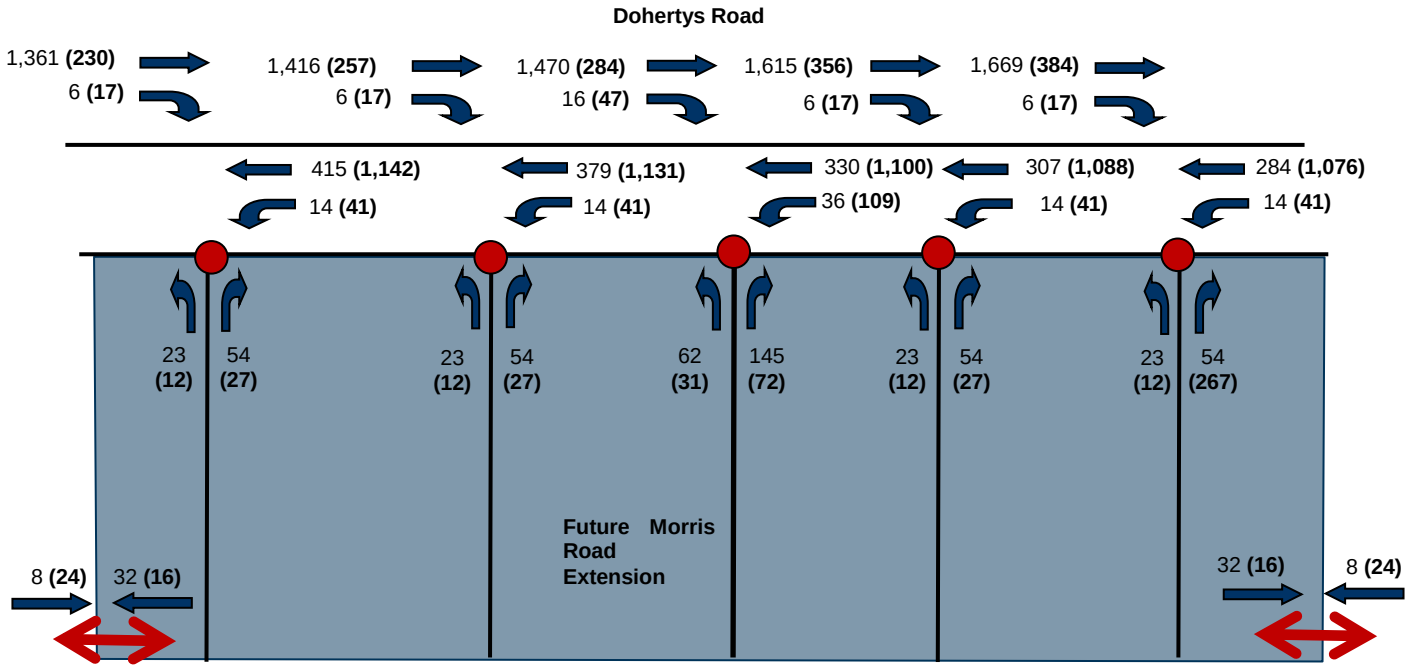
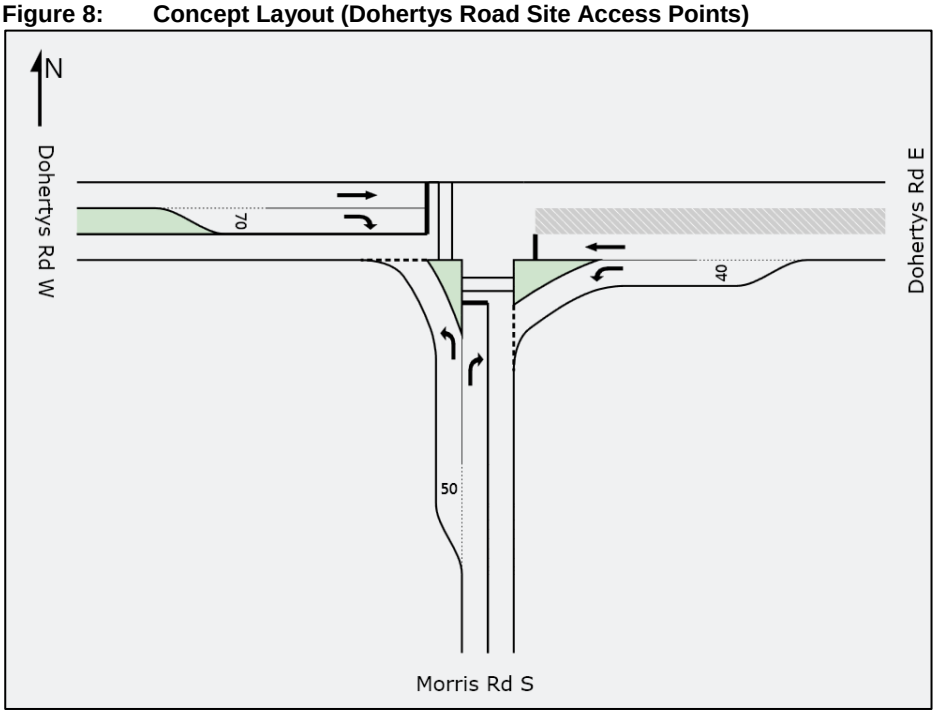


Figure 8: Concept Layout (Dohertys Road Site Access Points)



Based on the concept layout plan, Table 9 summarise the results of the SIDRA analysis in the AM and PM peak hour.

Table 9: SIDRA Analysis – Dohertys Road/ Morris Road Extension

Movement	AM Peak Hour			PM Peak Hour		
	DOS	**Average Delay (s)**	**95th'ile Back of Queue (m)**	**DOS**	**Average Delay (s)**	**95th'ile Back of Queue (m)**
Morris Rd S (L)	0.10	9	3	0.12	29	8
Morris Rd (R)	0.79	70	49	0.39	64	31
Dohertys Rd E (L)	0.04	8	1	0.12	8	4
Dohertys Rd E (T)	0.27	7	55	0.89	20	422
Dohertys Rd W (T)	1.19	218	1,590	0.23	7	46
Dohertys Rd W (R)	0.19	71	8	0.55	73	22

Review of the above table indicates that the critical movements in the intersection during the AM and PM peaks are the westbound through traffic and eastbound through traffic respectively. It is anticipated that by this stage, control of Dohertys Road will already have been transferred to VicRoads to become part of the regional Declared Main Road network.

Aside from issues with through traffic volumes, the Dohertys Road and Morris Road intersection is projected to operate within the 'fair" category during the morning and afternoon peak respectively, with manageable traffic queues and delays. Based on this, the interim access arrangement and the unduplicated Dohertys Road cross section would be an acceptable intersection treatment, contingent on the future duplication of Dohertys Road.

- Derrimut Road

Cardno sourced scram counts from Vic Roads at the intersection of Derrimut Road and Leakes Road on Wednesday 22 August 2012. Based on these traffic counts, it is estimated that Derrimut Road has a daily volume of approximately 20,000 vehicles.

As discussed earlier, it is estimated that approximately 30% of external traffic generated by the subject site will be to / from the west along Dohertys Road, or 294 movements in the AM and PM peak hours respectively.

Presuming that 50% of traffic from the development is evenly distributed to the north and south via Derrimut Road, it is projected that in the order of 147 movements will have origins/destinations to Derrimut Road during the peak hour periods, or approximately 1,470 movements per day.

Whilst noticeable, in view of the existing condition on Derrimut Road, this level of traffic is not expected to have any significant impact on its operation.

Regional Traffic Impacts

The development of the subject site which forms part of a greater PSP and then on a higher level a regional north western growth corridor represents a small component of the overall lot realisation. In simple terms the development of the subject site will yield no more than 950 lots which compared to the overall projections of more than 35,000 lots represents a very small component.

As part of the development of the area as a whole, input from authorities and land holders with regard to the delivery of infrastructure projects with the key function being roads. A number of road infrastructure projects have been identified however the funding mechanisms are unclear or focussed towards being delivered by developers which highlights a missing link between the nexus of the road construction compared to the realised development yield.

In this scenario it is clear that over time the duplication of roads in the vicinity of the site are necessary such as Dohertys Road, Derrimut Road and Leakes Road. These roads are key arterials for the region and as such have a high significance and reliance. It should therefore be the responsibility of a combined approach rather than being directed to individual land owners as the benefits are far reaching.

We trust that the above information is of assistance. Should you have any further queries regarding this matter, please do not hesitate to contact me on 8415 7711.

Yours sincerely

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