PROPOSED CODE AMENDMENT
LOT 325 PORT WAKEFIELD HIGHWAY, PORT WAKEFIELD

TRAFFIC AND PARKING REPORT

CIRQA™

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DOCUMENT CONTROL

Report title:	Proposed Code Amendment, Lot 325 Port Wakefield Highway, Port Wakefield
Project number:	22384
Client:	Adelaide Planning and Development Solutions Pty Ltd
Client contact:	Mr Mark Kwiatkowski

Version	Date	Details/status	Prepared by	Approved by
Draft 1	28 Jul 23	For review	ABH	BNW
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1. EXECUTIVE SUMMARY

CIRQA has been engaged to undertake transport investigations in relation to the potential rezoning of two parcels of land located on the eastern side of Port Wakefield Highway. Specifically, CIRQA's investigations relate to the proposed rezoning of land from 'Rural' and 'Rural Living' to 'Employment' Zone.

This report includes assessment of the potential traffic generation associated with the proposed rezoning and redevelopment of the Affected Area, the associated impact on the adjacent existing road network and consideration of the potential infrastructure provisions and upgrades. The assessment has been based on the future development of the Affected Area to include a service centre with additional fast food outlets on the portion north of the Wakefield River and warehousing on the portion south of the Wakefield River.

It is anticipated that access for the northern portion of the Affected Area would be provided in the form of a single central access point restricted to left-in, left-out and right-in. Access for the southern portion of the Affected Area would be via agreed (left-in and left-out) access points on Port Wakefield Highway for contiguous land to the west (already within an Employment Zone).

For the northern access point, deceleration lanes would be required on Port Wakefield Highway for both the left and right turning movements into the Affected Area. The access would be restricted to provide appropriate separation to the merge lane located near the northern end of the Affected Area. Consideration could be given to relocation of the speed zone changes to locate the Affected Area within a 50 km/h zone, albeit access arrangements have been identified should the existing speed limit be retained.

An assessment has been undertaken of the traffic generation associated with the future development of the Affected Area. The forecasts identify that the ultimate redevelopment of the Affected Area will result in the distribution of approximately 343 am and 514 pm peak hour movements on the adjacent Port Wakefield Highway.

An assessment has been made of the anticipated impacts of the additional volumes (including SIDRA intersection analysis). The assessment (including sensitivity analysis) has identified that the future traffic volumes would be easily accommodated at the Affected Area access on the surrounding road network with no change to the nature and function of any existing road or intersection.

2. BACKGROUND

2.1 AFFECTED AREA

The Affected Area comprises approximately 41,125 m^2 of land located on the northern side of the township of Port Wakefield. The Affected Area is bound by (unmade) road reserve to the north, agricultural land to the east and south and Port Wakefield Highway to the west. The Affected Area is split into two areas, namely a northern portion (north of the Wakefield River) and a southern portion (south of the Wakefield River). The Affected Area is illustrated in Figure 1.

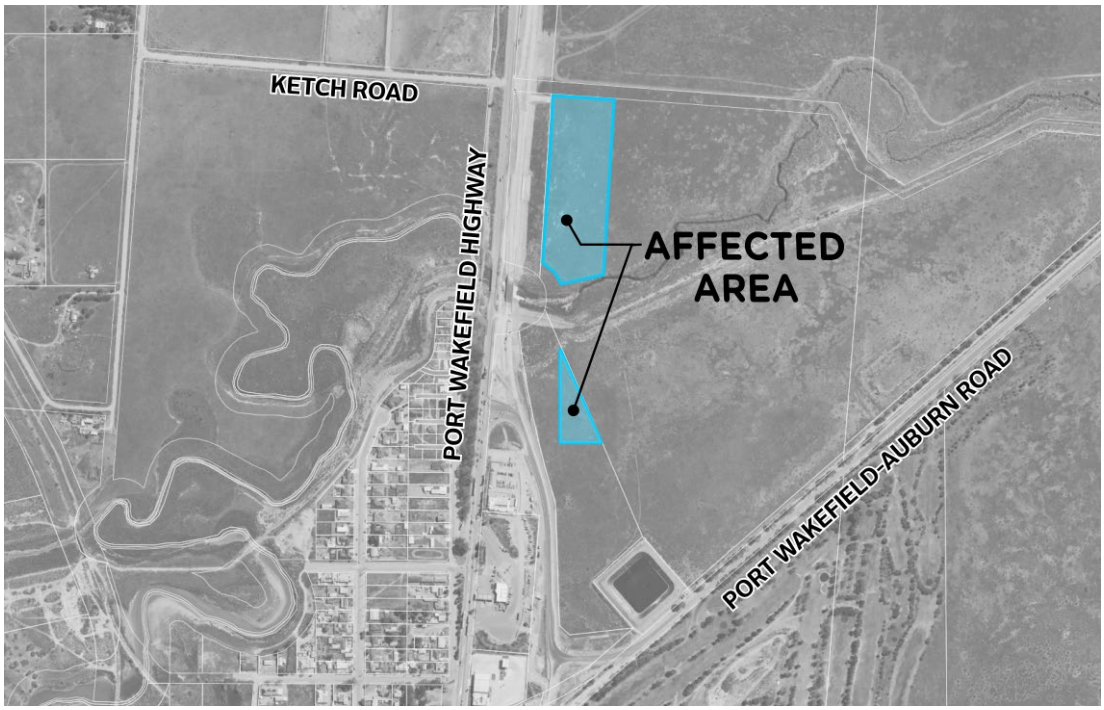

Figure 1 - Location of the Affected Area in respect to the adjacent road network (aerial imagery captured during construction of Port Wakefield Highway upgrade)

It is highlighted that the latest aerial imagery available was taken during ongoing construction of the Port Wakefield Highway Duplication project.

The Affected Area is currently vacant, undeveloped land with no improvements/buildings within it. Vehicle access is provided via an unsealed crossover near the north-western corner of the Affected Area, restricted to left-in and left-out. Vehicles travelling northbound would also be able to access the Affected Area conveniently, given the presence of a U-turn facility near the access point. It is noted that access point does not lead to any driveways within the Affected Area.

The Planning and Design Code identifies that the northern portion of the Affected Area is located within a Rural Zone, with the following Overlays applicable:

- Dwelling Excision;
- Hazards (Bushfire – General Risk);
- Hazards (Flooding - Evidence Required);
- Key Outback and Rural Routes;
- Limited Land Division;
- Native Vegetation; and
- Water Resources.

The southern portion of the Affected Area is within a Rural Living Zone with the following Overlays applicable:

- Affordable Housing;
- Dwelling Excision;
- Hazards (Bushfire – General Risk);
- Hazards (Bushfire – Urban Interface);
- Hazards (Flooding - Evidence Required);
- Key Outback and Rural Routes;
- Limited Land Division;
- Native Vegetation; and
- Water Resources.

2.2 ADJACENT ROAD NETWORK

Port Wakefield Highway is an arterial road under the care and control of the Department for Infrastructure and Transport (DIT). The adjacent section of Port Wakefield Highway has recently undergone an upgrade as part of the now completed 'Port Wakefield Overpass and Highway Duplication' project. As a result, Port Wakefield Highway now comprises two traffic lanes in each direction, separated by a wide central median, with adjacent sealed shoulders on each side. It is noted that road upgrades do not include pedestrian or cyclist facilities (i.e. footpaths and bicycle lanes), given this region would experience very low volumes for both use classes. Adjacent the Affected Area, an 80 km/h speed limit applies on Port Wakefield Highway.

Traffic counts obtained from DIT (count period 21 February 2023 to 27 February 2023) indicate the section of Port Wakefield Highway adjacent the Affected Area has an Annual Average Daily Traffic (AADT) volume in the order of 9,100 vpd. Data indicates that peak northbound volumes are experienced Friday evenings, with 567 vehicles recorded between 5 pm to 6 pm. Peak southbound volumes are

experienced Sunday midday, with 612 vehicles recorded between 11 am to 12 pm. This is indicative of the 'holiday' nature of the road with drivers leaving the greater Adelaide area for the weekend period.

Ketch Road a local road under the care and control of Wakefield Regional Council. Ketch Road comprises an 8.9 m wide unsealed carriageway (approximate), accommodating traffic in both directions. The default rural speed limit of 100 km/h applies on Ketch Road, however real speeds in the area are anticipated to be significantly less given the unsealed nature of the road.

Port Wakefield Highway and Ketch Road form a priority-controlled T-intersection (with priority assigned to Port Wakefield Highway). It is noted that the eastern leg of the intersection there is an unmade road reserve at the continuation of Ketch Road.

2.3 PUBLIC TRANSPORT

No public transport operates within the township of Port Wakefield. However, charter bus services are available through 'Greyhound Australia' and 'Yorke Peninsula Coaches' who offer daily services operating to/from Adelaide.

3. PROPOSED CODE AMENDMENT

3.1 REZONING AND POTENTIAL DEVELOPMENT

It is proposed to rezone the northern portion of the Affected Area from Rural Zone to Employment Zone and the southern portion from Rural Living to Employment Zone. The rezoning will allow for the future development of the Affected Area for commercial purposes.

Based on preliminary concept plans prepared by Brown Falconer (dated March 2023, see Appendix A), the development of the northern portion of the Affected Area is anticipated to consist of the following key components:

- fast food outlet 1 – 540 m^2;
- fast food outlet 2 – 300 m^2;
- retail fuel outlet – eight (8) service lanes;
- attached convenience store – 400 m^2;
- car wash, inclusive of six wash bays; and
- attached dog wash.

The northern portion of the Affected Area is also anticipated to include a truck refuelling and servicing area, separated from light vehicle areas. Such an arrangement would maintain enough area to accommodate an appropriate level of vehicle parking and heavy vehicle manoeuvring areas.

The southern portion (which forms the continuation of the adjacent Employment Zone) is anticipated to accommodate in the order of 2,500 m² floor area of warehousing.

3.2 ACCESS PROVISIONS

It is anticipated that access to/from future development within the northern portion of the Affected Area would be achieved via a left-in, left-out and right-in access point on Port Wakefield Highway (as has previously been discussed with DIT). It is noted the Affects Area's frontage to the unmade road reserve of Ketch Road would be unlikely to obtain access due to the proximity of the road reserve to the existing acceleration lane on Port Wakefield Highway.

This access is identified as being constrained by various factors relating to the newly constructed section of Port Wakefield Highway adjacent the Affected Area. It is noted that southbound traffic on Copper Coast Highway and Augusta Highway will merge together near the north-western corner of the Affected Area.

Any future access into the Affected Area would require a level of separation from this point to allow drivers sufficient separation between decision points.

The constraint detailed above would result in access into the affected area being located towards the southern end of the Affected Area. As a result, it is likely the deceleration lanes for both the left and right turn manoeuvres into the Affected Area would be located adjacent newly constructed culverts on Port Wakefield Highway. While the presence of culverts would not impact the viability of the access from a traffic perspective it would require civil works to determine the widening of the existing culverts. CIRQA has prepared preliminary concept designs for access treatments, highlighting the detailed constraints, see Appendix B).

It is noted that the design of any deceleration lanes for access into the Affected Area is dependent on the speed limit of the adjacent road in that greater distances are required for vehicles to decelerate as necessary. Currently, the speed limit adjacent the affected area is 80 km/h. This speed reduces to 50km/h on approach to the township of Port Wakefield, approximately 250 to 500 m south of the affected area. Consideration could, however, be given to relocation of the speed limit change to be north of the Affected Area's access (subject to further DIT review). Such a modification would have multiple positive outcomes for users of future development, such as:

- shortened turn lanes into and out of the Affected Area, providing more flexibility around the existing constraints, particularly the location of the left-in and left-out access points;
- reduced collision risk relating to vehicle speeds adjacent the Affected Area; and
- reduced consequence of any collisions resulting between vehicles travelling to/from the affected area and the adjacent road.

The plans provided in Appendix B illustrate concept options for both the existing speed limit (80 km/h with a 90 km/h design speed) and a reduced 50 km/h speed limit (60 km/h design speed).

Access treatments are envisaged to accommodate the largest vehicle gazetted for use on Port Wakefield Highway. This vehicle is identified as a 36.5m Road Train on the Department of Infrastructure and Transports (DIT) 'RAVnet' online map system.

The restriction of no right turns out of the Affected Area are unlikely to impact the viability of its future development, noting the majority of vehicles would use the Affected Area as a rest and refuelling stop. The nature of the Affected Area

would mean vehicles would predominantly continue travelling in the same direction (i.e. left-in and left-out). Furthermore, vehicles would be unlikely to stop at a petrol station on the opposite side of the road to vehicle travel, particularly given alternative services are available on the southern side of the Port Wakefield Township.

Any potential access point located on Port Wakefield Highway would achieve an Approach Sight Distance (ASD) above the 172.5m required by Austroads for a 90 km/h design speed (applicable to an 80 km/h speed limit). Given the adjacent stretch of road is straight, without crests and no significant visual obstructions are present.

Access for the portion of the Affected Area south of the Wakefield River will be via the contiguous land to the west via the left-in and left-out access points on Port Wakefield Highway (previously agreed with DIT).

4. TRAFFIC ASSESSMENT

4.1 TRAFFIC GENERATION

4.1.1 RETAIL FUEL OUTLET

The RTA's *"Guide to Traffic Generating Developments"* (the RTA Guide), and its subsequent updates, is a document commonly used by traffic engineers in order to determine the forecast traffic generation of a variety of land uses. An update to the RTA (now RMS) retail fuel outlet traffic generation rates was prepared by TEF Consulting and the RMS in 2013. The updated study identified that the previously recommended rates were based on data from 1979 and that the operation and nature of retail fuel outlets has changed significantly since that time.

Based on detailed statistical analysis, the updated report recommended the following rates for assessment of traffic generation at retail fuel outlets (including those with drive-through facilities) during the road network peak hours (where X1 is the total site area in m² and X2 is the number of service channels):

- am peak hour trips = $0.2815\ X2^2 + 14.047\ X2 + 16.715$; and
- pm peak hour trips = $0.0205\ X1 + 88.52$.

Given it is anticipated that the Affected Area will accommodate a variety of uses, an assumption has been made that 5,000 m^2 of the total site area can be attributed to operation of the retail fuel outlet, such an estimate includes allowances for the convenience store, petrol canopy, parking and manoeuvring areas and landscaping. It is also noted the petrol canopy could accommodate up to 8 service lanes. Based upon the above rates and assumptions the retail fuel outlet could generate in the order of 148 am and 191 pm trips during the relevant peak hour.

It is commonly accepted that in the order of 70% of vehicle trips associated with petrol filling stations are related to passing trade (i.e. vehicles already on the road network), with the remaining 30% of vehicle trips considered to be additional (new) trips on the adjacent road network. This equates to:

- 103 'passing trade' and 44 additional (new) trips during the am peak hour; and
- 134 'passing trade' trips and 57 additional (new) trips during the pm peak hour.

4.1.2 FAST FOOD OUTLETS

Given that the proposed fast-food outlets have not yet been identified, it has conservatively been assumed these outlets will be the two highest traffic generating fast food outlets (i.e. a McDonalds and KFC restaurant) for the purposes of this assessment.

The RMS Guide identifies the following peak hour traffic generation rates applicable to for McDonald's and KFC fast-food restaurants:

- McDonalds - 92 am and 183 pm peak hour vehicle trips per restaurant (it has been assumed that 50% of the pm peak hour generation would occur during the am peak hour); and
- KFC – 37 am and 73 pm peak hour vehicle trips per restaurant (it has been assumed that 50% of the pm peak hour generation would occur during the am peak hour).

In addition to the above, it has also been assumed that 50% of the peak hour generation associated with the fast-food outlets will be associated with passing trade.

Based upon the above, the proposed fast-food restaurants are forecast to generate in the order of 129 am and 256 pm trips during the relevant peak hour.

4.1.3 CAR WASH/DOG WASH

The RTA Guide and its updates provide no rate specific to car wash facilities such as that proposed. It is, therefore, common to assess such uses on a 'first principles' basis. A single automated car wash typically has a service rate of between 5 to 10 minutes per vehicle. On this basis, the automatic car wash bay could service between 6 and 12 vehicles in a single hour. A single manual car wash has a lower service rate of approximately one car every 15 minutes. Therefore, the manual car wash bays could service approximately 4 vehicles per hour. The vacuum bays are then utilised by patrons associated with the automatic and manual car washes and generally don't generate additional traffic (above that already associated with the car wash bays). The dog wash would have a service rate in the order of one dog every 10 minutes, resulting in up to 6 trips in one hour.

It has been assumed that the proposed development would include three manual and three automatic wash bays. On the basis of the above, the car and dog wash facilities could service in the order of 26 to 38 vehicles in an hour (at full occupancy).

4.1.4 WAREHOUSING

The RTA Guide rate of 0.5 peak hour trips per 100 m² of warehousing has been adopted for this land use component. Based on the anticipated yield of 2,500 m², it is forecast that there would be approximately 13 peak hour trips associated with the warehousing component.

4.1.5 TRAFFIC GENERATION SUMMARY

The traffic generation detailed above results in a total traffic generation for the of 330 am and 501 pm trips for the northern portion and 13 am and 13 pm peak hour trips for the southern portion of the Affected Area. It is noted that such a forecast assumes that the peak periods associated with all land uses occur simultaneously (which is unlikely). Additionally, this forecast applies no reduction for 'shared trips' as would be common-place between the land uses, particularly within the retail fuel outlet and the fast food outlets.

4.2 TRAFFIC DISTRIBUTION

The previously calculated traffic volumes will be distributed to and from and adjacent road network via the Affected Area's access points.

The following distribution assumptions have been adopted for the purposes of the assessment:

- northern portion of the Affected Area
  - all trips are equally distributed between ingress and egress during both the am and pm peak hours;
  - 85% of Affected Area uses will enter via a left-in and exit left-out (via the direct Port Wakefield Highway access point); and
  - 15% of Affected Area users will enter via a right-in and exit left-out.
- southern portion of the Affected Area
  - all trips are equally distributed between ingress and egress during both the am and pm peak hours; and
  - all trips are equally distributed between left-in and left-out movements (noting right-out movements are not proposed at the access points agreed with DIT).

Such distributions envisage driver behaviour as is common with retail fuel outlets and fast-food restaurants in service centre arrangements. Specifically, the vast majority of vehicles are expected to be associated with passing trade (i.e. already traversing the Port Wakefield Highway), continuing in the same direction from which they entered. Similarly, drivers are less likely to choose a petrol station on the opposite side of the road to their travel direction (particularly in the case of

heavy vehicles turning across an arterial road) when alternate petrol station and fast-food offerings are available (such as Port Wakefield and Port Adelaide).

Based on the above, Figure 2 illustrates the forecast additional movements associated with the anticipated development of the northern portion of the Affected Area.

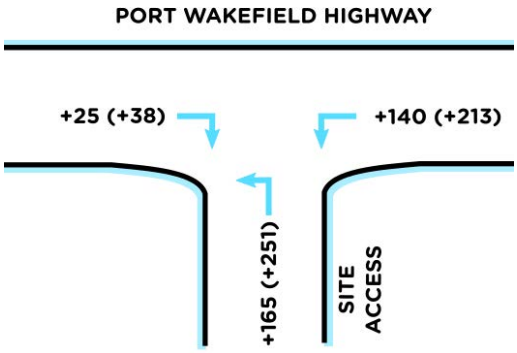

Figure 2 - Additional turning movements into and out of the northern portion of the Affected Area during the am (pm) peak hours

Figure 3 illustrates the forecast additional movements associated with the anticipated development of the southern portion of the Affected Area.

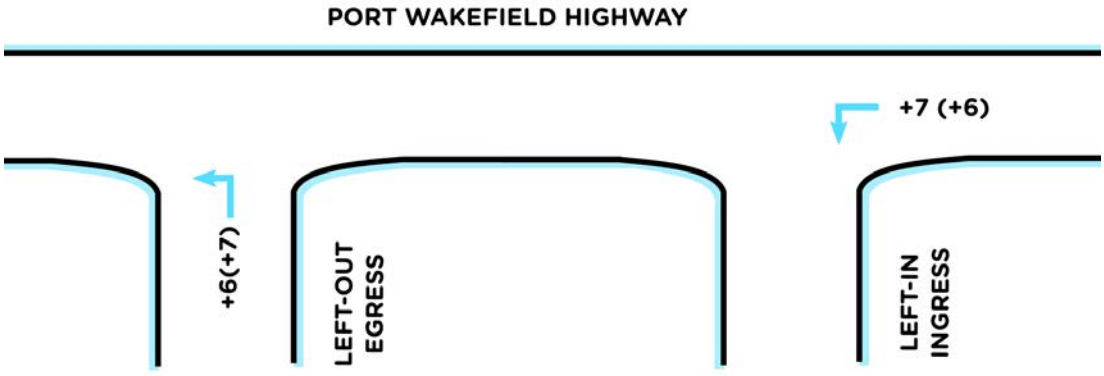

Figure 3 - Additional turning movements into and out of the access points for the southern portion of the Affected Area during the am (pm) peak hours

4.3 TRAFFIC IMPACT

The primary traffic impact of the proposal will be associated with the proposed access point for the northern portion of the Affected Area. Further analysis has been undertaken for this access point to consider future traffic conditions at this location. Further detailed analysis has not been undertaken for the access points for the southern portion of the Affected Area noting the very low additional movements forecast for that portion of land.

4.3.1 NORTHERN SITE ACCESS POINT

For the assessment of conditions at the northern access point, SIDRA Intersection models have been prepared. To assess any potential impacts at the access point, through volumes have been assumed for the adjacent section of Port Wakefield Highway based on the DIT traffic volumes.

In order to provide a conservative assessment, the Affected Areas am peak has been assumed to coincide with the peak morning period on Port Wakefield Highway, this being Sunday 11 am to 12 pm. Similarly, the pm peak for the Affected Area has assumed to coincide with Friday evening 5 pm to 6 pm peak hour on Port Wakefield Highway.

This assessment has been undertaken with the following further conservative assumptions:

- all Affected Area users experience peak traffic volumes simultaneously;
- no shared trip discount is applied to traffic utilising the Affected Area;
- volumes on Port Wakefield Highway are akin to a weekly peak periods;
- an 80 km/h speed limit has been assumed on Port Wakefield Highway; and
- 22.5% of all vehicles in the model are commercial vehicles (with calibration factors applied based on the vehicle classification information provided by DIT).

Key results from the SIDRA model are included in Table 1. Full details are provided in Appendix C.

Table 1 - Key SIDRA results at a future Affected Area access during the am (pm) peak hour

Approach	Movement	Future Development Scenario		
		Degree of Saturation	Ave. Delay (sec)	Level of Service
Port Wakefield Highway (N)	L	0.110 (0.171)	8.6 (8.7)	A (A)
	T	0.245 (0.184)	0.1 (0.0)	A (A)
Affected Area access (E)	L	0.272 (0.351)	4.0 (3.2)	A (A)
Port Wakefield Highway (S)	T	0.160 (0.227)	0.0 (0.1)	A (A)
	R	0.077 (0.080)	17.5 (13.6)	C (B)

The SIDRA results indicate the additional traffic associated with the Affected Area will have negligible impact on Port Wakefield Highway, with all through traffic experiencing no delay. The highest delays would be experienced by traffic turning right into the Affected Area. However, associated queuing would be confined to the separated right turn lane and not impact through traffic on Port Wakefield

Highway. Furthermore, the maximum average delay of 12.4 seconds is considered low and provides a high level of service to drivers turning accessing the Affected Area.

Notwithstanding the above assessment, it is noted that DIT has queried the potential for a higher distribution of movements via the right-in turn from Port Wakefield Highway. In order to respond to the DIT query, a sensitivity analysis of conditions has been undertaken with the right turn ingress movement doubled and a 10-year design horizon with 2% annual growth applied to through movements on Port Wakefield Road (allowing for further growth and development in the surrounding area). Notably, the left turn movements have not been reduced for this sensitivity analysis and this provides another layer of conservatism in the assessment. The SIDRA results for the sensitivity analysis are provided in Appendix D and key results are summarised in Table 2.

Table 2 - Key SIDRA results at a future Affected Area access during the am (pm) peak hour for the sensitivity analysis case

Approach	Movement	Future Development Scenario		
		Degree of Saturation	Ave. Delay (sec)	Level of Service
Port Wakefield Highway (N)	L	0.114 (0. 180)	8.7 (9.0)	A (A)
	T	0.312 (0.234)	0.1 (0.1)	A (A)
Affected Area access (E)	L	0.333 (0.401)	6.5 (4.9)	A (A)
Port Wakefield Highway (S)	T	0.209 (0. 289)	0.1 (0.1)	A (A)
	R	0.255 (0. 218)	27.1 (17.6)	D (C)

The above sensitivity analysis indicates that even with highly conservative forecasts applied, the access point would still operate within DIT performance targets. Of particular importance, the SIDRA results for the sensitivity case (refer Appendix D) indicate 95th percentile queues of 0.7 vehicles in both the am and pm peak hours. This confirms that, even with overly conservative forecasts adopted for the right-in movements, a sheltered right turn lane could adequately accommodate the forecast queues without 'spill-back' to the northbound through lanes on Port Wakefield Road.

4.3.2 BROADER IMPACTS

Beyond the Affected Area access points, it is anticipated that the additional volumes would be easily accommodated on Port Wakefield Highway, particularly given the recent upgrade works. It is noted that a small proportion of traffic may use the adjacent road network to continue in the northbound direction. This manoeuvre would be accommodated within a designated U-turn area located approximately 900 m south from the Affected Area (near the intersection with Phillips Road). It is anticipated that this manoeuvre would only be undertaken by a small proportion of drivers accessing the Affected Area (due to the

inconvenience and extra travel distance). Nonetheless, the existing U-turn facility is anticipated to easily accommodate for the small volume of vehicles performing the manoeuvre.

Similarly, a small proportion of movements associated with the southern portion of the Affected Area will access the site via the nearby right turn facilities (effectively U-turn facilities) on Port Wakefield Highway. Nevertheless, the level of additional movements would be extremely low (less than 5 additional peak hour movements per right turn at these facilities) and traffic impacts will be minimal.

APPENDIX A

BROWN FALCONER PLANS DATED MARCH 2023

PRELIMINARY

Rev	Amendment	Date
-		

PORT WAKEFIELD HIGHWAY

SLIP ROAD

ROAD WIDENING

SERVICE ROAD

VAC BAYS + DOG WASH

CARWASH 400 sqm

SHOP 400 sqm

YARD

FUEL

FAST FOOD 300 sqm

FAST FOOD 540 sqm

TRUCK PARKING

TRUCK

RETAIL SITE 37 115 sqm

35000

122000

20000

2000

2767

296953

0 10 20 30 40 50m

Scale 1:1000 @ A3

BROWN FALCONER

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ABN 65 007 846 586 brownfalconer.com.au

ACCORD PROPERTY LTD PTY

RETAIL DEVELOPMENT
PORT WAKEFIELD

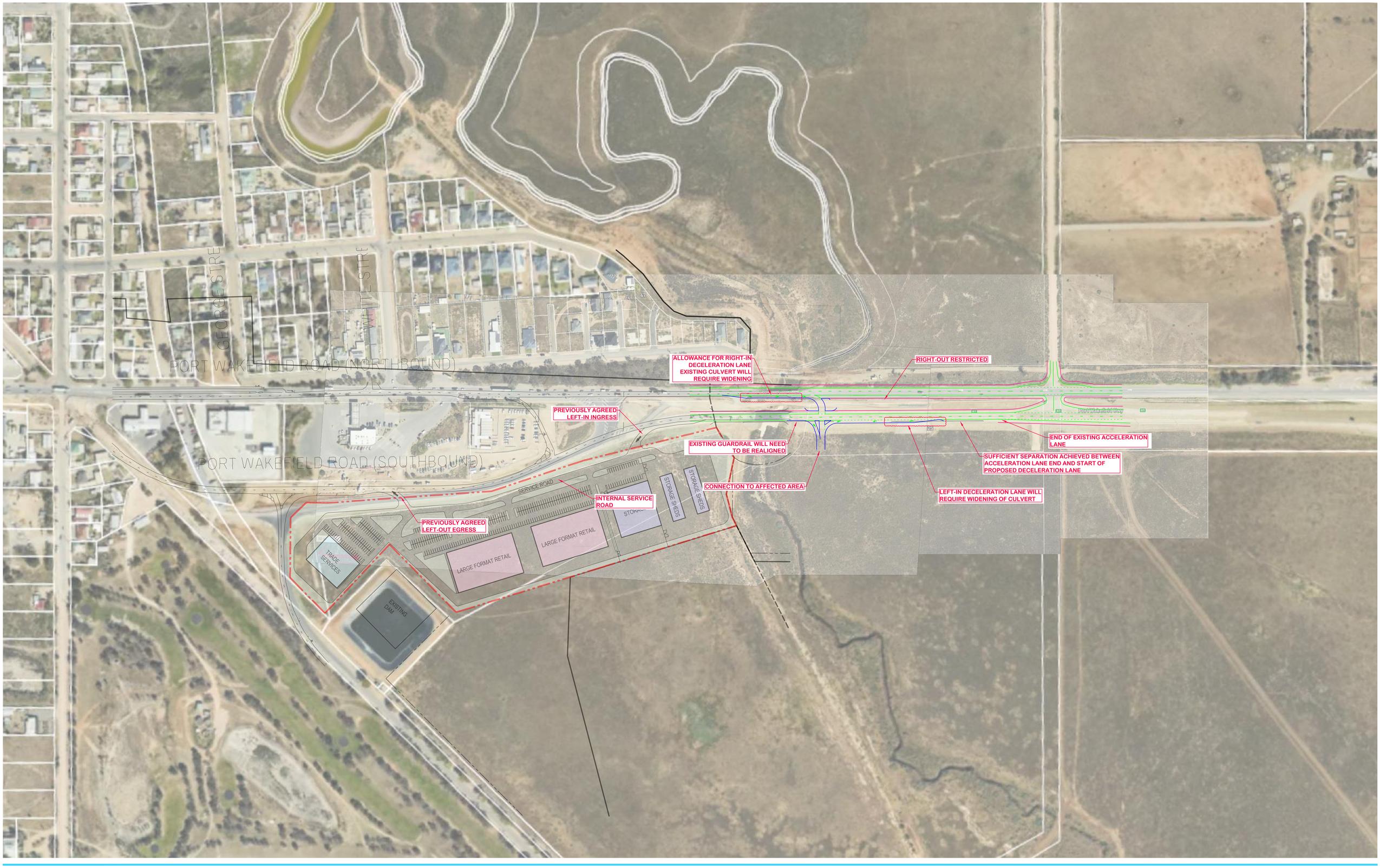
CONCEPT SITE PLAN

Scale 1:1000
Drawn AW
Date MARCH 2023
Job No 2021000

Dwg No S3611 07 Rev - A3 sheet

APPENDIX B

ACCESS CONCEPT PLANS (PREPARED BY CIRQA)



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DRAWING AMENDMENTS

VER	DATE	DESCRIPTION	DWN	CHK
A	NOT ISSUED		BNW	BNW
B	8/03/2023		BNW	BNW
C	NOT ISSUED		BNW	BNW
D	09/05/2023		BNW	BNW

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PORT WAKEFIELD CODE AMENDMENT

COMBINED ACCESS REVIEW

HIGHER SPEED LIMIT OPTION - PORT WAKEFIELD ROAD

PROJECT # 22384 SHEET # 01_SH01

APPENDIX C

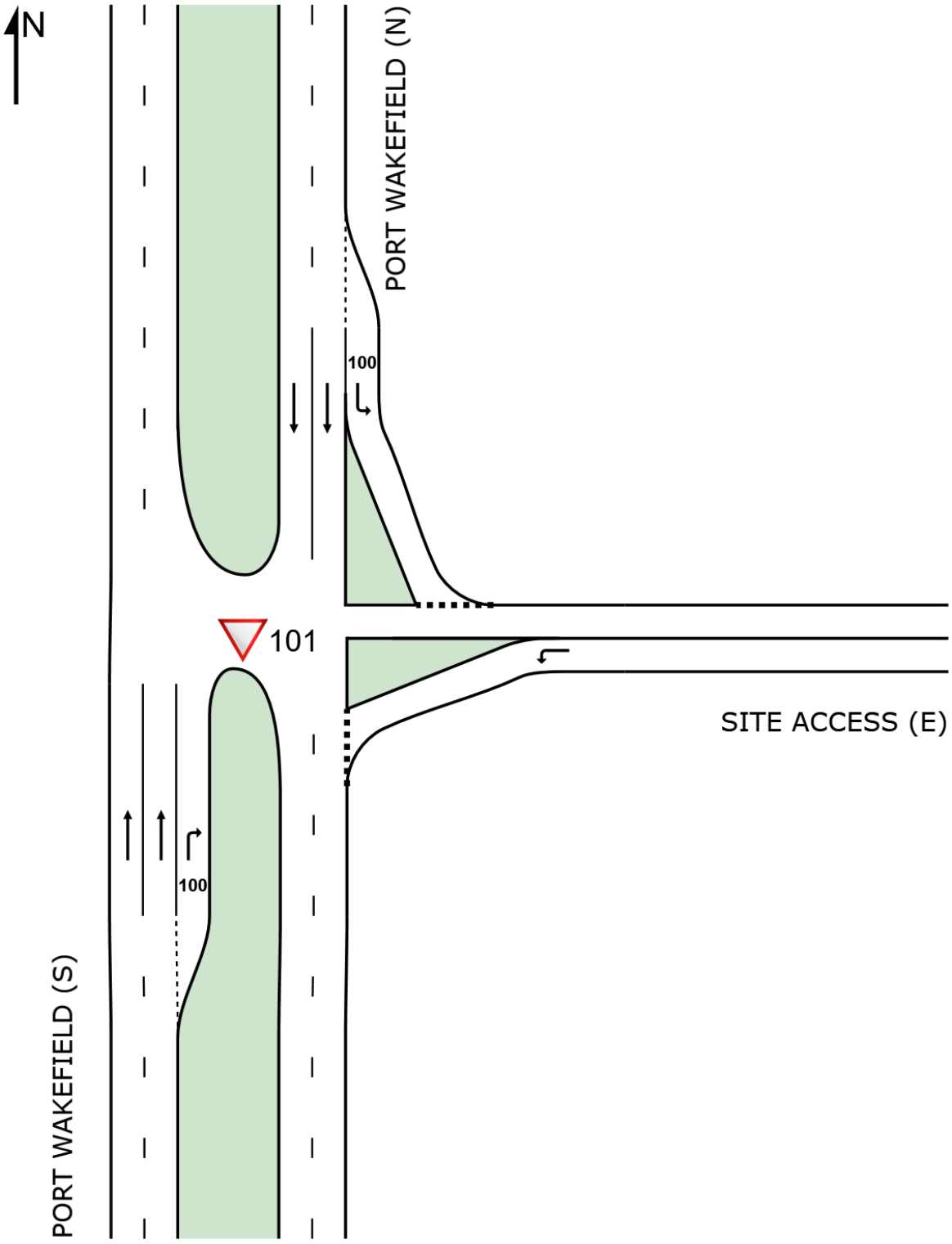
DETAILED SIDRA OUTPUT
AFFECTED AREA NORTHERN ACCESS POINT

SITE LAYOUT

Site: 101 [FUAM - SITE ACCESS (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

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



MOVEMENT SUMMARY

Site: 101 [FUAM - SITE ACCESS (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: PORT WAKEFIELD (S)															
2	T1	All MCs	421	22.5	421	22.5	0.160	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
3	R2	All MCs	26	22.5	26	22.5	0.077	17.5	LOS C	0.2	2.1	0.68	0.89	0.68	28.1
Approach			447	22.5	447	22.5	0.160	1.1	NA	0.2	2.1	0.04	0.05	0.04	72.0
East: SITE ACCESS (E)															
4	L2	All MCs	174	22.5	174	22.5	0.272	4.0	LOS A	1.1	9.9	0.53	0.51	0.57	28.0
Approach			174	22.5	174	22.5	0.272	4.0	LOS A	1.1	9.9	0.53	0.51	0.57	28.0
North: PORT WAKEFIELD (N)															
7	L2	All MCs	147	22.5	147	22.5	0.110	8.6	LOS A	0.5	4.4	0.11	0.61	0.11	30.2
8	T1	All MCs	644	22.5	644	22.5	0.245	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Approach			792	22.5	792	22.5	0.245	1.7	LOS A	0.5	4.4	0.02	0.11	0.02	60.9
All Vehicles			1413	22.5	1413	22.5	0.272	1.8	NA	1.1	9.9	0.09	0.14	0.09	55.5

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

MOVEMENT SUMMARY

Site: 101 [FUPM - SITE ACCESS (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: PORT WAKEFIELD (S)															
2	T1	All MCs	597	22.5	597	22.5	0.227	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
3	R2	All MCs	40	22.5	40	22.5	0.080	13.6	LOS B	0.3	2.5	0.58	0.81	0.58	29.0
Approach			637	22.5	637	22.5	0.227	0.9	NA	0.3	2.5	0.04	0.05	0.04	71.8
East: SITE ACCESS (E)															
4	L2	All MCs	264	22.5	264	22.5	0.351	3.2	LOS A	1.7	15.7	0.50	0.47	0.56	28.2
Approach			264	22.5	264	22.5	0.351	3.2	LOS A	1.7	15.7	0.50	0.47	0.56	28.2
North: PORT WAKEFIELD (N)															
7	L2	All MCs	224	22.5	224	22.5	0.171	8.7	LOS A	0.8	7.2	0.15	0.61	0.15	30.2
8	T1	All MCs	483	22.5	483	22.5	0.184	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Approach			707	22.5	707	22.5	0.184	2.8	LOS A	0.8	7.2	0.05	0.19	0.05	52.3
All Vehicles			1608	22.5	1608	22.5	0.351	2.1	NA	1.7	15.7	0.12	0.18	0.13	50.6

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

APPENDIX D

DETAILED SIDRA OUTPUT
AFFECTED AREA NORTHERN ACCESS POINT
SENSITIVITY ANALYSIS CASE

MOVEMENT SUMMARY

Site: 101 [FUAM - SITE ACCESS - 2045 (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: PORT WAKEFIELD (S)															
2	T1	All MCs	548	22.5	548	22.5	0.209	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
3	R2	All MCs	53	22.5	53	22.5	0.255	27.1	LOS D	0.7	6.6	0.82	0.97	0.95	26.2
Approach			601	22.5	601	22.5	0.255	2.4	NA	0.7	6.6	0.07	0.08	0.08	67.6
East: SITE ACCESS (E)															
4	L2	All MCs	174	22.5	174	22.5	0.333	6.5	LOS A	1.4	12.9	0.60	0.73	0.76	27.5
Approach			174	22.5	174	22.5	0.333	6.5	LOS A	1.4	12.9	0.60	0.73	0.76	27.5
North: PORT WAKEFIELD (N)															
7	L2	All MCs	147	22.5	147	22.5	0.114	8.7	LOS A	0.5	4.5	0.17	0.61	0.17	30.1
8	T1	All MCs	819	22.5	819	22.5	0.312	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
Approach			966	22.5	966	22.5	0.312	1.4	LOS A	0.5	4.5	0.03	0.09	0.03	63.6
All Vehicles			1741	22.5	1741	22.5	0.333	2.3	NA	1.4	12.9	0.10	0.15	0.12	57.2

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

MOVEMENT SUMMARY

Site: 101 [FUPM - SITE ACCESS - 2045 (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: PORT WAKEFIELD (S)															
2	T1	All MCs	758	22.5	758	22.5	0.289	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
3	R2	All MCs	80	22.5	80	22.5	0.218	17.6	LOS C	0.7	6.7	0.70	0.91	0.75	28.1
Approach			838	22.5	838	22.5	0.289	1.8	NA	0.7	6.7	0.07	0.09	0.07	67.7
East: SITE ACCESS (E)															
4	L2	All MCs	264	22.5	264	22.5	0.401	4.9	LOS A	2.1	19.3	0.57	0.67	0.74	27.9
Approach			264	22.5	264	22.5	0.401	4.9	LOS A	2.1	19.3	0.57	0.67	0.74	27.9
North: PORT WAKEFIELD (N)															
7	L2	All MCs	224	22.5	224	22.5	0.180	9.0	LOS A	0.8	7.5	0.23	0.61	0.23	30.1
8	T1	All MCs	614	22.5	614	22.5	0.234	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Approach			838	22.5	838	22.5	0.234	2.4	LOS A	0.8	7.5	0.06	0.16	0.06	55.2
All Vehicles			1940	22.5	1940	22.5	0.401	2.5	NA	2.1	19.3	0.13	0.20	0.16	52.3

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