



**KIDMAN PARK NORTH
DEVELOPMENT PLAN AMENDMENT**

TRANSPORT INVESTIGATIONS



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DOCUMENT CONTROL

Report title: Development Plan Amendment, Findon Road, Kidman Park North

Project number: 18270

Client: IBS Planning and Projects

Client contact: Mr Dennis Chung

Version	Date	Details/status	Prepared by	Approved by
Draft 1	19 Dec 2018	For review	JJB/BNW	BNW
Draft 2	20 Dec 2018	Minor amendments	JJB/BNW	BNW
V1	04 Feb 2019	For submission	JJB/BNW	BNW

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1. INTRODUCTION

CIRQA has been engaged to provide traffic impact investigations for the proposed Kidman Park North Development Plan Amendment (DPA). Specifically, CIRQA's investigations relate to the proposed rezoning of land (from Urban Employment to Residential and Commercial) on the western side of Findon Road (south of Grange Road and north of Valetta Road).

This report includes assessment of the potential traffic generation associated with the potential rezoning and redevelopment of the subject land, the associated impact on the adjacent existing road network, active and sustainable transport provisions and consideration of appropriate infrastructure upgrades/requirements.

The assessment also includes high level consideration of potential cumulative impacts of redevelopment of the subject site, as well as other nearby separate DPA proposals.

2. BACKGROUND

2.1 STUDY AREA

The subject site is located approximately 5km north-west of Adelaide's Central Business District (CBD) and comprises approximately 7.8 hectares. The site is bounded by Findon Road to the east and residential dwellings to the north, south and west. Figure 1 illustrates the subject site and adjacent road network.

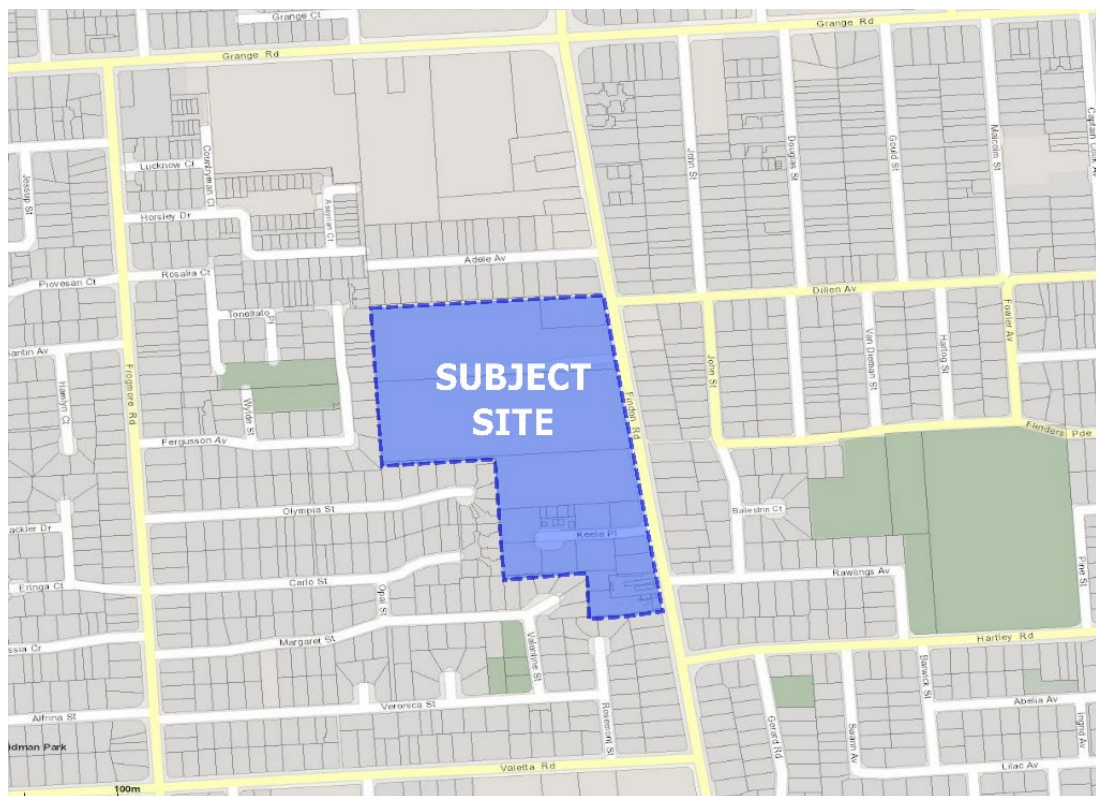


Figure 1 - Subject site and adjacent road network

The City of Charles Sturt's Development Plan (consolidated 13 September 2018) identifies that the site is currently located within an 'Urban Employment' Zone. The primary purpose of this zone is to provide employment opportunities through both commercial and industrial land uses.

The existing land uses are reflective of the current zoning with a mix of primarily industrial and commercial businesses. This includes a number of relatively large industrial businesses which generate regular heavy vehicle movements (including B-Doubles). The existing site is held under multiple ownerships and comprises a number of separate properties. Specifically, Table 1 summarises the following existing uses located within the subject site.

Table 1 - Existing uses within the subject site

Property Address	Use
322 Findon Road	Retail & Factory
338-342 Findon Road	Factory (and Associated Office)
344-354 Findon Road	Factory and Fitness Centre
358-364 Findon Road	Factory (and Associated Office)
366-368 Findon Road	Office
370-372 Findon Road	Service Trade Premises
374 Findon Road	Residential
378-384 Findon Road	Retail
1 Keele Place	OASA
2 Keele Place	Shop
3-4 Keele Place	Fitness Centre
Units 1-4/5 Keele Place	Factory
Unit 1/6 Keele Place	Factory

The site is primarily serviced directly via Findon Road, albeit the southern allotments are accessed via Keele Place (the only local road currently located within the subject site). A total of thirteen crossovers are provided on Findon Road. All access points are two-way with the exception of two one-way crossovers near the southern end of the site. There are no restrictions to turning movements at any of the access points (other than the one-way being restricted to ingress or egress only movements).

2.2 ADJACENT ROAD NETWORK

Findon Road is an arterial road under the care and control of the Department of Planning, Transport and Infrastructure (DPTI). Adjacent the site, Findon Road comprises a single wide traffic lane in each direction. DPTI has indicated that a painted median treatment has been considered for Findon Road but there is no specific timing available in relation to its implementation. Traffic data obtained from DPTI indicates that this section of Findon Road has an Annual Average Daily Traffic (AADT) volume in the order of 20,500 vehicles per day (vpd), of which approximately 4% are commercial vehicles. Adjacent the site, a 60 km/h speed limit applies on Findon Road. Findon Road is gazetted for B-Double use. Such vehicles are primarily associated with industrial uses on the subject site as well as the Metcash distribution centre south of Valetta Road.

Keele Place is a local cul-de-sac under the care and control of the Charles Sturt Council. The carriageway of Keele Place is approximately 10.6 m wide and accommodates two-way traffic movements. A default urban speed limit of 50 km/h applies on Keele Place.

The intersection of Findon Road and Keele Place forms a priority-controlled T-intersection, with Findon Road forming the priority approach. No formal turn lanes are provided at the intersection (albeit the traffic lanes on Findon Road are wide such that a vehicle may pass a vehicle turning into Keele Place).

2.3 WALKING AND CYCLING

Sealed footpaths are provided on both sides of Findon Road and Keele Place. No formal cycling facilities are provided on either Findon Road or Keele Place. As such, cyclists are required to use the traffic lanes (under a standard shared arrangement) or the adjacent footpath network.

There are limited formal crossing facilities for pedestrians on Findon Road (i.e. midblock locations). However, pedestrian crossing movements are facilitated at the signalised intersections of Findon Road/Grange Road (to the north) and Findon Road/Valetta Road (to the south).

In addition to the above, the River Torrens Linear Trail (shared pedestrian and cyclist path) is located approximately 850 m south of the site. The Linear Trail provides a safe and convenient route for access to/from the CBD as well as other destinations.

2.4 PUBLIC TRANSPORT

Numerous public transport services operate within close vicinity to the subject site. Specifically, high-frequency bus services operate along Grange Road, Valetta Road and Hartley Road with regular bus services operating along Findon Road.

Bus stops are located immediately adjacent the site on Findon Road providing connectivity to West Lakes Centre Interchange and Marion Centre Interchange as well as the City and metropolitan Adelaide via interchange services. Bus routes operating within close proximity to the site include:

- Route 110, 112 – West Lakes to City;
- Route 286, 287 – Henley Beach to City;
- Route 288 – West Lakes Centre Interchange to City;
- Route 288S – City to Seaton;
- Route 300 – Suburban Connector;
- Route 652, 653, 654, 655, 656, 661, 663, 671 – Various school services.
- Route J7, J8 – West Lakes Centre Interchange to Marion Centre Interchange; and
- Route J7M – West Lakes Centre Interchange to Camden Park.

3. PROPOSED REZONING

It is proposed to rezone the subject area to enable Mixed-Use development on the site. It is anticipated that the rezoning will allow primarily residential and commercial development, with residential development focused on the western section of the site and commercial development fronting Findon Road. However, the DPA will also allow mixed-use development combining both types of uses within the site (mixed use developments would be more likely to be established along the eastern section of the site).

In addition to the subject rezoning, it is noted that an DPA has been recently been undertaken (and approved) on land adjacent the north-eastern corner of the Findon Road/Grange Road intersection (primarily to accommodate an ALDI supermarket). Furthermore, a DPA is currently being prepared for the Metcash distribution centre site located south of the subject site (adjacent Valetta Road). While the approved Statement of Intent for the subject DPA did not require assessment of the other DPAs, DPTI has requested consideration be given to all three in the following assessment. Accordingly, a separate, high-level assessment of the cumulative impacts (i.e. the subject, ALDI and Metcash DPA sites) has been included below.

3.1 ANTICIPATED DEVELOPMENT YIELDS

CIRQA has been advised that a range of potential development yields could be accommodated by the rezoning. The site has been separated into the three development areas as illustrated in Figure 2.



Figure 2 - Development areas within the subject site

The following anticipated development yields have been advised for each of the areas identified in Figure 2 (it should be noted that the yields include consideration of the requirement for land for an internal road network and other relevant considerations):

- **Area 1** – 35 to 45 medium-density residential dwellings;
- **Area 2** – up to 80 medium-density and 35 high-density residential dwellings plus up to 2,900 m² of commercial floor area. The commercial uses could accommodate activities such as retail showrooms/bulky goods retailing, service trade premises, service industry, consulting room and offices (or similar); and
- **Area 3** – up to 8,400 m² of commercial floor area plus up to 35 high-density residential dwellings.

3.2 ACCESS AND TRANSPORT INFRASTRUCTURE

Access provisions on Findon Road for future development within the site should be consolidated where possible (i.e. direct property access to Findon Road minimised where possible). Generally, it is considered that at least two primary intersections (with all turning movements) should be provided to service the majority of the overall site. One of the primary intersections could be formed by the retention of the existing Keele Place intersection with other intersection(s) further north.

Consideration has been given to restriction of right-out movements, however given restricted connectivity to the west, few safe u-turn opportunities and broader road network connectivity, it is considered desirable that right-out movements be accommodated (and designed for appropriately). Such a scenario would be similar to existing access for properties within the site for which right turn egress movements are accommodated (i.e. additional conflict potential is unlikely).

Given the site's frontage, additional intersections could potentially be provided to service the site. If proposed, additional intersections would need to ensure adequate separation from other intersections including those associated with the site and those on the opposite side of Findon Road. Consideration would also need to be given to provision of appropriate traffic control treatments, which may result in any additional intersections having turn restrictions (i.e. no right turns). Nevertheless, this would be subject to further design input to confirm appropriate provisions and can be investigated further as the future site layout and internal road network is planned in more detail.

In order to service the future development of the subject site, an internal road network will also be required. The internal road network should provide

connectivity between the primary intersections. Provision of rear access to allotments fronting Findon Road would be desirable to minimise the requirement for direct access to Findon Road.

The other intersection(s) should then be located further north and aligned to ensure appropriate separation to Dillon Avenue on the opposite side of the Findon Road. Additional minor direct access to Findon Road should be minimised but could be considered where justified and designed appropriately.

The primary intersections should be treated with separate right turn lanes on Findon Road. Ideally, this would be undertaken in conjunction with implementation of DPTI's painted median treatment along Findon Road (if still proposed).

Additionally, treatment of Findon Road should also seek to improve pedestrian safety and connectivity across Findon Road (i.e. pedestrian refuges could be provided). Opportunities to improve provisions for cyclists (such as on-road bicycle lanes) should also be considered (i.e. where intersection treatments and associated road widening are undertaken).

The internal road network should be designed in accordance with the City of Charles Sturt's engineering guidelines. In particular, the design of the road network should include consideration of on-street parking provisions, pedestrian and cyclist connectivity, waste collection provisions and appropriate traffic management treatments at all new intersections.

In addition to the above, consideration could be given to a possible future connection to the road network west of the subject site. While existing residential properties currently preclude a road network connection, future redevelopment of housing may facilitate a connection in the future and, as such, allowance for future connection should not be precluded.

4. PARKING ASSESSMENT

The City of Charles Sturt's Development Plan identifies varying parking requirements for sites dependant on their proximity to public transport, active transport facilities and nearby services. It is noted that the northern portion of the site is located within close proximity to high frequency public transport (bus routes) operating along Grange Road, while the southern portion is in the vicinity of high frequency public transport (bus routes) operating along Valetta Road and Hartley Road. The majority of the site is, however, outside of the 200 m distance from high frequency services noted in *"Table ChSt/2A – Off Street Vehicle Parking Requirements for Designated Areas"* for application of reduced rates.

On the basis of the above, the parking requirements identified in *"Table ChSt/2 – Off Street Vehicle Parking Requirements"* are generally considered appropriate for application to future development within the subject site. However, the rate for 'shop(s)' (of 7 spaces per 100 m²) identified in Table ChSt/2 is relatively high. While such a rate was traditionally applied to the shop uses in the past, more recent demand data for retail uses recorded over the past decade indicate 'shop' demands are more typically in the range of 4.5 to 5.5 spaces per 100 m² (particularly where efficiencies are achieved due to the mixed uses). Consideration of a reduced rate for 'shop' within the Mixed Use Zone could be considered to be included as part of the DPA.

If parking requirements relevant to any proposed land uses are not defined in Council's Development Plan, advice should be sought from a suitably qualified Traffic Engineer.

5. TRAFFIC GENERATION & DISTRIBUTION

In order to determine the impacts of the proposed rezoning on the adjacent road network, traffic volumes associated with the existing and potential future site (based upon the above yields) have been forecast.

Traffic volumes have generally been forecast using rates adopted from the NSW Roads and Maritime Services' *"Guide to Traffic Generating Developments"* (the RMS Guide) or other rates considered appropriate based on CIRQA's experience. The proportion of heavy vehicle movements assumed for each use has also been identified.

- **Low density residential**
 - 0.71 am and 0.78 pm peak hour trips per dwelling;
 - 0% of peak hour trips assumed to be commercial vehicles;
- **Medium density residential**
 - 0.65 am and pm peak hour trips per dwelling;
 - 0% of peak hour trips assumed to be commercial vehicles;
- **High density residential**
 - 0.65 am and pm peak hour trips per dwelling;
 - 0% of peak hour trips assumed to be commercial vehicles;
- **Office**
 - 1.6 am and 1.2 pm peak hour trips per 100 m² gross floor area;
 - 2% of peak hour trips assumed to be commercial vehicles;
- **Gym**
 - 3 peak hour trips per 100 m² gross floor area;
 - 0% of peak hour trips assumed to be commercial vehicles;
- **Commercial (excluding retail)**
 - 0.02 am and pm peak hour trips;
 - 2% of peak hour trips assumed to be commercial vehicles;
- **Retail/shop**
 - 4.5 am / 9 pm trips per 100 m² gross leasable floor area;
 - 2% of trips assumed to be commercial vehicles;
- **Industry (Business parks and industrial estates)**
 - 0.52 am and 0.56 pm peak hour trips per 100 m² of gross floor area;
 - 5% of peak hour trips assumed to be commercial vehicles;
- **Metcash Distribution Centre**

- a peak hour trip rate 0.343 am and pm trips per 100 m² of gross leasable floor area was adopted. This rate was based off data obtained from the Woolworths distribution centre in Gepps Cross (with the existing Metcash site anticipated to generate traffic in a similar manner);
- a peak hour commercial vehicle percentage of 40% am and 25% pm was adopted based on the Woolworths distribution centre in Gepps Cross;

Traffic volumes have been distributed to various intersections surrounding the subject site in order to determine the rezoning's potential impact. Intersections which have been considered in this assessment include:

- Findon Road and Grange Road (signalised intersection);
- Findon Road and Hartley Road (Give Way intersection); and
- Findon Road and Valetta Road (signalised intersection).

5.1 EXISTING TRAFFIC

5.1.1 SUBJECT SITE

The above industry, gym, office and residential trip rates are applicable to the subject site. Based on these rates, it is estimated that the existing site generates in the order of 335 am and 286 pm peak hour trips (refer Appendix A). This includes 9 am and 8 pm commercial vehicle trips.

In addition, it has been estimated that 60% of movements will be into the site and 40% out for the am peak period and vice versa for the pm peak. The distribution of trips to/from the adjacent road network (via Findon Road) is illustrated in Figure 3 below.

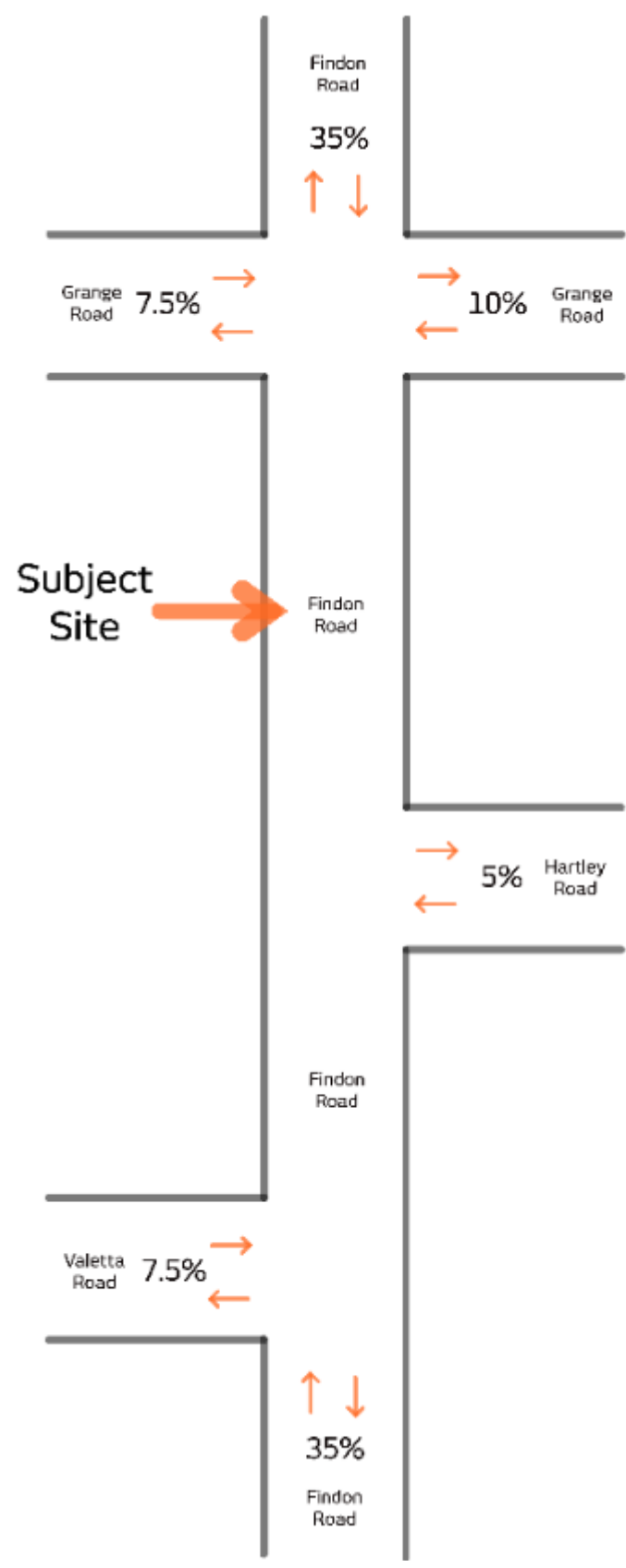


Figure 3 - Assumed distribution of current traffic from the subject site.

5.1.2 METCASH SITE

The distribution centre trip rates have been applied to the existing properties on the Metcash site. It is estimated that the Metcash site generates in the order of 243 am and 246 pm peak hour trips (refer Appendix B). This includes 85 am and 54 pm commercial vehicle trips.

In addition, it has been assumed that 60% of movements will be to and 40% from the site during the am peak hour (and vice versa during the pm hour). These assumptions are high level only and for the broad consideration of potential impacts associated with the redevelopment of the Metcash site. Existing traffic generation should be considered in more detail as part of the separate DPA for the Metcash site and is beyond the scope of this assessment.

The Metcash site is currently accessed via Findon Road and Valetta Road. The distribution of trips to the broader road network has been assumed to be in line with that identified in Figure 3.

5.1.3 ALDI SITE

An assessment of traffic generation associated with the ALDI site DPA (north-eastern corner of the Findon Road/Grange Road intersection) was prepared by Infraplan. The Infraplan assessment identified the additional number of movements that will be distributed via the adjacent road network as a result of the rezoning and subject redevelopment of that site. Given the Infraplan assessment identified additional movements, separate consideration of existing movements associated with that site is not required for this assessment.

5.2 FUTURE TRAFFIC GENERATION

5.2.1 SUBJECT SITE

For the purposes of the following assessment, the maximum anticipated development yields have been adopted (125 medium density dwellings, 65 high density dwellings and 11,300 m² of commercial development). This will provide a conservative assessment with regard to traffic impacts on the adjacent road network.

Based upon the traffic generation rates identified above, it is forecast that the proposed rezoning site could generate up to 333 movements during the am and pm peak hours with 2% of peak hour movements assumed to be commercial vehicles (refer Appendix B).

The following in/out distributions have been adopted for the purposes of this assessment:

- **Residential** – 30% in and 70% out during the am peak hour (vice versa during the pm peak hour; and
- **Commercial** – 50% in and 50% out during both the am and pm peak hours.

Taking into consideration anticipated development yields, this equates to 45% of the total movements being inbound and 55% being outbound during the am peak hour and vice versa during the pm peak hour. For the proposes of the future assessment, it has been assumed that commercial vehicles will comprise 2% of forecast vehicle movements (based upon the nature of the anticipated uses).

The distribution of future trips associated with the site has been estimated using demographic data from the 2016 ABS Census. This included demographic data from the City of Charles Sturt in relation to the location of residents' places of work and residential origins of workers within the vicinity of the subject site. The resulting traffic distribution and vehicle movements are illustrated in Figure 4 and Figure 5, respectively.

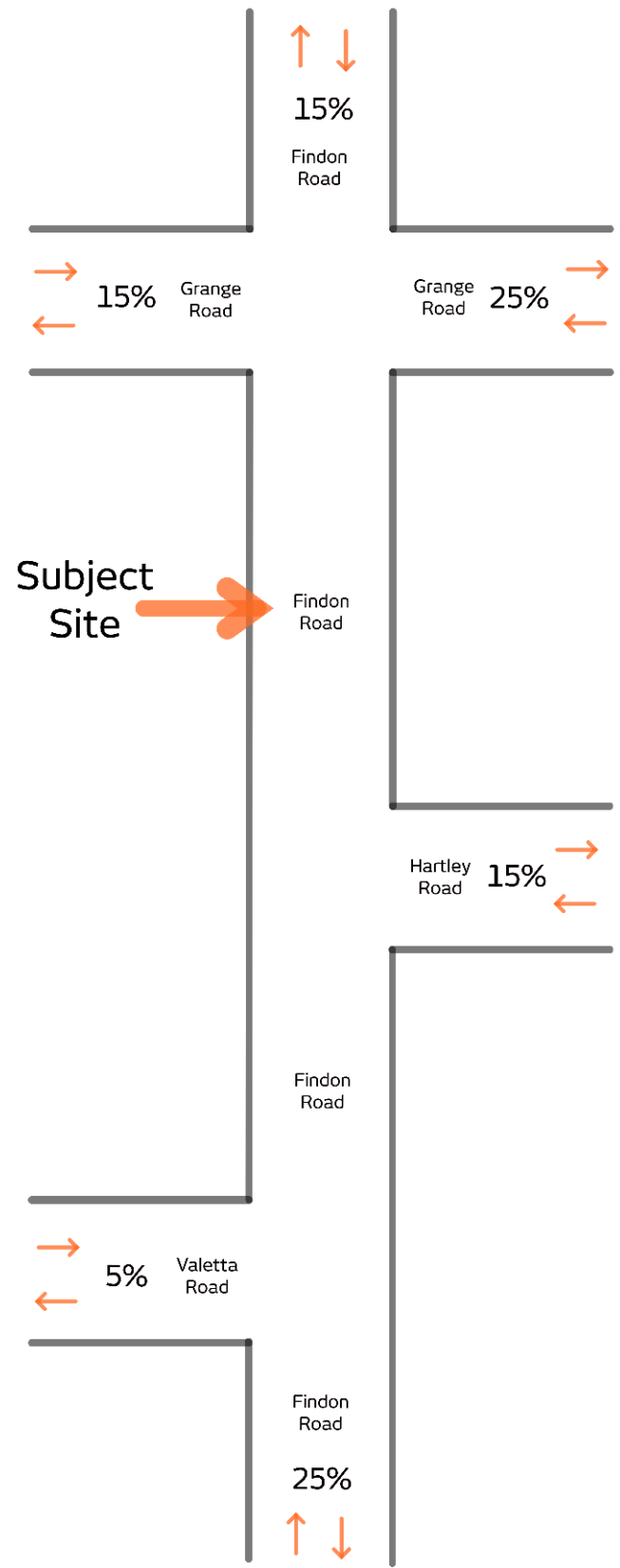


Figure 4 - Forecast future distribution of trips from the proposed rezoning on the adjacent road network.

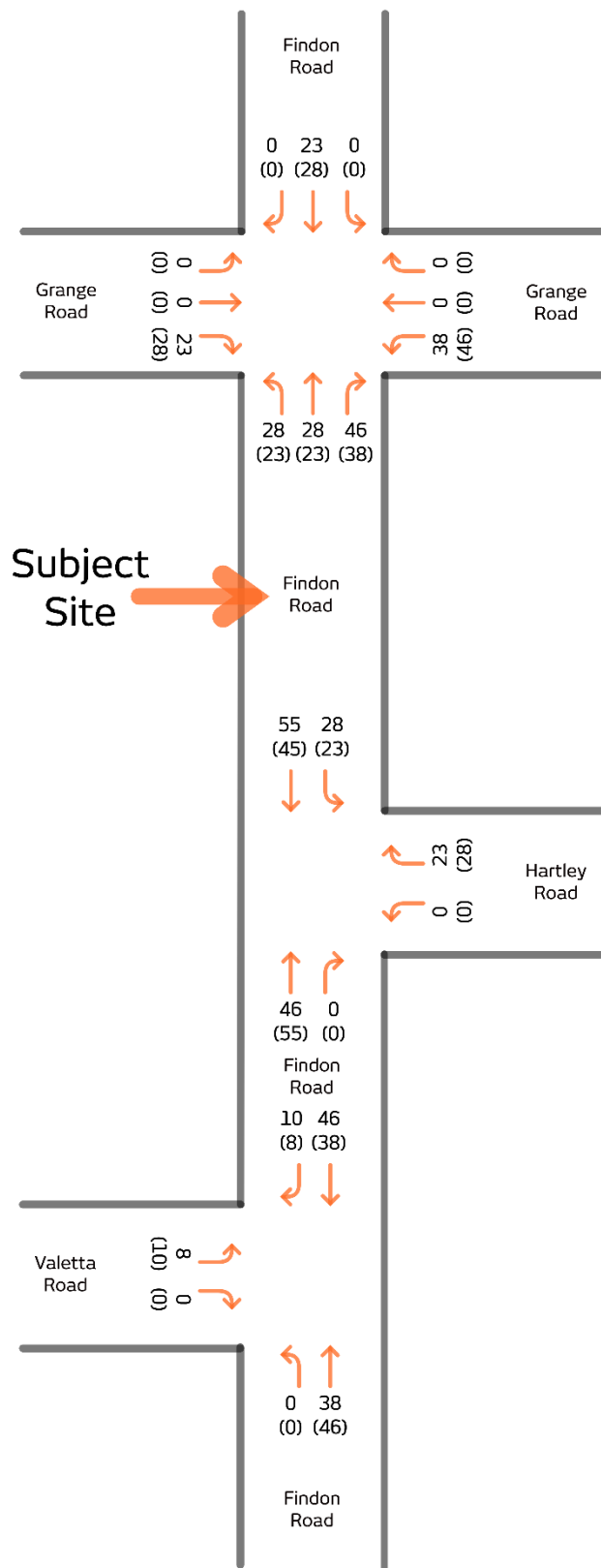


Figure 5 - Forecast traffic generated on the adjacent road network by the proposed rezoning during the am (pm) peak hours.

5.2.2 METCASH SITE

Details in respect to the potential nature and form of development of the Metcash site have not been provided to CIRQA to inform the following assessment. Accordingly, a number of assumptions have been made which should be assessed in more detail as part of the separate Metcash DPA investigations. Nevertheless, the following assumptions provide an indication of the potential comparative and cumulative impact of redevelopment of the Metcash site.

It has been assumed that the development of the Metcash site will be similar in nature to the subject site in respect to likely uses and proportion of commercial and residential uses (the yields per hectare for the subject site have been applied to the Metcash site). It is also assumed that redevelopment of the Metcash site would be serviced by access points on both Valetta Road and Findon Road.

As identified in Appendix B, the above assumptions result in a forecast of 549 am and 549 pm peak hour movements to/from the Metcash site. The overall inbound and outbound split of the subject site traffic has also been applied to the Metcash site (45% in / 55% out during the am peak and vice versa during the pm peak). It is estimated that 2% of peak hour movements will be associated with commercial vehicles.

The forecast distribution of traffic and vehicle movements to/from the Metcash site has been based on the same broad distribution assumed for the subject site. The resulting distribution proportions on the adjacent road network and associated peak hour trips forecasts are shown in Figure 6 and Figure 7, respectively.

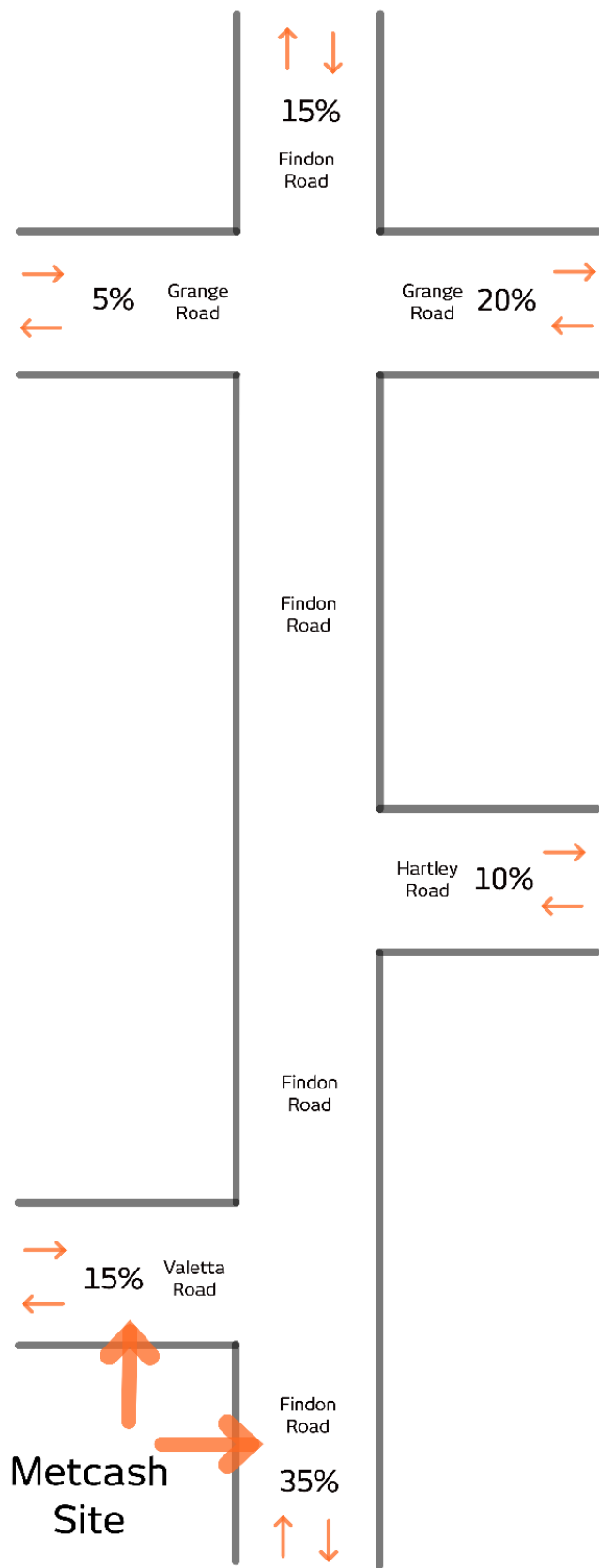


Figure 6 - Assumed distribution of 'Metcash' DPA movements on the adjacent road network.

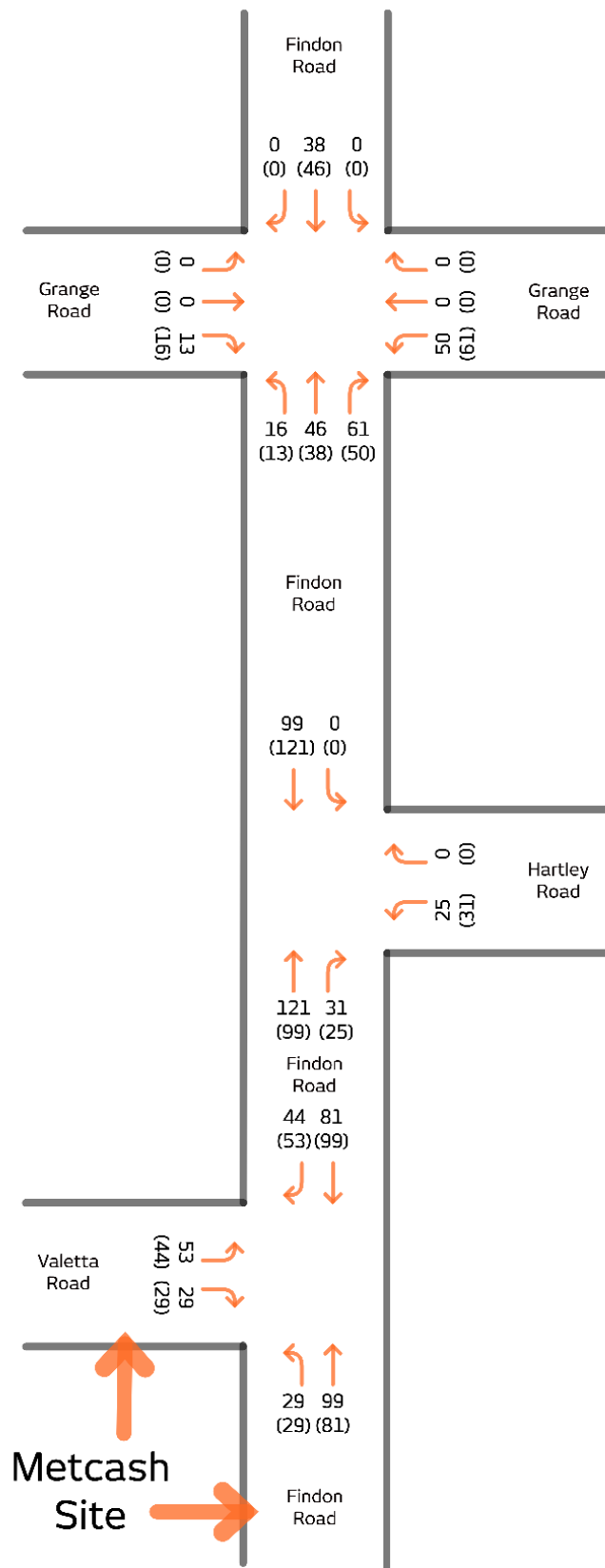


Figure 7 - Forecast am and (pm) peak hour trips associated with rezoning of the Metcash site.

5.2.3 ALDI SITE

As noted above, the Infraplan report prepared for the ALDI DPA site identified additional volumes distributed to the adjacent road network. The additional peak trips are identified in Figure 8 below. The Infraplan report did not detail forecasts at the intersections of Hartley Road and Valetta Road. These volumes have been forecast based on existing movement proportions at these intersections as well as consideration of general road network accessibility to/from the ALDI site.

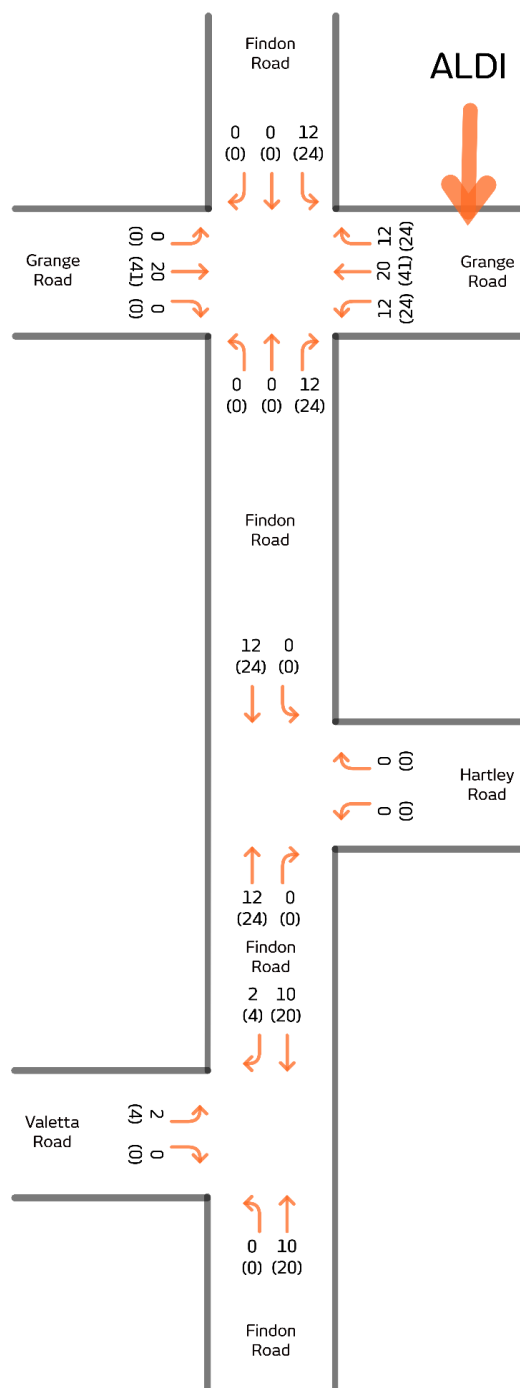


Figure 8 – Forecast am and (pm) traffic volumes associated with the ALDI DPA.

6. TRAFFIC IMPACT

SIDRA Intersection modelling software (version 7) has been used to assess the impacts of the proposed rezoning and anticipated development on the adjacent road network. Given the other recent DPA sites within close vicinity of the subject site, DPTI has requested that a high-level assessment of the cumulative impacts of the subject DPA, Metcash DPA and ALDI DPA be undertaken. The SIDRA output for each scenario and intersection are provided in Appendices D to F.

It should be noted that all SIDRA Intersection modelling has included consideration of DPTI's SIDRA Modelling Guidelines. Of particular note, all intersections have been assessed as 'standalone sites' (given that DPTI does not yet support SIDRA network models). In addition, default values have been adopted for commercial vehicle parameters. In reality, there are a number of B-Double movements associated with the subject site (as well as the Metcash site) which would reduce following redevelopment of the site (and the actual results likely to be better for the proposal than conservatively assessed).

As per instructions from Council and discussions with DPTI, the SIDRA analysis has been undertaken for the following intersections:

- Grange Road/ Findon Road;
- Findon Road/ Hartley Road; and
- Findon Road/ Valetta Road.

To assess the impact of potential nearby developments, a number of scenarios were modelled. These scenarios include:

- **Base case** - to establish the baseline performance of each intersection;
- **Scenario 1** – Existing (base case) volumes with the assumed existing volumes of the subject site subtracted and future volumes associated with the subject site added. This allows identification of the difference in traffic impacts between the current site uses and the ultimately anticipated redevelopment of the subject site; and
- **Scenario 2** – Existing (base case) volumes with the assumed existing volumes of all both the subject site and the Metcash site subtracted, and future volumes associated with all three DPA sites added. This allows identification of the difference in traffic impacts between the current site uses and the assumed future uses of all three sites (i.e. the cumulative impact of all three site redevelopments).

Detailed SIDRA output is included in Appendices E to G with key results and outcomes identified below.

6.1 BASE CASE MODELLING

Recent SCATS data and 2016 DPTI turn count surveys for the Findon Road/Grange Road intersection (TS 048) and Findon Road/Valetta Road intersection (TS 338) were assessed and compared. The SCATS data and turn count data were relatively similar with only minor differences in volumes. Given the DPTI turn count survey data provides more accurate identification of traffic movements, particularly for shared lanes (i.e. through and left or right turn lanes), the turn count survey data has been utilised for the assessment. In any event, the turn count data is slightly higher than the SCATS data and provides a more conservative assessment. The adopted 'base case' (existing) volumes are illustrated in Figure 9 below.

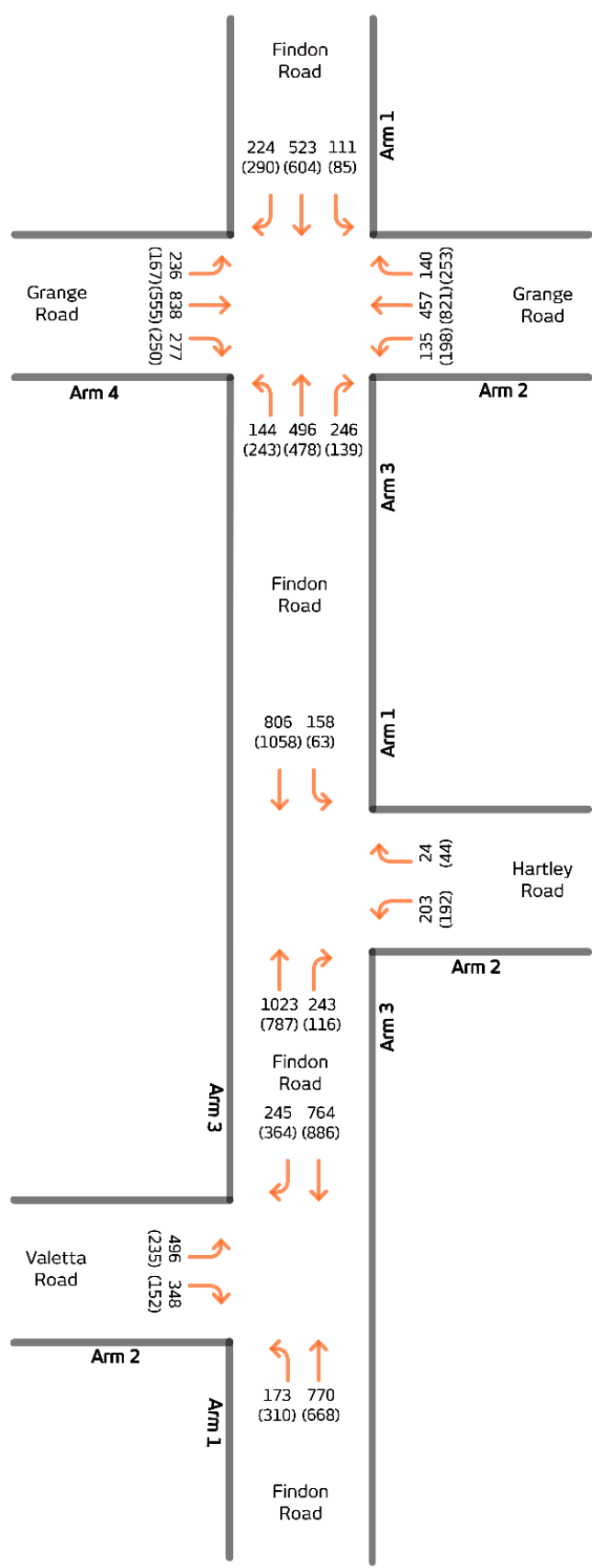


Figure 9 - Base case (existing) am and (pm) peak hour volumes

6.1.1 FINDON ROAD/GRANGE ROAD

The key SIDRA results for the base case for Grange Road/Findon Road are identified in Table 2 - Key am peak hour base case results for Grange Road/Findon Road and Table 3 - Key pm peak hour base case results for Grange Road/Findon Road.

Table 2 - Key am peak hour base case results for Grange Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	L	0.412	34.1	51.2	LOS C
	T	1.389	354.9	596.4	LOS F
	R	0.797	59.2	107.7	LOS E
Grange Road (East)	L	0.659	52	109	LOS D
	T	0.659	42.5	111.7	LOS D
	R	0.507	34.9	37	LOS C
Findon Road (North)	L	0.548	55.1	83.1	LOS E
	T	1.36	301.4	533.2	LOS F
	R	0.726	58.3	96.5	LOS E
Grange Road (West)	L	1.092	117	363.8	LOS F
	T	1.092	130	396.9	LOS F
	R	0.733	32.5	80.4	LOS C

Table 3 - Key pm peak hour base case results for Grange Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	L	0.377	45.6	98.7	LOS D
	T	1.271	263.8	471.8	LOS F
	R	0.508	58.3	56.5	LOS E
Grange Road (East)	L	1.097	118.6	393.6	LOS F
	T	1.097	130.7	393.6	LOS F
	R	0.681	31.7	67.1	LOS C
Findon Road (North)	L	0.6	54.6	87.4	LOS D
	T	1.489	374.6	662.2	LOS F
	R	1.151	200.4	260.1	LOS F
Grange Road (West)	L	0.71	50.7	121.9	LOS D
	T	0.71	42.9	149.9	LOS D
	R	0.8	43.3	78.8	LOS D

The results indicate that a number of movements are currently oversaturated during the am and pm peak hours. Of particular note, all through bound movements (with the exception of the western Grange Road approach in the pm

peak hour) experience degrees of saturation above 1.0 and Levels of Service of 'F'. This indicates existing capacity issues at the intersections which aligns with DPTI commentary that the intersection is currently at or near capacity.

Consideration was given to potential adjustments to default SIDRA values, however there was very limited difference in the output from the (reasonable) adjustment of SIDRA variables (based upon available data). This included consideration of the impact of extending the northern and southern through lane approaches to provide dual lane for a longer distance than is linemarked on-site (as drivers do tend to queue for longer than the lengths of the dual through lanes). The difference with this adjustment was, however, minimal.

6.1.2 FINDON ROAD/HARTLEY ROAD

The Findon Road/Hartley Road intersection had initially been set up to reflect the current layout of the intersection (i.e. one lane in each direction on Findon Road). During the assessment, it was noted that such a layout did not appropriately simulate northbound through vehicles passing other vehicles queueing to turn right from Findon Road (south) to Hartley Road (east). An additional northbound through lane was added to simulate vehicles passing the right turn vehicle queue. However, given the relatively high number of movements from Valetta Road to Hartley Road and to on-site observations of vehicle positioning, the lane utilisation ratio for the added through ('bypass') lane was adjusted to 27.5% for the am peak and 25% for the pm peak. These ratios were adopted based on a review of detector data from the Valetta Road/Findon Road intersection and volumes associated with northbound movements and those from Valetta Road to Hartley Road.

The key SIDRA results for the base case for Hartley Road/Findon Road are identified in Table 4 and Table 5.

Table 4 - Key am peak hour base case results for Hartley Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	T	0.938	16.8	181.3	LOS C
	R	0.938	40.7	181.3	LOS E
Hartley Road (East)	L	0.377	12.7	12	LOS B
	R	1.378	683.7	59.5	LOS F
Findon Road (North)	L	0.493	5.6	0	LOS A
	T	0.493	0.1	0	LOS A

Table 5 - Key pm peak hour base case results for Hartley Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	T	0.695	10.2	78.5	LOS B
	R	0.695	30.3	78.5	LOS D
Hartley Road (East)	L	0.615	23.1	20.1	LOS C
	R	2.09	1168.1	147.6	LOS F
Findon Road (North)	L	0.561	5.6	0	LOS A
	T	0.561	0.1	0	LOS A

The SIDRA results indicate that the intersections operate relatively well for through-bound and left turn movements. Right turns into Hartley Road from Findon Road have acceptable delays but queues may extend past the intersection of Valetta Road/Findon Road. The SIDRA indicates that the right-out movements from Hartley Road have high degrees of saturation, delays and queues in the am and pm peak hours.

6.1.3 FINDON ROAD/VALETTA ROAD

The key SIDRA results for the base case for Valetta Road /Findon Road are identified in Table 6 and Table 7.

Table 6 - Key am peak hour base case results for Valetta Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	L	0.434	23.3	31.7	LOS C
	T	1.378	358.8	846.1	LOS F
Findon Road (North)	T	0.731	10.9	126.1	LOS B
	R	1.261	269.5	221.7	LOS F
Valetta Road (West)	L	2.487	1360.4	1032.2	LOS F
	R	0.801	29.2	73.5	LOS C

Table 7 - Key pm peak hour base case results for Valetta Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	L	1.245	255	261.5	LOS F
	T	1.319	313	663.9	LOS F
Findon Road (North)	T	0.678	5.8	110.3	LOS A
	R	0.854	30.9	79.7	LOS C
Valetta Road (West)	L	0.548	27.3	46.5	LOS C
	R	0.586	32.7	32.7	LOS C

The SIDRA analysis indicates that there are existing capacity issues at the Valetta Road/Findon Road intersection. The Levels of Service for most movements are low with the exception of the through movement from the northern Findon Road approach. The SIDRA indicates relatively long queues for left turns and right turns into Valetta Road. This presents potential broader capacity issues with the proximity of the Findon Road/Hartley Road intersection further north (particularly for drivers turning left out of Hartley Road and then right into Valetta Road).

6.2 SUBJECT DPA IMPACTS (SCENARIO 1)

Scenario 1 has been analysed to allow considerations of the impacts of the rezoning and redevelopment of the subject site (excluding consideration of the other DPA sites). The following subsections detail the results of the Scenario 1 analyses.

6.2.1 FINDON ROAD/GRANGE ROAD

The key SIDRA results for Scenario 1 for Grange Road/Findon Road are identified in Table 8 and Table 9.

Table 8 - Key am peak hour Scenario 1 results for Grange Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	L	0.403	27.8	52.6	LOS C
	T	1.357	334.7	560.4	LOS F
	R	1	86.7	158.7	LOS F
Grange Road (East)	L	0.672	51.6	111.8	LOS D
	T	0.672	42.5	114.7	LOS D
	R	0.507	34.9	37	LOS C
Findon Road (North)	L	0.491	53.6	77.5	LOS D
	T	1.219	210.2	399.4	LOS F
	R	0.726	58.3	96.5	LOS E
Grange Road (West)	L	1.083	108.9	355.3	LOS F
	T	1.083	122	382.5	LOS F
	R	0.757	32.9	82.8	LOS C

Table 9 - Key pm peak hour Scenario 1 results for Grange Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	L	0.37	39	89.1	LOS D
	T	1.246	256.2	439.6	LOS F
	R	0.502	55.6	63.1	LOS E
Grange Road (East)	L	1.139	152.9	471.6	LOS F
	T	1.139	165.8	471.6	LOS F
	R	0.755	33.9	70.9	LOS C
Findon Road (North)	L	0.588	54	85.1	LOS D
	T	1.458	355	631.3	LOS F
	R	1.076	138	211.1	LOS F
Grange Road (West)	L	0.729	52.4	124	LOS D
	T	0.729	44.1	151.4	LOS D
	R	0.95	53.1	101	LOS D

The Scenario 1 SIDRA analyses indicate there are minimal differences in the performance of the intersection as a result of the rezoning and redevelopment of the subject site. The only movement with a reduction in Level of Service is the right turn from Findon Road (south) in the am period, however this is offset by improvements in queuing and delays for a number of other movements at the intersection. The analyses suggest that the proposed rezoning and subsequent development will essentially retain the status quo at the intersection of Findon Road/Grange Road (i.e. impacts of the proposal are of a similar magnitude to the impacts of the existing site uses).

6.2.2 FINDON ROAD/HARTLEY ROAD

The key SIDRA results for Scenario 1 for Hartley Road/Findon Road are identified in Table 10 and Table 11.

Table 10 - Key am peak hour Scenario 1 results for Hartley Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	T	0.918	15	158.8	LOS B
	R	0.918	37.3	158.8	LOS E
Hartley Road (East)	L	0.375	12.7	12	LOS B
	R	0.43	318.1	8.8	LOS F
Findon Road (North)	L	0.492	5.6	0	LOS A
	T	0.492	0.1	0	LOS A

Table 11 - Key pm peak hour Scenario 1 results for Hartley Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	T	0.657	8.4	71.8	LOS A
	R	0.657	26.9	71.8	LOS D
Hartley Road (East)	L	0.569	20.7	18.3	LOS C
	R	2.053	1115.4	157.5	LOS F
Findon Road (North)	L	0.539	5.6	0	LOS A
	T	0.539	0.1	0	LOS A

The proposed rezoning and subsequent redevelopment results in an improvement of conditions at the intersection of Hartley Road and Findon Road. The subject rezoning is therefore considered a positive impact in relation to conditions at the Hartley Road/Findon Road intersection.

6.2.3 FINDON ROAD/VALETTA ROAD

The key SIDRA results for Scenario 1 for Hartley Road/Findon Road are identified in Table 12 and Table 13.

Table 12 - Key am peak hour Scenario 1 results for Valetta Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	L	0.42	22.9	30.6	LOS C
	T	1.335	323.6	763.9	LOS F
Findon Road (North)	T	0.729	10.9	125.6	LOS B
	R	1.256	265.1	218.5	LOS F
Valetta Road (West)	L	2.447	1325	1006.2	LOS F
	R	0.801	29.2	73.5	LOS C

Table 13 - Key pm peak hour Scenario 1 results for Valetta Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	L	1.245	255.1	261.6	LOS F
	T	1.328	320.6	678.9	LOS F
Findon Road (North)	T	0.66	5.6	104.8	LOS A
	R	0.842	30.6	77.8	LOS C
Valetta Road (West)	L	0.55	27.3	46.7	LOS C
	R	0.586	32.7	32.7	LOS C

The proposed rezoning and subsequent redevelopment results in minor improvements to conditions at the intersection of Valetta Road/Findon Road. It is therefore considered that the proposal will not adversely impact the intersection.

6.2.4 SITE ACCESS (INTERSECTIONS)

Based on the forecast future traffic volumes, SIDRA analysis has been prepared to consider access provisions for the site. High level analysis of future intersection provisions for the site confirmed that a single access would have relatively high delays for right turn movements into and out of the site. The provision of at least two primary intersections, however, will be adequate to accommodate the future traffic movements (albeit, in reality, volumes at the intersections may be slightly lower if other minor direct access to Findon Road is accommodated). As detailed above, separated right turn lanes for movements into the primary intersections from Findon Road would be warranted.

The SIDRA analysis for a scenario with two intersections for the site (it has essentially been assumed that each access will accommodate 50% of the future traffic movements) indicates that there will be high levels of service for through-bound, left turn and right-in movements at the intersections. The SIDRA analysis indicates that the right-out movement will be oversaturated, however

this has only been modelled as a 'single stage' right turn. In reality, the intersection treatments could be designed to accommodate 'two-stage' right turns (i.e. via a sufficient median opening to accommodate car storage) which would reduce the degree of saturation to an acceptable level. Furthermore, the provision of additional intersections and/or access points (subject to appropriate design) would further improve conditions.

6.3 CUMULATIVE DPA IMPACTS (SCENARIO 2)

Scenario 2 has been analysed to allow considerations of the cumulative impacts of the rezoning and redevelopment of all three DPA site (i.e. the subject site, the Metcash site and the ALDI site). The following subsections detail the results of the Scenario 2 analysis.

6.3.1 FINDON ROAD/GRANGE ROAD

The key SIDRA results for Scenario 2 for Grange Road/Findon Road are identified in Table 14 and Table 15.

Table 14 - Key am peak hour Scenario 2 results for Grange Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	L	0.41	30.4	55.6	LOS C
	T	1.384	354.9	580.2	LOS F
	R	1.207	247.4	349.2	LOS F
Grange Road (East)	L	0.712	49.4	118.2	LOS D
	T	0.712	41.9	122.6	LOS D
	R	0.552	35.1	40.7	LOS D
Findon Road (North)	L	0.48	52.9	77.5	LOS D
	T	1.192	194.3	362.7	LOS F
	R	0.726	58.3	96.5	LOS E
Grange Road (West)	L	1.104	126.2	395.5	LOS F
	T	1.104	139	415	LOS F
	R	0.774	33.2	82.6	LOS C

Table 15 - Key pm peak hour Scenario 2 results for Grange Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	L	0.361	37.9	85.9	LOS D
	T	1.218	236.4	406.8	LOS F
	R	0.685	57.7	89.5	LOS E
Grange Road (East)	L	1.224	227	608.3	LOS F
	T	1.224	239.9	608.3	LOS F
	R	0.865	36.1	80.8	LOS D
Findon Road (North)	L	0.617	54.5	90.2	LOS D
	T	1.531	410	696.7	LOS F
	R	1.078	139.9	212.8	LOS F
Grange Road (West)	L	0.78	55.6	135.8	LOS E
	T	0.78	45.7	165.1	LOS D
	R	0.978	60.4	113.5	LOS E

The analysis indicates that the cumulative impact of all three development sites will result in a general worsening of conditions at the intersection. Exact impacts will need to be considered further as part of the Metcash DPA investigations (given forecasts adopted for this assessment for the Metcash site are high-level only). Nevertheless, as Scenario 1 identified negligible impact as a result of the subject site rezoning and redevelopment, the worsening of conditions is considered to have little association with the subject proposal.

6.3.2 FINDON ROAD/HARTLEY ROAD

The key SIDRA results for Scenario 2 for Hartley Road/Findon Road are identified in Table 16 and Table 17.

Table 16 - Key am peak hour Scenario 2 results for Hartley Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	T	1.026	33.9	331.4	LOS D
	R	1.026	73	331.4	LOS F
Hartley Road (East)	L	0.419	13.4	13.7	LOS B
	R	0.605	518.1	12.4	LOS F
Findon Road (North)	L	0.502	5.6	0	LOS A
	T	0.502	0.1	0	LOS A

Table 17 - Key pm peak hour Scenario 2 results for Hartley Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	T	0.806	14	102.6	LOS B
	R	0.806	37.6	102.6	LOS E
Hartley Road (East)	L	0.792	33.6	31.4	LOS D
	R	3.206	2164.4	215.5	LOS F
Findon Road (North)	L	0.578	5.6	0	LOS A
	T	0.578	0.1	0	LOS A

The cumulative impact of the three DPA sites suggests conditions for right turns into and out of Hartley Road would worsen. There would be minimal impact on left turns and southbound through movements at the intersection. However, the northbound through movement may become oversaturated in the am peak hour. The SIDRA results suggest that formal separation of a northbound through lane and separated right turn lane for movements into Hartley Road should be considered.

6.3.3 FINDON ROAD/VALETTA ROAD

The key SIDRA results for Scenario 2 for Hartley Road/Findon Road are identified in Table 18 and Table 19.

Table 18 - Key am peak hour Scenario 2 results for Valetta Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	L	0.449	22.5	32.1	LOS C
	T	1.426	405.5	925.2	LOS F
Findon Road (North)	T	0.731	10.9	125.2	LOS B
	R	1.439	426.6	338.1	LOS F
Valetta Road (West)	L	2.691	1543.8	1167.7	LOS F
	R	0.836	29.5	77.5	LOS C

Table 19 - Key pm peak hour Scenario 2 results for Grange Road/Findon Road

Arm	Movement	Degree of Saturation (v/c)	Average Delay (sec)	95% Back of Queue Distance (m)	Level of Service
Findon Road (South)	L	1.298	301.5	304	LOS F
	T	1.374	361.7	753.2	LOS F
Findon Road (North)	T	0.707	6	119.4	LOS A
	R	0.962	39.6	110	LOS D
Valetta Road (West)	L	0.637	27.9	55.6	LOS C
	R	0.641	33	36.1	LOS C

Scenario 2 results in a worsening of conditions for most movements at the intersection of Valetta Road/Findon Road. Given the primary impact on this intersection is likely to be volumes associated with the Metcash site, opportunities to improve capacity of the intersection should be considered further as part of the Metcash DPA investigations. In particular, it is noted that the redevelopment of the Metcash site would provide an opportunity for land acquisition on the south-western corner of the intersection for potential upgrade improvements. Nevertheless, the ultimate impacts of the Metcash site rezoning and redevelopment need to be confirmed in more detail than the high-level assessment included in this assessment.

7. SUMMARY

The subject rezoning (DPA) within Kidman Park North will facilitate the future redevelopment of the study area for residential and commercial development. It is anticipated that in the order of 190 medium and high density dwellings plus 11,300 m² of commercial floor area could ultimately be developed within the overall site.

The redevelopment of the site will present an opportunity to consolidate access provisions on Findon Road and improve safety and efficiency of movements into and out of the site. Of particular note, the future redevelopment will be likely to reduce the number of heavy commercial vehicle movements (including B-Doubles) associated with the site which will provide traffic capacity and safety benefits.

It is considered desirable that at least two primary local road intersections be provided to service the subject site, albeit additional intersections and minor direct access to Findon Road may be considered (subject to appropriate analysis, design and liaison with Council and DPTI). The provision of at least two primary connections will adequately accommodate movements into and out of the site while minimising impact on through-bound movements. These intersections can be provided as priority controlled T-intersections but should be treated with separated right turn lanes on Findon Road, provision for two-stage right-out movements (if right turn movements are proposed) and, desirably, allowance for on-road bicycle lanes. This would likely require widening of the existing road reserve and into the subject site.

The primary intersections should connect to an internal road network designed and constructed in accordance with City of Charles Sturt's requirements. The planning and design of the internal layout shall ensure adequate provisions for on-street parking, waste collection vehicle movements and appropriate traffic control treatments within the site.

An assessment has been undertaken of the traffic generation associated with the subject site. This includes a forecast of existing generation as well as that associated with the anticipated future yields. The forecasts identify that there will be a relatively low traffic generation associated with the ultimate redevelopment of the site, albeit heavy vehicles proportions will reduce.

SIDRA intersection modelling software has been used to compare the impacts of existing site volumes against the future forecasts. The SIDRA analyses indicate that the impacts of the proposal on the adjacent road network will be negligible. There will be a minor increase of queues and delays for one movement at the Findon Road/Grange Road intersection, however this will be offset by improvements in performance for other movements at the intersection. For the

intersections of Findon Road with Hartley Road and Valetta Road, the modelling indicates the rezoning and subsequent redevelopment would be likely to improve conditions at the intersections. The rezoning is therefore to have an overall positive impact on the road network.

In addition to the assessment of the subject rezoning, as requested by DPTI, high level consideration has been given to the cumulative impacts of other nearby DPA sites (the ALDI site and the Metcash site). The cumulative impacts indicate a worsening of conditions at the three assessed intersections would be likely. However, the majority of the impact relates to the assumed Metcash site redevelopment volumes (particularly given the assessment based on solely the subject site indicates negligible impact). Given the high-level nature of the cumulative impacts, it is considered that further analysis should be undertaken as part of the Metcash DPA investigations to ensure appropriate development yield assumptions are adopted. The future performance of the adjacent road network will be highly dependent on the traffic generation associated with the redevelopment of the Metcash site and requires further detailed assessment than is within the scope of this study.

APPENDIX A

SUBJECT SITE

EXISTING TRAFFIC GENERATION FORECAST

SUBJECT SITE - EXISTING TRAFFIC GENERATION

Property Number	Street	Suburb			Property Number	Street	Suburb	Site Location	Use	Building Area	Rate description	AM Rate	AM Peak Trips	%CVs	CVs		PM Rate	PM Peak Trips	%CVs	CVs
322	Findon Rd	Kidman Park			322	Findon Rd	Kidman Park	Eastern building	Retail/shop	570		0.045	25.65	2%	0.513		0.09	2.3085	2%	0.04617
324	Findon Rd	Kidman Park						Western building	Retail/Fact	440		0.045	19.8	5%	0.99		0.09	1.782	5%	0.0891
326	Findon Rd	Kidman Park																		
328	Findon Rd	Kidman Park			338-342	Findon Rd	Kidman Park	Eastern building	Office	460		0.016	7.36	2%	0.1472		0.012	5.52	2%	0.1104
330	Findon Rd	Kidman Park							Factory	600		0.0052	3.12	5%	0.156		0.0056	3.36	5%	0.168
332	Findon Rd	Kidman Park						Western building	Office	2600		0.016	41.6	2%	0.832		0.012	31.20	2%	0.624
336	Findon Rd	Kidman Park							Factory	1970		0.0052	10.244	5%	0.5122		0.0056	11.03	5%	0.5516
338-342	Findon Rd	Kidman Park																		
344-354	Findon Rd	Kidman Park			344-354	Findon Rd	Kidman Park	Far east	Gym	650		0.03	19.5	0%	0		0.03	19.50	0%	0
358-364	Findon Rd	Kidman Park						Mid East	Factory	4225		0.0052	21.97	5%	1.0985		0.0056	23.66	5%	1.183
366	Findon Rd	Kidman Park						Mid West	Factory	735		0.0052	3.822	5%	0.1911		0.0056	4.12	5%	0.2058
370-372	Findon Rd	Kidman Park						Far West	Factory	5410		0.0052	28.132	5%	1.4066		0.0056	30.30	5%	1.5148
374	Findon Rd	Kidman Park						South	Factory	2565		0.0052	13.338	5%	0.6669		0.0056	14.36	5%	0.7182
1/378-384	Findon Rd	Kidman Park																		
2/378-384	Findon Rd	Kidman Park			358-364	Findon Rd	Kidman Park	eastern block	office	760		0.016	12.16	2%	0.2432		0.012	9.12	2%	0.1824
1	Keele Place	Kidman Park						mid block	Factory	785		0.0052	4.082	5%	0.2041		0.0056	4.40	5%	0.2198
2	Keele Place	Kidman Park						western block	Factory	1420		0.0052	7.384	5%	0.3692		0.0056	7.95	5%	0.3976
3-Apr	Keele Place	Kidman Park																		
1/5	Keele Place	Kidman Park			366-368	Findon Rd	Kidman Park		office	420		0.016	6.72	2%	0.1344		0.012	5.04	2%	0.1008
2/5	Keele Place	Kidman Park																		
3/5	Keele Place	Kidman Park			U1/6	Keele Place	Kidman Park		Factory	520		0.0052	2.704	5%	0.1352		0.0056	2.91	5%	0.1456
4/5	Keele Place	Kidman Park																		
6	Keele Place	Kidman Park			U1-4/5	Keele Place	Kidman Park		Factory	550		0.0052	2.86	5%	0.143		0.0056	3.08	5%	0.154
					"3-4"	Keele Place	Kidman Park		gym	2720		0.03	81.6	0%	0		0.03	81.60	0%	0
					2	Keele Place	Kidman Park		upholstery	810	light industry/com	0.0052	4.212	5%	0.2106		0.0056	4.54	5%	0.2268
					1	Keele Place	Kidman Park		OASA	735	light industry	0.0052	3.822	5%	0.1911		0.0056	4.12	5%	0.2058
					370-372	Findon Rd	Kidman Park		Mechanic	410		0.0052	2.132	2%	0.04264		0.0056	2.30	2%	0.04592
					374	Findon Rd	Kidman Park		Residential	500	low denisty dwellin	0.71	0.71	0%	0		0.78	0.78	0%	0
					378-384	Findon Rd	Kidman Park		butchers	2230		0.0052	11.596	5%	0.5798		0.0056	12.49	5%	0.6244

Total	334.518	8.76674	Total	285.4545	7.51419
Rounded Total	335	9	Rounded Total	286	8
IN	60%		IN	40%	
	201	5		114	3
OUT	40%		OUT	60%	
	134	4		172	5

APPENDIX B

METCASH SITE

EXISTING TRAFFIC GENERATION FORECAST

METCASH SITE - FORECAST EXISTING TRAFFIC GENERATION

Property Number	Street	Suburb	Site Location	Use	Building Area	Rate description	AM Rate	AM Peak Trips	%CVs	CVs		PM Rate	PM Peak Trips	%CVs	CVs
7	Valetta Rd	Kidman Park			2500		0.0052	13	5%	0.65		0.0056	14	5%	0.7
5	Valetta Rd	Kidman Park		maxim strength fitn	2790		0.0052	14.508	5%	0.7254		0.0056	15.624	5%	0.7812

Total	27.508	1.3754	Total	29.624	1.4812
Rounded	28	2	Rounded Total	30	2
IN	60%	60%	IN	40%	40%
	17	1		12	1
OUT	40%	40%	OUT	60%	60%
	11	1		18	1

404-406	Findon Rd	Kidman Park			1720		0.0052	8.944	5%	0.4472		0.0056	9.632	5%	0.4816
436-450	Findon Rd	Kidman Park	northern		8100		0.00343	27.783	40%	11.1132		0.00343	27.783	25%	6.94575
			small northern		2300		0.00343	7.889	40%	3.1556		0.00343	7.889	25%	1.97225
			Large building	Metcash?	49800		0.00343	170.814	40%	68.3256		0.00343	170.814	25%	42.7035

Total	215.43	83.0416	Total	216.118	52.1031
Rounded	216	84	Rounded Total	217	53
IN	60%	60%	IN	40%	40%
	130	50		87	21
OUT	40%	40%	OUT	60%	60%
	86	34		130	32

Total	242.938	84.417	Total	245.742	53.5843
Rounded	243	85	Rounded Total	246	54
Combined Valetta rd + Findon rd propoerties	IN	60%	IN	40%	40%
	146	51		98	22
	OUT	40%	OUT	60%	60%
	97	34		148	32

APPENDIX C

SUBJECT SITE

FUTURE TRAFFIC GENERATION FORECAST

EXISTING SITE AND METCASH SITE FUTURE DEVELOPMENT FORECASTS

		Low to Medium Density			High Density							AM Trip Generated		PM Trip Generated	
Area 1	AM	Dwellings	Rate per dwell	Trips Gen								29.25	29.25		
	PM	45	0.65	29.25											
		45	0.65	29.25									29.25		
Area 2	AM	Dwellings	Rate per dwell	Trips Gen		Dwellings	Rate per dwell	Trips Gen		Commercial Area	Developed Area	Rate per d	Trips Gen	112.1	112.1
	PM	80	0.65	52		30	0.65	19.5		2900	70%	0.02	40.6		
		80	0.65	52		30	0.65	19.5		2900	70%	0.02	40.6		
Area 3	AM	Dwellings	Rate per dwell	Trips Gen		Dwellings	Rate per dwell	Trips Gen		Commercial Area	Developed Area	Rate per d	Trips Gen	190.75	190.75
	PM					35	0.65	22.75		8400	100%	0.02	168		
						35	0.65	22.75		8400	100%	0.02	168		
												Total	332.1	332.1	
												Rounded Total	333	333	
*** Resi assumed to be 70/30 split (in/out) & commercial is 50/50 resulting in 55/45 in/out												IN	45%	55%	
													150	183	
												OUT	55%	45%	
													183	150	

Total area from statement of justification for subject site			
7.76 hectares	AM trips per m2	PM trips per m2	
77600 m2		0.004291237	0.004291237

METCASH - FUTURE FORECAST			
Area measured from PLB		Trips for metcash dev	
12.776 hectares	AM	PM	
127760 m2	Total estimated Me	548.2484536	548.2484536
	Rounded up	549	549

IN	45%	55%
	247	302
OUT	55%	45%
	302	247

APPENDIX D

BASE CASE MODELLING RESULTS

APPENDIX D.1

FINDON ROAD/GRANGE ROAD

INTERSECTION SUMMARY

 **Site: TS048 [Grange Rd / Findon Rd - AM exist]**

Base Case AM

Signals - Actuated Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	17.1 km/h	1.9 km/h	16.9 km/h
Travel Distance (Total)	4108.0 veh-km/h	8.1 ped-km/h	4937.7 pers-km/h
Travel Time (Total)	240.6 veh-h/h	4.3 ped-h/h	293.0 pers-h/h
Demand Flows (Total)	4028 veh/h	211 ped/h	5045 pers/h
Percent Heavy Vehicles (Demand)	3.6 %		
Degree of Saturation	1.389	0.048	
Practical Spare Capacity	-35.2 %		
Effective Intersection Capacity	2901 veh/h		
Control Delay (Total)	160.60 veh-h/h	2.61 ped-h/h	195.33 pers-h/h
Control Delay (Average)	143.5 sec	44.6 sec	139.4 sec
Control Delay (Worst Lane)	398.1 sec		
Control Delay (Worst Movement)	354.9 sec	49.6 sec	354.9 sec
Geometric Delay (Average)	2.2 sec		
Stop-Line Delay (Average)	141.3 sec		
Idling Time (Average)	140.9 sec		
Intersection Level of Service (LOS)	LOS F	LOS E	
95% Back of Queue - Vehicles (Worst Lane)	82.5 veh		
95% Back of Queue - Distance (Worst Lane)	596.4 m		
Queue Storage Ratio (Worst Lane)	0.73		
Total Effective Stops	5197 veh/h	182 ped/h	6418 pers/h
Effective Stop Rate	1.29 per veh	0.86 per ped	1.27 per pers
Proportion Queued	0.96	0.86	0.96
Performance Index	663.6	5.3	669.0
Cost (Total)	7714.74 \$/h	109.13 \$/h	7823.88 \$/h
Fuel Consumption (Total)	623.5 L/h		
Carbon Dioxide (Total)	1476.4 kg/h		
Hydrocarbons (Total)	0.155 kg/h		
Carbon Monoxide (Total)	1.480 kg/h		
NOx (Total)	2.109 kg/h		

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	1,933,642 veh/y	101,053 ped/y	2,421,424 pers/y
Delay	77,087 veh-h/y	1,253 ped-h/y	93,758 pers-h/y
Effective Stops	2,494,511 veh/y	87,138 ped/y	3,080,553 pers/y
Travel Distance	1,971,860 veh-km/y	3,865 ped-km/y	2,370,097 pers-km/y
Travel Time	115,481 veh-h/y	2,079 ped-h/y	140,655 pers-h/y
Cost	3,703,076 \$/y	52,384 \$/y	3,755,460 \$/y
Fuel Consumption	299,303 L/y		
Carbon Dioxide	708,655 kg/y		
Hydrocarbons	74 kg/y		
Carbon Monoxide	711 kg/y		
NOx	1,012 kg/y		

MOVEMENT SUMMARY

 **Site: TS048 [Grange Rd / Findon Rd - AM exist]**

Base Case AM

Signals - Actuated Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Road (S)											
1	L2	152	5.6	0.412	34.1	LOS C	7.0	51.2	0.84	0.81	38.8
2	T1	522	3.8	1.389	354.9	LOS F	82.5	596.4	0.98	2.12	8.5
3	R2	259	4.5	0.797	59.2	LOS E	14.8	107.7	0.99	0.84	30.0
Approach		933	4.3	1.389	220.7	LOS F	82.5	596.4	0.96	1.55	12.7
East: Grange Road (E)											
4	L2	142	6.7	0.659	52.0	LOS D	14.9	109.0	0.92	0.91	33.0
5	T1	481	3.9	0.659	42.5	LOS D	15.4	111.7	0.89	0.81	35.1
6	R2	147	2.1	0.507	34.9	LOS C	5.2	37.0	0.94	0.78	37.6
Approach		771	4.1	0.659	42.8	LOS D	15.4	111.7	0.91	0.82	35.1
North: Findon Road (N)											
7	L2	117	1.8	0.548	55.1	LOS E	11.6	83.1	0.91	0.90	32.1
8	T1	551	3.4	1.360	301.4	LOS F	74.0	533.2	0.98	1.90	9.8
9	R2	236	4.5	0.726	58.3	LOS E	13.3	96.5	0.97	0.83	30.3
Approach		903	3.5	1.360	206.1	LOS F	74.0	533.2	0.97	1.49	13.4
West: Grange Road (W)											
10	L2	248	3.0	1.092	117.0	LOS F	50.6	363.8	1.00	1.22	17.0
11	T1	882	3.3	1.092	130.0	LOS F	55.1	396.9	1.00	1.39	17.4
12	R2	292	2.2	0.733	32.5	LOS C	11.3	80.4	0.92	0.82	38.5
Approach		1422	3.0	1.092	107.8	LOS F	55.1	396.9	0.98	1.25	19.6
All Vehicles		4028	3.6	1.389	143.5	LOS F	82.5	596.4	0.96	1.29	17.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	40.1	LOS E	0.1	0.1	0.82	0.82	
P2	East Full Crossing	53	48.7	LOS E	0.2	0.2	0.90	0.90	
P3	North Full Crossing	53	40.1	LOS E	0.1	0.1	0.82	0.82	
P4	West Full Crossing	53	49.6	LOS E	0.2	0.2	0.91	0.91	
All Pedestrians		211	44.6	LOS E			0.86	0.86	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

INTERSECTION SUMMARY

 **Site: TS048 [Grange Rd / Findon Rd - PM exist]**

Base Case PM

Signals - Actuated Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	16.5 km/h	1.9 km/h	16.3 km/h
Travel Distance (Total)	4383.1 veh-km/h	8.1 ped-km/h	5267.7 pers-km/h
Travel Time (Total)	266.2 veh-h/h	4.3 ped-h/h	323.8 pers-h/h
Demand Flows (Total)	4298 veh/h	211 ped/h	5368 pers/h
Percent Heavy Vehicles (Demand)	1.2 %		
Degree of Saturation	1.489	0.048	
Practical Spare Capacity	-39.6 %		
Effective Intersection Capacity	2886 veh/h		
Control Delay (Total)	180.16 veh-h/h	2.59 ped-h/h	218.78 pers-h/h
Control Delay (Average)	150.9 sec	44.2 sec	146.7 sec
Control Delay (Worst Lane)	486.3 sec		
Control Delay (Worst Movement)	374.6 sec	49.6 sec	374.6 sec
Geometric Delay (Average)	2.2 sec		
Stop-Line Delay (Average)	148.7 sec		
Idling Time (Average)	148.6 sec		
Intersection Level of Service (LOS)	LOS F	LOS E	
95% Back of Queue - Vehicles (Worst Lane)	93.9 veh		
95% Back of Queue - Distance (Worst Lane)	662.2 m		
Queue Storage Ratio (Worst Lane)	0.81		
Total Effective Stops	5623 veh/h	181 ped/h	6928 pers/h
Effective Stop Rate	1.31 per veh	0.86 per ped	1.29 per pers
Proportion Queued	0.97	0.86	0.96
Performance Index	724.2	5.3	729.5
Cost (Total)	8458.41 \$/h	108.53 \$/h	8566.94 \$/h
Fuel Consumption (Total)	625.1 L/h		
Carbon Dioxide (Total)	1472.6 kg/h		
Hydrocarbons (Total)	0.150 kg/h		
Carbon Monoxide (Total)	1.419 kg/h		
NOx (Total)	0.968 kg/h		

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	2,062,990 veh/y	101,053 ped/y	2,576,640 pers/y
Delay	86,477 veh-h/y	1,241 ped-h/y	105,014 pers-h/y
Effective Stops	2,698,813 veh/y	86,716 ped/y	3,325,292 pers/y
Travel Distance	2,103,878 veh-km/y	3,865 ped-km/y	2,528,519 pers-km/y
Travel Time	127,788 veh-h/y	2,067 ped-h/y	155,413 pers-h/y
Cost	4,060,036 \$/y	52,096 \$/y	4,112,132 \$/y
Fuel Consumption	300,035 L/y		
Carbon Dioxide	706,862 kg/y		
Hydrocarbons	72 kg/y		
Carbon Monoxide	681 kg/y		
NOx	465 kg/y		

MOVEMENT SUMMARY

 **Site: TS048 [Grange Rd / Findon Rd - PM exist]**

Base Case PM

Signals - Actuated Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Road (S)											
1	L2	256	1.2	0.377	45.6	LOS D	14.0	98.7	0.86	0.97	34.5
2	T1	503	0.8	1.271	263.8	LOS F	66.9	471.8	0.98	1.85	10.9
3	R2	146	0.7	0.508	58.3	LOS E	8.0	56.5	0.94	0.79	30.3
Approach		905	0.9	1.271	168.9	LOS F	66.9	471.8	0.94	1.43	15.5
East: Grange Road (E)											
4	L2	208	1.0	1.097	118.6	LOS F	55.6	393.6	1.00	1.23	16.7
5	T1	864	1.5	1.097	130.7	LOS F	55.6	393.6	1.00	1.36	17.0
6	R2	266	0.0	0.681	31.7	LOS C	9.6	67.1	0.93	0.82	38.9
Approach		1339	1.1	1.097	109.1	LOS F	55.6	393.6	0.99	1.23	19.1
North: Findon Road (N)											
7	L2	89	1.2	0.600	54.6	LOS D	12.4	87.4	0.93	0.87	32.5
8	T1	636	0.8	1.489	374.6	LOS F	93.9	662.2	0.98	2.06	8.2
9	R2	305	2.4	1.151	200.4	LOS F	36.4	260.1	1.00	1.34	13.6
Approach		1031	1.3	1.489	295.2	LOS F	93.9	662.2	0.98	1.74	10.0
West: Grange Road (W)											
10	L2	176	3.0	0.710	50.7	LOS D	17.1	121.9	0.93	0.93	33.4
11	T1	584	1.4	0.710	42.9	LOS D	21.2	149.9	0.93	0.84	35.0
12	R2	263	0.0	0.800	43.3	LOS D	11.3	78.8	0.99	0.85	34.6
Approach		1023	1.3	0.800	44.3	LOS D	21.2	149.9	0.94	0.86	34.6
All Vehicles		4298	1.2	1.489	150.9	LOS F	93.9	662.2	0.97	1.31	16.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	39.3	LOS D	0.1	0.1	0.81	0.81	
P2	East Full Crossing	53	48.7	LOS E	0.2	0.2	0.90	0.90	
P3	North Full Crossing	53	39.3	LOS D	0.1	0.1	0.81	0.81	
P4	West Full Crossing	53	49.6	LOS E	0.2	0.2	0.91	0.91	
All Pedestrians		211	44.2	LOS E			0.86	0.86	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

APPENDIX D.2

FINDON ROAD/HARTLEY ROAD

INTERSECTION SUMMARY

▽ Site: 101 [AM Exist]

New Site
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	39.4 km/h	39.4 km/h
Travel Distance (Total)	1668.5 veh-km/h	2002.2 pers-km/h
Travel Time (Total)	42.3 veh-h/h	50.8 pers-h/h
Demand Flows (Total)	2586 veh/h	3104 pers/h
Percent Heavy Vehicles (Demand)	3.3 %	
Degree of Saturation	1.378	
Practical Spare Capacity	-41.9 %	
Effective Intersection Capacity	1877 veh/h	
Control Delay (Total)	13.77 veh-h/h	16.52 pers-h/h
Control Delay (Average)	19.2 sec	19.2 sec
Control Delay (Worst Lane)	683.7 sec	
Control Delay (Worst Movement)	683.7 sec	683.7 sec
Geometric Delay (Average)	1.4 sec	
Stop-Line Delay (Average)	17.7 sec	
Idling Time (Average)	14.6 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	25.2 veh	
95% Back of Queue - Distance (Worst Lane)	181.3 m	
Queue Storage Ratio (Worst Lane)	0.73	
Total Effective Stops	825 veh/h	990 pers/h
Effective Stop Rate	0.32 per veh	0.32 per pers
Proportion Queued	0.40	0.40
Performance Index	85.7	85.7
Cost (Total)	1204.68 \$/h	1204.68 \$/h
Fuel Consumption (Total)	163.2 L/h	
Carbon Dioxide (Total)	386.8 kg/h	
Hydrocarbons (Total)	0.034 kg/h	
Carbon Monoxide (Total)	0.427 kg/h	
NOx (Total)	0.557 kg/h	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,241,432 veh/y	1,489,718 pers/y
Delay	6,608 veh-h/y	7,929 pers-h/y
Effective Stops	396,059 veh/y	475,271 pers/y
Travel Distance	800,890 veh-km/y	961,067 pers-km/y
Travel Time	20,303 veh-h/y	24,363 pers-h/y
Cost	578,245 \$/y	578,245 \$/y
Fuel Consumption	78,337 L/y	
Carbon Dioxide	185,668 kg/y	
Hydrocarbons	16 kg/y	
Carbon Monoxide	205 kg/y	
NOx	267 kg/y	

MOVEMENT SUMMARY

▽ Site: 101 [AM Exist]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Rd (S)											
2	T1	1077	2.9	0.938	16.8	LOS C	25.2	181.3	0.56	0.32	39.9
3	R2	256	4.5	0.938	40.7	LOS E	25.2	181.3	1.00	0.57	30.9
Approach		1333	3.2	0.938	21.4	NA	25.2	181.3	0.64	0.36	37.8
East: Hartley Rd (E)											
4	L2	214	2.5	0.377	12.7	LOS B	1.7	12.0	0.75	0.96	42.3
6	R2	25	4.2	1.378	683.7	LOS F	8.2	59.5	1.00	1.37	4.6
Approach		239	2.6	1.378	83.7	LOS F	8.2	59.5	0.77	1.00	18.1
North: Findon Rd (N)											
7	L2	166	2.5	0.493	5.6	LOS A	0.0	0.0	0.00	0.10	57.3
8	T1	848	3.6	0.493	0.1	LOS A	0.0	0.0	0.00	0.10	58.4
Approach		1015	3.4	0.493	1.0	NA	0.0	0.0	0.00	0.10	58.1
All Vehicles		2586	3.3	1.378	19.2	NA	25.2	181.3	0.40	0.32	39.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: P:\2018\18270 DPA Findon Road Kidman Park North\SIDRA\20181204TSXXXXkidmanparkdevV2.sip7

INTERSECTION SUMMARY

▽ Site: 101 [PM Exist]

New Site
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	32.6 km/h	32.6 km/h
Travel Distance (Total)	1508.8 veh-km/h	1810.6 pers-km/h
Travel Time (Total)	46.3 veh-h/h	55.5 pers-h/h
Demand Flows (Total)	2379 veh/h	2855 pers/h
Percent Heavy Vehicles (Demand)	1.1 %	
Degree of Saturation	2.090	
Practical Spare Capacity	-61.7 %	
Effective Intersection Capacity	1138 veh/h	
Control Delay (Total)	19.83 veh-h/h	23.79 pers-h/h
Control Delay (Average)	30.0 sec	30.0 sec
Control Delay (Worst Lane)	1168.1 sec	
Control Delay (Worst Movement)	1168.1 sec	1168.1 sec
Geometric Delay (Average)	1.0 sec	
Stop-Line Delay (Average)	29.0 sec	
Idling Time (Average)	28.2 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	20.7 veh	
95% Back of Queue - Distance (Worst Lane)	147.6 m	
Queue Storage Ratio (Worst Lane)	0.32	
Total Effective Stops	491 veh/h	589 pers/h
Effective Stop Rate	0.21 per veh	0.21 per pers
Proportion Queued	0.36	0.36
Performance Index	81.0	81.0
Cost (Total)	1375.75 \$/h	1375.75 \$/h
Fuel Consumption (Total)	140.5 L/h	
Carbon Dioxide (Total)	331.1 kg/h	
Hydrocarbons (Total)	0.030 kg/h	
Carbon Monoxide (Total)	0.370 kg/h	
NOx (Total)	0.233 kg/h	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,141,895 veh/y	1,370,274 pers/y
Delay	9,517 veh-h/y	11,420 pers-h/y
Effective Stops	235,775 veh/y	282,930 pers/y
Travel Distance	724,242 veh-km/y	869,090 pers-km/y
Travel Time	22,207 veh-h/y	26,648 pers-h/y
Cost	660,362 \$/y	660,362 \$/y
Fuel Consumption	67,421 L/y	
Carbon Dioxide	158,926 kg/y	
Hydrocarbons	14 kg/y	
Carbon Monoxide	178 kg/y	
NOx	112 kg/y	

MOVEMENT SUMMARY

▽ Site: 101 [PM Exist]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Rd (S)											
2	T1	828	0.8	0.695	10.2	LOS B	11.1	78.5	0.61	0.14	45.5
3	R2	122	3.4	0.695	30.3	LOS D	11.1	78.5	1.00	0.23	38.3
Approach		951	1.1	0.695	12.8	NA	11.1	78.5	0.66	0.15	44.4
East: Hartley Rd (E)											
4	L2	202	2.1	0.615	23.1	LOS C	2.8	20.1	0.91	1.11	35.3
6	R2	46	2.3	2.090	1168.1	LOS F	20.7	147.6	1.00	1.75	2.8
Approach		248	2.1	2.090	236.6	LOS F	20.7	147.6	0.93	1.23	8.4
North: Findon Rd (N)											
7	L2	66	0.0	0.561	5.6	LOS A	0.0	0.0	0.00	0.03	57.9
8	T1	1114	0.9	0.561	0.1	LOS A	0.0	0.0	0.00	0.03	59.3
Approach		1180	0.9	0.561	0.4	NA	0.0	0.0	0.00	0.03	59.2
All Vehicles		2379	1.1	2.090	30.0	NA	20.7	147.6	0.36	0.21	32.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: P:\2018\18270 DPA Findon Road Kidman Park North\SIDRA\20181204TSXXXXkidmanparkdevV2.sip7

APPENDIX D.3

FINDON ROAD/VALETTA ROAD

INTERSECTION SUMMARY

 **Site: 101 [Valetta/Findon AM exist]**

New Site

Signals - Actuated Isolated Cycle Time = 60 seconds (User-Given Phase Times)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	8.3 km/h	2.5 km/h	8.2 km/h
Travel Distance (Total)	2985.6 veh-km/h	5.4 ped-km/h	3588.1 pers-km/h
Travel Time (Total)	361.1 veh-h/h	2.1 ped-h/h	435.5 pers-h/h
Demand Flows (Total)	2943 veh/h	158 ped/h	3690 pers/h
Percent Heavy Vehicles (Demand)	2.8 %		
Degree of Saturation	2.487	0.044	
Practical Spare Capacity	-63.8 %		
Effective Intersection Capacity	1184 veh/h		
Control Delay (Total)	303.97 veh-h/h	0.98 ped-h/h	365.74 pers-h/h
Control Delay (Average)	371.8 sec	22.4 sec	356.9 sec
Control Delay (Worst Lane)	1360.4 sec		
Control Delay (Worst Movement)	1360.4 sec	24.4 sec	1360.4 sec
Geometric Delay (Average)	2.2 sec		
Stop-Line Delay (Average)	369.6 sec		
Idling Time (Average)	350.0 sec		
Intersection Level of Service (LOS)	LOS F	LOS C	
95% Back of Queue - Vehicles (Worst Lane)	144.7 veh		
95% Back of Queue - Distance (Worst Lane)	1032.2 m		
Queue Storage Ratio (Worst Lane)	1.04		
Total Effective Stops	6834 veh/h	136 ped/h	8337 pers/h
Effective Stop Rate	2.32 per veh	0.86 per ped	2.26 per pers
Proportion Queued	0.93	0.86	0.93
Performance Index	783.9	2.9	786.8
Cost (Total)	11699.77 \$/h	53.73 \$/h	11753.50 \$/h
Fuel Consumption (Total)	684.2 L/h		
Carbon Dioxide (Total)	1616.0 kg/h		
Hydrocarbons (Total)	0.188 kg/h		
Carbon Monoxide (Total)	1.440 kg/h		
NOx (Total)	1.639 kg/h		

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	1,412,716 veh/y	75,789 ped/y	1,771,049 pers/y
Delay	145,905 veh-h/y	471 ped-h/y	175,557 pers-h/y
Effective Stops	3,280,139 veh/y	65,407 ped/y	4,001,574 pers/y
Travel Distance	1,433,077 veh-km/y	2,584 ped-km/y	1,722,277 pers-km/y
Travel Time	173,352 veh-h/y	1,023 ped-h/y	209,046 pers-h/y
Cost	5,615,891 \$/y	25,792 \$/y	5,641,683 \$/y
Fuel Consumption	328,406 L/y		
Carbon Dioxide	775,662 kg/y		
Hydrocarbons	90 kg/y		
Carbon Monoxide	691 kg/y		
NOx	787 kg/y		

MOVEMENT SUMMARY

 **Site: 101 [Valetta/Findon AM exist]**

New Site

Signals - Actuated Isolated Cycle Time = 60 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Rd (S)											
1	L2	182	1.7	0.434	23.3	LOS C	4.5	31.7	0.91	0.17	40.4
2	T1	811	3.9	1.378	358.8	LOS F	117.0	846.1	1.00	3.43	8.6
Approach		993	3.5	1.378	297.3	LOS F	117.0	846.1	0.98	2.83	10.0
North: Findon Rd (N)											
8	T1	804	3.0	0.731	10.9	LOS B	17.6	126.1	0.78	0.71	50.9
9	R2	258	4.5	1.261	269.5	LOS F	30.5	221.7	1.00	2.11	10.6
Approach		1062	3.4	1.261	73.7	LOS E	30.5	221.7	0.84	1.05	26.5
West: Valetta Rd (W)											
10	L2	522	2.2	2.487	1360.4	LOS F	144.7	1032.2	1.00	4.98	2.5
12	R2	366	0.0	0.801	29.2	LOS C	10.5	73.5	0.97	0.84	37.2
Approach		888	1.3	2.487	811.5	LOS F	144.7	1032.2	0.99	3.28	4.1
All Vehicles		2943	2.8	2.487	371.8	LOS F	144.7	1032.2	0.93	2.32	8.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P3	North Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P4	West Full Crossing	53	18.4	LOS B	0.1	0.1	0.79	0.79	
All Pedestrians		158	22.4	LOS C			0.86	0.86	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

INTERSECTION SUMMARY

 **Site: 101 [Valetta/Findon PM exist]**

New Site

Signals - Actuated Isolated Cycle Time = 60 seconds (User-Given Phase Times)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	19.6 km/h	2.7 km/h	19.4 km/h
Travel Distance (Total)	2792.4 veh-km/h	5.4 ped-km/h	3356.3 pers-km/h
Travel Time (Total)	142.7 veh-h/h	2.0 ped-h/h	173.3 pers-h/h
Demand Flows (Total)	2753 veh/h	158 ped/h	3461 pers/h
Percent Heavy Vehicles (Demand)	1.0 %		
Degree of Saturation	1.319	0.044	
Practical Spare Capacity	-31.8 %		
Effective Intersection Capacity	2087 veh/h		
Control Delay (Total)	92.36 veh-h/h	0.84 ped-h/h	111.67 pers-h/h
Control Delay (Average)	120.8 sec	19.1 sec	116.2 sec
Control Delay (Worst Lane)	313.0 sec		
Control Delay (Worst Movement)	313.0 sec	24.4 sec	313.0 sec
Geometric Delay (Average)	2.1 sec		
Stop-Line Delay (Average)	118.7 sec		
Idling Time (Average)	106.9 sec		
Intersection Level of Service (LOS)	LOS F	LOS B	
95% Back of Queue - Vehicles (Worst Lane)	94.1 veh		
95% Back of Queue - Distance (Worst Lane)	663.9 m		
Queue Storage Ratio (Worst Lane)	0.81		
Total Effective Stops	4035 veh/h	123 ped/h	4965 pers/h
Effective Stop Rate	1.47 per veh	0.78 per ped	1.43 per pers
Proportion Queued	0.85	0.78	0.85
Performance Index	370.4	2.7	373.0
Cost (Total)	4425.29 \$/h	50.09 \$/h	4475.38 \$/h
Fuel Consumption (Total)	352.1 L/h		
Carbon Dioxide (Total)	829.3 kg/h		
Hydrocarbons (Total)	0.080 kg/h		
Carbon Monoxide (Total)	0.775 kg/h		
NOx (Total)	0.494 kg/h		

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	1,321,263 veh/y	75,789 ped/y	1,661,305 pers/y
Delay	44,333 veh-h/y	402 ped-h/y	53,601 pers-h/y
Effective Stops	1,936,805 veh/y	59,077 ped/y	2,383,243 pers/y
Travel Distance	1,340,353 veh-km/y	2,584 ped-km/y	1,611,008 pers-km/y
Travel Time	68,513 veh-h/y	954 ped-h/y	83,169 pers-h/y
Cost	2,124,140 \$/y	24,042 \$/y	2,148,182 \$/y
Fuel Consumption	169,016 L/y		
Carbon Dioxide	398,057 kg/y		
Hydrocarbons	39 kg/y		
Carbon Monoxide	372 kg/y		
NOx	237 kg/y		

MOVEMENT SUMMARY

 **Site: 101 [Valetta/Findon PM exist]**

New Site

Signals - Actuated Isolated Cycle Time = 60 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Rd (S)											
1	L2	326	0.3	1.245	255.0	LOS F	37.3	261.5	1.00	2.11	11.1
2	T1	703	0.9	1.319	313.0	LOS F	94.1	663.9	1.00	3.09	9.6
Approach		1029	0.7	1.319	294.6	LOS F	94.1	663.9	1.00	2.78	10.1
North: Findon Rd (N)											
8	T1	933	1.1	0.678	5.8	LOS A	15.6	110.3	0.61	0.56	54.8
9	R2	383	1.1	0.854	30.9	LOS C	11.3	79.7	0.99	0.86	37.1
Approach		1316	1.1	0.854	13.1	LOS B	15.6	110.3	0.72	0.64	48.1
West: Valetta Rd (W)											
10	L2	247	1.7	0.548	27.3	LOS C	6.5	46.5	0.90	0.80	38.0
12	R2	160	0.7	0.586	32.7	LOS C	4.7	32.7	0.95	0.79	35.9
Approach		407	1.3	0.586	29.4	LOS C	6.5	46.5	0.92	0.80	37.2
All Vehicles		2753	1.0	1.319	120.8	LOS F	94.1	663.9	0.85	1.47	19.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P3	North Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P4	West Full Crossing	53	8.6	LOS A	0.0	0.0	0.53	0.53	
All Pedestrians		158	19.1	LOS B			0.78	0.78	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

APPENDIX D.4

SITE ACCESS POINT (PRIMARY INTERSECTIONS)

INTERSECTION SUMMARY

▽ Site: 101 [Site Access/Findon - AM Single Access - 2 turn lanes]

New Site
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	24.4 km/h	24.4 km/h
Travel Distance (Total)	2502.1 veh-km/h	3002.5 pers-km/h
Travel Time (Total)	102.5 veh-h/h	123.0 pers-h/h
Demand Flows (Total)	2468 veh/h	2962 pers/h
Percent Heavy Vehicles (Demand)	3.1 %	
Degree of Saturation	3.355	
Practical Spare Capacity	-76.2 %	
Effective Intersection Capacity	736 veh/h	
Control Delay (Total)	58.07 veh-h/h	69.69 pers-h/h
Control Delay (Average)	84.7 sec	84.7 sec
Control Delay (Worst Lane)	2213.3 sec	
Control Delay (Worst Movement)	2213.3 sec	2213.3 sec
Geometric Delay (Average)	0.7 sec	
Stop-Line Delay (Average)	84.0 sec	
Idling Time (Average)	83.7 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	45.9 veh	
95% Back of Queue - Distance (Worst Lane)	327.0 m	
Queue Storage Ratio (Worst Lane)	0.26	
Total Effective Stops	458 veh/h	549 pers/h
Effective Stop Rate	0.19 per veh	0.19 per pers
Proportion Queued	0.52	0.52
Performance Index	168.6	168.6
Cost (Total)	3050.55 \$/h	3050.55 \$/h
Fuel Consumption (Total)	273.9 L/h	
Carbon Dioxide (Total)	648.2 kg/h	
Hydrocarbons (Total)	0.061 kg/h	
Carbon Monoxide (Total)	0.668 kg/h	
NOx (Total)	0.747 kg/h	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,184,842 veh/y	1,421,811 pers/y
Delay	27,876 veh-h/y	33,451 pers-h/y
Effective Stops	219,740 veh/y	263,688 pers/y
Travel Distance	1,201,000 veh-km/y	1,441,200 pers-km/y
Travel Time	49,212 veh-h/y	59,054 pers-h/y
Cost	1,464,263 \$/y	1,464,263 \$/y
Fuel Consumption	131,463 L/y	
Carbon Dioxide	311,144 kg/y	
Hydrocarbons	29 kg/y	
Carbon Monoxide	321 kg/y	
NOx	359 kg/y	

MOVEMENT SUMMARY

▽ Site: 101 [Site Access/Findon - AM Single Access - 2 turn lanes]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Road (S)											
1	L2	72	2.0	0.565	5.6	LOS A	0.0	0.0	0.00	0.04	57.8
2	T1	1102	3.0	0.565	0.1	LOS A	0.0	0.0	0.00	0.04	59.5
Approach		1174	2.9	0.565	0.4	NA	0.0	0.0	0.00	0.04	59.4
North: Findon Road (N)											
8	T1	1015	3.5	0.795	12.2	LOS B	17.2	124.2	1.00	0.10	48.6
9	R2	87	2.0	0.795	38.3	LOS E	17.2	124.2	1.00	0.10	44.7
Approach		1102	3.4	0.795	14.2	NA	17.2	124.2	1.00	0.10	48.3
West: Site Access (W)											
10	L2	106	2.0	0.323	17.0	LOS C	1.2	8.3	0.85	0.98	42.6
12	R2	86	2.0	3.355	2213.3	LOS F	45.9	327.0	1.00	2.37	1.5
Approach		193	2.0	3.355	1001.1	LOS F	45.9	327.0	0.92	1.60	3.3
All Vehicles		2468	3.1	3.355	84.7	NA	45.9	327.0	0.52	0.19	24.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

INTERSECTION SUMMARY

▽ Site: 101 [Site Access/Findon - PM Single Access - 2 turn lanes]

New Site
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	27.4 km/h	27.4 km/h
Travel Distance (Total)	2439.2 veh-km/h	2927.0 pers-km/h
Travel Time (Total)	89.2 veh-h/h	107.0 pers-h/h
Demand Flows (Total)	2406 veh/h	2888 pers/h
Percent Heavy Vehicles (Demand)	1.1 %	
Degree of Saturation	3.269	
Practical Spare Capacity	-75.5 %	
Effective Intersection Capacity	736 veh/h	
Control Delay (Total)	45.94 veh-h/h	55.13 pers-h/h
Control Delay (Average)	68.7 sec	68.7 sec
Control Delay (Worst Lane)	2155.0 sec	
Control Delay (Worst Movement)	2155.0 sec	2155.0 sec
Geometric Delay (Average)	0.7 sec	
Stop-Line Delay (Average)	68.0 sec	
Idling Time (Average)	67.6 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	38.8 veh	
95% Back of Queue - Distance (Worst Lane)	276.1 m	
Queue Storage Ratio (Worst Lane)	0.22	
Total Effective Stops	402 veh/h	483 pers/h
Effective Stop Rate	0.17 per veh	0.17 per pers
Proportion Queued	0.59	0.59
Performance Index	143.0	143.0
Cost (Total)	2624.37 \$/h	2624.37 \$/h
Fuel Consumption (Total)	243.3 L/h	
Carbon Dioxide (Total)	573.7 kg/h	
Hydrocarbons (Total)	0.054 kg/h	
Carbon Monoxide (Total)	0.615 kg/h	
NOx (Total)	0.389 kg/h	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,155,032 veh/y	1,386,038 pers/y
Delay	22,053 veh-h/y	26,463 pers-h/y
Effective Stops	193,143 veh/y	231,771 pers/y
Travel Distance	1,170,808 veh-km/y	1,404,970 pers-km/y
Travel Time	42,806 veh-h/y	51,367 pers-h/y
Cost	1,259,698 \$/y	1,259,698 \$/y
Fuel Consumption	116,799 L/y	
Carbon Dioxide	275,355 kg/y	
Hydrocarbons	26 kg/y	
Carbon Monoxide	295 kg/y	
NOx	187 kg/y	

MOVEMENT SUMMARY

▽ Site: 101 [Site Access/Findon - PM Single Access - 2 turn lanes]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Road (S)											
1	L2	86	2.0	0.458	5.6	LOS A	0.0	0.0	0.00	0.05	57.7
2	T1	875	1.0	0.458	0.1	LOS A	0.0	0.0	0.00	0.05	59.4
Approach		961	1.1	0.458	0.6	NA	0.0	0.0	0.00	0.05	59.2
North: Findon Road (N)											
8	T1	1180	1.0	0.776	5.9	LOS A	13.7	96.5	1.00	0.09	53.4
9	R2	106	2.0	0.776	26.2	LOS D	13.7	96.5	1.00	0.09	48.7
Approach		1286	1.1	0.776	7.5	NA	13.7	96.5	1.00	0.09	53.0
West: Site Access (W)											
10	L2	87	2.0	0.158	10.2	LOS B	0.6	3.9	0.70	0.86	46.2
12	R2	72	2.0	3.269	2155.0	LOS F	38.8	276.1	1.00	2.17	1.6
Approach		159	2.0	3.269	976.1	LOS F	38.8	276.1	0.83	1.45	3.4
All Vehicles		2406	1.1	3.269	68.7	NA	38.8	276.1	0.59	0.17	27.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: P:\2018\18270 DPA Findon Road Kidman Park North\SIDRA\Site Access 19DEC18-V1.sip7

INTERSECTION SUMMARY

▽ Site: 101 [Site Access/Findon - AM Dual Access - 2 turn lanes]

New Site
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	48.3 km/h	48.3 km/h
Travel Distance (Total)	2324.5 veh-km/h	2789.4 pers-km/h
Travel Time (Total)	48.1 veh-h/h	57.8 pers-h/h
Demand Flows (Total)	2294 veh/h	2752 pers/h
Percent Heavy Vehicles (Demand)	3.1 %	
Degree of Saturation	1.407	
Practical Spare Capacity	-43.2 %	
Effective Intersection Capacity	1630 veh/h	
Control Delay (Total)	8.67 veh-h/h	10.41 pers-h/h
Control Delay (Average)	13.6 sec	13.6 sec
Control Delay (Worst Lane)	554.9 sec	
Control Delay (Worst Movement)	554.9 sec	554.9 sec
Geometric Delay (Average)	0.4 sec	
Stop-Line Delay (Average)	13.2 sec	
Idling Time (Average)	11.2 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	12.5 veh	
95% Back of Queue - Distance (Worst Lane)	90.2 m	
Queue Storage Ratio (Worst Lane)	0.07	
Total Effective Stops	193 veh/h	231 pers/h
Effective Stop Rate	0.08 per veh	0.08 per pers
Proportion Queued	0.50	0.50
Performance Index	78.7	78.7
Cost (Total)	1293.14 \$/h	1293.14 \$/h
Fuel Consumption (Total)	195.7 L/h	
Carbon Dioxide (Total)	463.9 kg/h	
Hydrocarbons (Total)	0.037 kg/h	
Carbon Monoxide (Total)	0.523 kg/h	
NOx (Total)	0.642 kg/h	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,100,969 veh/y	1,321,162 pers/y
Delay	4,164 veh-h/y	4,997 pers-h/y
Effective Stops	92,548 veh/y	111,057 pers/y
Travel Distance	1,115,762 veh-km/y	1,338,915 pers-km/y
Travel Time	23,101 veh-h/y	27,721 pers-h/y
Cost	620,709 \$/y	620,709 \$/y
Fuel Consumption	93,926 L/y	
Carbon Dioxide	222,660 kg/y	
Hydrocarbons	18 kg/y	
Carbon Monoxide	251 kg/y	
NOx	308 kg/y	

MOVEMENT SUMMARY

▽ Site: 101 [Site Access/Findon - AM Dual Access - 2 turn lanes]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Road (S)											
1	L2	36	2.0	0.547	5.6	LOS A	0.0	0.0	0.00	0.02	57.9
2	T1	1102	3.0	0.547	0.1	LOS A	0.0	0.0	0.00	0.02	59.6
Approach		1138	3.0	0.547	0.3	NA	0.0	0.0	0.00	0.02	59.6
North: Findon Road (N)											
8	T1	1015	3.5	0.629	4.7	LOS A	12.5	90.2	1.00	0.04	54.7
9	R2	44	2.0	0.629	31.4	LOS D	12.5	90.2	1.00	0.04	49.9
Approach		1059	3.4	0.629	5.8	NA	12.5	90.2	1.00	0.04	54.5
West: Site Access (W)											
10	L2	54	2.0	0.163	15.0	LOS B	0.5	3.7	0.82	0.92	43.6
12	R2	43	2.0	1.407	554.9	LOS F	11.6	82.9	1.00	1.73	5.6
Approach		97	2.0	1.407	255.6	LOS F	11.6	82.9	0.90	1.28	10.8
All Vehicles		2294	3.1	1.407	13.6	NA	12.5	90.2	0.50	0.08	48.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

INTERSECTION SUMMARY

▽ Site: 101 [Site Access/Findon - PM Dual Access - 2 turn lanes]

New Site
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	51.6 km/h	51.6 km/h
Travel Distance (Total)	2262.7 veh-km/h	2715.2 pers-km/h
Travel Time (Total)	43.8 veh-h/h	52.6 pers-h/h
Demand Flows (Total)	2233 veh/h	2679 pers/h
Percent Heavy Vehicles (Demand)	1.1 %	
Degree of Saturation	1.219	
Practical Spare Capacity	-34.4 %	
Effective Intersection Capacity	1832 veh/h	
Control Delay (Total)	5.62 veh-h/h	6.75 pers-h/h
Control Delay (Average)	9.1 sec	9.1 sec
Control Delay (Worst Lane)	434.9 sec	
Control Delay (Worst Movement)	434.9 sec	434.9 sec
Geometric Delay (Average)	0.4 sec	
Stop-Line Delay (Average)	8.7 sec	
Idling Time (Average)	8.0 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	7.5 veh	
95% Back of Queue - Distance (Worst Lane)	53.7 m	
Queue Storage Ratio (Worst Lane)	0.04	
Total Effective Stops	158 veh/h	190 pers/h
Effective Stop Rate	0.07 per veh	0.07 per pers
Proportion Queued	0.18	0.18
Performance Index	56.7	56.7
Cost (Total)	1040.34 \$/h	1040.34 \$/h
Fuel Consumption (Total)	153.6 L/h	
Carbon Dioxide (Total)	362.4 kg/h	
Hydrocarbons (Total)	0.028 kg/h	
Carbon Monoxide (Total)	0.439 kg/h	
NOx (Total)	0.227 kg/h	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,071,663 veh/y	1,285,996 pers/y
Delay	2,699 veh-h/y	3,239 pers-h/y
Effective Stops	75,838 veh/y	91,006 pers/y
Travel Distance	1,086,078 veh-km/y	1,303,294 pers-km/y
Travel Time	21,043 veh-h/y	25,252 pers-h/y
Cost	499,364 \$/y	499,364 \$/y
Fuel Consumption	73,752 L/y	
Carbon Dioxide	173,929 kg/y	
Hydrocarbons	14 kg/y	
Carbon Monoxide	211 kg/y	
NOx	109 kg/y	

MOVEMENT SUMMARY

▽ Site: 101 [Site Access/Findon - PM Dual Access - 2 turn lanes]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Road (S)											
1	L2	43	2.0	0.436	5.6	LOS A	0.0	0.0	0.00	0.03	57.9
2	T1	875	1.0	0.436	0.1	LOS A	0.0	0.0	0.00	0.03	59.6
Approach		918	1.0	0.436	0.3	NA	0.0	0.0	0.00	0.03	59.5
North: Findon Road (N)											
8	T1	1180	1.0	0.661	2.3	LOS A	3.7	25.9	0.27	0.03	57.0
9	R2	55	2.0	0.661	21.8	LOS C	3.7	25.9	0.27	0.03	51.7
Approach		1235	1.0	0.661	3.2	NA	3.7	25.9	0.27	0.03	56.8
West: Site Access (W)											
10	L2	44	2.0	0.080	9.9	LOS A	0.3	1.9	0.68	0.85	46.4
12	R2	36	2.0	1.219	434.9	LOS F	7.5	53.7	1.00	1.50	7.0
Approach		80	2.0	1.219	200.1	LOS F	7.5	53.7	0.82	1.14	13.2
All Vehicles		2233	1.1	1.219	9.1	NA	7.5	53.7	0.18	0.07	51.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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APPENDIX E

SCENARIO 1 MODELLING (SUBJECT SITE ONLY)

APPENDIX E.1

FINDON ROAD/GRANGE ROAD

INTERSECTION SUMMARY

 **Site: TS048 [Grange Rd / Findon Rd - AM -SV +SD]**

AM -SV +SD

Signals - Actuated Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	18.8 km/h	1.9 km/h	18.5 km/h
Travel Distance (Total)	4114.6 veh-km/h	8.1 ped-km/h	4945.5 pers-km/h
Travel Time (Total)	218.6 veh-h/h	4.3 ped-h/h	266.7 pers-h/h
Demand Flows (Total)	4035 veh/h	211 ped/h	5052 pers/h
Percent Heavy Vehicles (Demand)	3.6 %		
Degree of Saturation	1.357	0.048	
Practical Spare Capacity	-33.7 %		
Effective Intersection Capacity	2973 veh/h		
Control Delay (Total)	139.34 veh-h/h	2.61 ped-h/h	169.82 pers-h/h
Control Delay (Average)	124.3 sec	44.6 sec	121.0 sec
Control Delay (Worst Lane)	370.5 sec		
Control Delay (Worst Movement)	334.7 sec	49.6 sec	334.7 sec
Geometric Delay (Average)	2.3 sec		
Stop-Line Delay (Average)	122.0 sec		
Idling Time (Average)	121.7 sec		
Intersection Level of Service (LOS)	LOS F	LOS E	
95% Back of Queue - Vehicles (Worst Lane)	77.5 veh		
95% Back of Queue - Distance (Worst Lane)	560.4 m		
Queue Storage Ratio (Worst Lane)	0.69		
Total Effective Stops	4967 veh/h	182 ped/h	6142 pers/h
Effective Stop Rate	1.23 per veh	0.86 per ped	1.22 per pers
Proportion Queued	0.96	0.86	0.95
Performance Index	626.1	5.3	631.4
Cost (Total)	6990.28 \$/h	109.13 \$/h	7099.42 \$/h
Fuel Consumption (Total)	593.2 L/h		
Carbon Dioxide (Total)	1404.7 kg/h		
Hydrocarbons (Total)	0.145 kg/h		
Carbon Monoxide (Total)	1.422 kg/h		
NOx (Total)	2.028 kg/h		

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	1,936,674 veh/y	101,053 ped/y	2,425,061 pers/y
Delay	66,883 veh-h/y	1,253 ped-h/y	81,512 pers-h/y
Effective Stops	2,384,132 veh/y	87,138 ped/y	2,948,097 pers/y
Travel Distance	1,974,993 veh-km/y	3,865 ped-km/y	2,373,857 pers-km/y
Travel Time	104,948 veh-h/y	2,079 ped-h/y	128,016 pers-h/y
Cost	3,355,335 \$/y	52,384 \$/y	3,407,719 \$/y
Fuel Consumption	284,758 L/y		
Carbon Dioxide	674,263 kg/y		
Hydrocarbons	69 kg/y		
Carbon Monoxide	683 kg/y		
NOx	973 kg/y		

MOVEMENT SUMMARY

 **Site: TS048 [Grange Rd / Findon Rd - AM -SV +SD]**

AM -SV +SD

Signals - Actuated Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Road (S)											
1	L2	169	5.0	0.403	27.8	LOS C	7.2	52.6	0.80	0.77	41.4
2	T1	502	3.8	1.357	334.7	LOS F	77.5	560.4	0.98	2.06	9.0
3	R2	293	4.0	1.000	86.7	LOS F	21.9	158.7	1.00	0.99	24.5
Approach		964	4.0	1.357	205.5	LOS F	77.5	560.4	0.96	1.51	13.4
East: Grange Road (E)											
4	L2	160	5.9	0.672	51.6	LOS D	15.3	111.8	0.92	0.92	33.1
5	T1	481	3.9	0.672	42.5	LOS D	15.9	114.7	0.90	0.81	35.1
6	R2	147	2.1	0.507	34.9	LOS C	5.2	37.0	0.94	0.78	37.6
Approach		788	4.0	0.672	42.9	LOS D	15.9	114.7	0.91	0.83	35.1
North: Findon Road (N)											
7	L2	117	1.8	0.491	53.6	LOS D	10.8	77.5	0.89	0.90	32.5
8	T1	500	3.6	1.219	210.2	LOS F	55.4	399.4	0.98	1.62	13.1
9	R2	236	4.5	0.726	58.3	LOS E	13.3	96.5	0.97	0.83	30.3
Approach		853	3.6	1.219	146.7	LOS F	55.4	399.4	0.96	1.30	17.2
West: Grange Road (W)											
10	L2	248	3.0	1.083	108.9	LOS F	49.4	355.3	1.00	1.20	17.7
11	T1	882	3.3	1.083	122.0	LOS F	53.1	382.5	1.00	1.36	18.1
12	R2	299	2.1	0.757	32.9	LOS C	11.6	82.8	0.93	0.83	38.3
Approach		1429	3.0	1.083	101.1	LOS F	53.1	382.5	0.99	1.22	20.3
All Vehicles		4035	3.6	1.357	124.3	LOS F	77.5	560.4	0.96	1.23	18.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	40.1	LOS E	0.1	0.1	0.82	0.82	
P2	East Full Crossing	53	48.7	LOS E	0.2	0.2	0.90	0.90	
P3	North Full Crossing	53	40.1	LOS E	0.1	0.1	0.82	0.82	
P4	West Full Crossing	53	49.6	LOS E	0.2	0.2	0.91	0.91	
All Pedestrians		211	44.6	LOS E			0.86	0.86	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

INTERSECTION SUMMARY

 **Site: TS048 [Grange Rd / Findon Rd - PM -SV +SD]**

PM -SV +SD

Signals - Actuated Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	16.6 km/h	1.9 km/h	16.4 km/h
Travel Distance (Total)	4418.6 veh-km/h	8.1 ped-km/h	5310.4 pers-km/h
Travel Time (Total)	266.4 veh-h/h	4.3 ped-h/h	324.0 pers-h/h
Demand Flows (Total)	4333 veh/h	211 ped/h	5410 pers/h
Percent Heavy Vehicles (Demand)	1.1 %		
Degree of Saturation	1.458	0.048	
Practical Spare Capacity	-38.3 %		
Effective Intersection Capacity	2971 veh/h		
Control Delay (Total)	179.50 veh-h/h	2.61 ped-h/h	218.01 pers-h/h
Control Delay (Average)	149.1 sec	44.6 sec	145.1 sec
Control Delay (Worst Lane)	459.0 sec		
Control Delay (Worst Movement)	355.0 sec	49.6 sec	355.0 sec
Geometric Delay (Average)	2.3 sec		
Stop-Line Delay (Average)	146.8 sec		
Idling Time (Average)	147.0 sec		
Intersection Level of Service (LOS)	LOS F	LOS E	
95% Back of Queue - Vehicles (Worst Lane)	89.7 veh		
95% Back of Queue - Distance (Worst Lane)	631.3 m		
Queue Storage Ratio (Worst Lane)	0.77		
Total Effective Stops	5644 veh/h	182 ped/h	6954 pers/h
Effective Stop Rate	1.30 per veh	0.86 per ped	1.29 per pers
Proportion Queued	0.97	0.86	0.96
Performance Index	736.4	5.3	741.8
Cost (Total)	8459.51 \$/h	109.13 \$/h	8568.64 \$/h
Fuel Consumption (Total)	626.5 L/h		
Carbon Dioxide (Total)	1475.7 kg/h		
Hydrocarbons (Total)	0.150 kg/h		
Carbon Monoxide (Total)	1.420 kg/h		
NOx (Total)	0.938 kg/h		

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	2,079,663 veh/y	101,053 ped/y	2,596,649 pers/y
Delay	86,161 veh-h/y	1,253 ped-h/y	104,647 pers-h/y
Effective Stops	2,709,070 veh/y	87,138 ped/y	3,338,022 pers/y
Travel Distance	2,120,936 veh-km/y	3,865 ped-km/y	2,548,989 pers-km/y
Travel Time	127,881 veh-h/y	2,079 ped-h/y	155,536 pers-h/y
Cost	4,060,563 \$/y	52,384 \$/y	4,112,947 \$/y
Fuel Consumption	300,705 L/y		
Carbon Dioxide	708,340 kg/y		
Hydrocarbons	72 kg/y		
Carbon Monoxide	682 kg/y		
NOx	450 kg/y		

MOVEMENT SUMMARY

 **Site: TS048 [Grange Rd / Findon Rd - PM -SV +SD]**

PM -SV +SD

Signals - Actuated Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Road (S)											
1	L2	266	1.2	0.370	39.0	LOS D	12.6	89.1	0.80	0.88	36.6
2	T1	463	0.7	1.246	256.2	LOS F	62.4	439.6	0.98	1.83	11.2
3	R2	167	0.6	0.502	55.6	LOS E	9.0	63.1	0.92	0.80	31.0
Approach		897	0.8	1.246	154.3	LOS F	62.4	439.6	0.92	1.35	16.6
East: Grange Road (E)											
4	L2	244	0.9	1.139	152.9	LOS F	66.7	471.6	1.00	1.30	14.3
5	T1	864	1.5	1.139	165.8	LOS F	66.7	471.6	1.00	1.48	14.6
6	R2	266	0.0	0.755	33.9	LOS C	10.1	70.9	0.96	0.83	38.0
Approach		1375	1.1	1.139	137.9	LOS F	66.7	471.6	0.99	1.32	16.5
North: Findon Road (N)											
7	L2	89	1.2	0.588	54.0	LOS D	12.1	85.1	0.92	0.86	32.7
8	T1	623	0.7	1.458	355.0	LOS F	89.7	631.3	0.98	2.02	8.5
9	R2	305	2.4	1.076	138.0	LOS F	29.5	211.1	1.00	1.17	17.9
Approach		1018	1.2	1.458	263.5	LOS F	89.7	631.3	0.98	1.66	11.0
West: Grange Road (W)											
10	L2	176	3.0	0.729	52.4	LOS D	17.4	124.0	0.94	0.94	32.9
11	T1	584	1.4	0.729	44.1	LOS D	21.4	151.4	0.94	0.85	34.6
12	R2	283	0.0	0.950	53.1	LOS D	14.4	101.0	1.00	0.92	31.7
Approach		1043	1.3	0.950	47.9	LOS D	21.4	151.4	0.96	0.89	33.5
All Vehicles		4333	1.1	1.458	149.1	LOS F	89.7	631.3	0.97	1.30	16.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	40.1	LOS E	0.1	0.1	0.82	0.82	
P2	East Full Crossing	53	48.7	LOS E	0.2	0.2	0.90	0.90	
P3	North Full Crossing	53	40.1	LOS E	0.1	0.1	0.82	0.82	
P4	West Full Crossing	53	49.6	LOS E	0.2	0.2	0.91	0.91	
All Pedestrians		211	44.6	LOS E			0.86	0.86	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

APPENDIX E.2

FINDON ROAD/HARTLEY ROAD

INTERSECTION SUMMARY

▽ Site: 101 [AM Exist -SV +SD]

New Site
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	45.1 km/h	45.1 km/h
Travel Distance (Total)	1622.5 veh-km/h	1947.0 pers-km/h
Travel Time (Total)	35.9 veh-h/h	43.1 pers-h/h
Demand Flows (Total)	2523 veh/h	3028 pers/h
Percent Heavy Vehicles (Demand)	3.3 %	
Degree of Saturation	0.918	
Practical Spare Capacity	6.7 %	
Effective Intersection Capacity	2748 veh/h	
Control Delay (Total)	8.54 veh-h/h	10.24 pers-h/h
Control Delay (Average)	12.2 sec	12.2 sec
Control Delay (Worst Lane)	318.1 sec	
Control Delay (Worst Movement)	318.1 sec	318.1 sec
Geometric Delay (Average)	1.4 sec	
Stop-Line Delay (Average)	10.8 sec	
Idling Time (Average)	7.4 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	22.0 veh	
95% Back of Queue - Distance (Worst Lane)	158.8 m	
Queue Storage Ratio (Worst Lane)	0.64	
Total Effective Stops	771 veh/h	926 pers/h
Effective Stop Rate	0.31 per veh	0.31 per pers
Proportion Queued	0.39	0.39
Performance Index	69.6	69.6
Cost (Total)	1002.78 \$/h	1002.78 \$/h
Fuel Consumption (Total)	151.7 L/h	
Carbon Dioxide (Total)	359.7 kg/h	
Hydrocarbons (Total)	0.031 kg/h	
Carbon Monoxide (Total)	0.403 kg/h	
NOx (Total)	0.531 kg/h	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,211,116 veh/y	1,453,339 pers/y
Delay	4,098 veh-h/y	4,917 pers-h/y
Effective Stops	370,292 veh/y	444,351 pers/y
Travel Distance	778,796 veh-km/y	934,555 pers-km/y
Travel Time	17,251 veh-h/y	20,702 pers-h/y
Cost	481,335 \$/y	481,335 \$/y
Fuel Consumption	72,836 L/y	
Carbon Dioxide	172,672 kg/y	
Hydrocarbons	15 kg/y	
Carbon Monoxide	193 kg/y	
NOx	255 kg/y	

MOVEMENT SUMMARY

▽ Site: 101 [AM Exist -SV +SD]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Rd (S)											
2	T1	1034	2.9	0.918	15.0	LOS B	22.0	158.8	0.55	0.31	41.3
3	R2	256	4.5	0.918	37.3	LOS E	22.0	158.8	1.00	0.56	32.2
Approach		1289	3.2	0.918	19.4	NA	22.0	158.8	0.64	0.36	39.1
East: Hartley Rd (E)											
4	L2	214	2.5	0.375	12.7	LOS B	1.7	12.0	0.75	0.96	42.4
6	R2	6	16.7	0.430	318.1	LOS F	1.1	8.8	0.99	1.01	9.6
Approach		220	2.9	0.430	21.4	LOS C	1.7	12.0	0.75	0.96	36.6
North: Findon Rd (N)											
7	L2	167	2.5	0.492	5.6	LOS A	0.0	0.0	0.00	0.10	57.3
8	T1	846	3.6	0.492	0.1	LOS A	0.0	0.0	0.00	0.10	58.4
Approach		1014	3.4	0.492	1.0	NA	0.0	0.0	0.00	0.10	58.1
All Vehicles		2523	3.3	0.918	12.2	NA	22.0	158.8	0.39	0.31	45.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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INTERSECTION SUMMARY

▽ Site: 101 [PM Exist -SV +SD]

New Site
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	32.2 km/h	32.2 km/h
Travel Distance (Total)	1486.5 veh-km/h	1783.8 pers-km/h
Travel Time (Total)	46.2 veh-h/h	55.4 pers-h/h
Demand Flows (Total)	2347 veh/h	2817 pers/h
Percent Heavy Vehicles (Demand)	1.0 %	
Degree of Saturation	2.053	
Practical Spare Capacity	-61.0 %	
Effective Intersection Capacity	1143 veh/h	
Control Delay (Total)	20.12 veh-h/h	24.15 pers-h/h
Control Delay (Average)	30.9 sec	30.9 sec
Control Delay (Worst Lane)	1115.4 sec	
Control Delay (Worst Movement)	1115.4 sec	1115.4 sec
Geometric Delay (Average)	1.0 sec	
Stop-Line Delay (Average)	29.8 sec	
Idling Time (Average)	29.0 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	22.1 veh	
95% Back of Queue - Distance (Worst Lane)	157.5 m	
Queue Storage Ratio (Worst Lane)	0.29	
Total Effective Stops	487 veh/h	585 pers/h
Effective Stop Rate	0.21 per veh	0.21 per pers
Proportion Queued	0.38	0.38
Performance Index	80.8	80.8
Cost (Total)	1374.86 \$/h	1374.86 \$/h
Fuel Consumption (Total)	139.7 L/h	
Carbon Dioxide (Total)	329.2 kg/h	
Hydrocarbons (Total)	0.030 kg/h	
Carbon Monoxide (Total)	0.366 kg/h	
NOx (Total)	0.226 kg/h	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,126,737 veh/y	1,352,084 pers/y
Delay	9,658 veh-h/y	11,590 pers-h/y
Effective Stops	233,979 veh/y	280,775 pers/y
Travel Distance	713,504 veh-km/y	856,205 pers-km/y
Travel Time	22,156 veh-h/y	26,587 pers-h/y
Cost	659,932 \$/y	659,932 \$/y
Fuel Consumption	67,036 L/y	
Carbon Dioxide	157,997 kg/y	
Hydrocarbons	14 kg/y	
Carbon Monoxide	176 kg/y	
NOx	109 kg/y	

MOVEMENT SUMMARY

▽ Site: 101 [PM Exist -SV +SD]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Rd (S)											
2	T1	835	0.8	0.657	8.4	LOS A	10.1	71.8	0.63	0.14	47.2
3	R2	122	3.4	0.657	26.9	LOS D	10.1	71.8	1.00	0.22	40.8
Approach		957	1.1	0.657	10.8	NA	10.1	71.8	0.68	0.15	46.3
East: Hartley Rd (E)											
4	L2	202	2.1	0.569	20.7	LOS C	2.6	18.3	0.89	1.08	36.7
6	R2	52	2.0	2.053	1115.4	LOS F	22.1	157.5	1.00	1.83	2.9
Approach		254	2.1	2.053	243.3	LOS F	22.1	157.5	0.91	1.24	8.3
North: Findon Rd (N)											
7	L2	54	0.0	0.539	5.6	LOS A	0.0	0.0	0.00	0.03	58.0
8	T1	1083	0.8	0.539	0.1	LOS A	0.0	0.0	0.00	0.03	59.4
Approach		1137	0.7	0.539	0.4	NA	0.0	0.0	0.00	0.03	59.3
All Vehicles		2347	1.0	2.053	30.9	NA	22.1	157.5	0.38	0.21	32.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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APPENDIX E.3

FINDON ROAD/VALETTA ROAD

INTERSECTION SUMMARY

 **Site: 101 [Valetta/Findon AM -SV +SD]**

New Site

Signals - Actuated Isolated Cycle Time = 60 seconds (User-Given Phase Times)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	8.6 km/h	2.5 km/h	8.6 km/h
Travel Distance (Total)	2939.7 veh-km/h	5.4 ped-km/h	3533.0 pers-km/h
Travel Time (Total)	340.4 veh-h/h	2.1 ped-h/h	410.6 pers-h/h
Demand Flows (Total)	2898 veh/h	158 ped/h	3635 pers/h
Percent Heavy Vehicles (Demand)	2.8 %		
Degree of Saturation	2.447	0.044	
Practical Spare Capacity	-63.2 %		
Effective Intersection Capacity	1184 veh/h		
Control Delay (Total)	284.27 veh-h/h	0.98 ped-h/h	342.10 pers-h/h
Control Delay (Average)	353.1 sec	22.4 sec	338.8 sec
Control Delay (Worst Lane)	1325.0 sec		
Control Delay (Worst Movement)	1325.0 sec	24.4 sec	1325.0 sec
Geometric Delay (Average)	2.2 sec		
Stop-Line Delay (Average)	350.9 sec		
Idling Time (Average)	332.2 sec		
Intersection Level of Service (LOS)	LOS F	LOS C	
95% Back of Queue - Vehicles (Worst Lane)	141.0 veh		
95% Back of Queue - Distance (Worst Lane)	1006.2 m		
Queue Storage Ratio (Worst Lane)	0.94		
Total Effective Stops	6493 veh/h	136 ped/h	7928 pers/h
Effective Stop Rate	2.24 per veh	0.86 per ped	2.18 per pers
Proportion Queued	0.93	0.86	0.93
Performance Index	743.3	2.9	746.2
Cost (Total)	11013.79 \$/h	53.73 \$/h	11067.52 \$/h
Fuel Consumption (Total)	652.1 L/h		
Carbon Dioxide (Total)	1540.2 kg/h		
Hydrocarbons (Total)	0.178 kg/h		
Carbon Monoxide (Total)	1.379 kg/h		
NOx (Total)	1.566 kg/h		

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	1,390,989 veh/y	75,789 ped/y	1,744,977 pers/y
Delay	136,448 veh-h/y	471 ped-h/y	164,209 pers-h/y
Effective Stops	3,116,713 veh/y	65,407 ped/y	3,805,463 pers/y
Travel Distance	1,411,044 veh-km/y	2,584 ped-km/y	1,695,837 pers-km/y
Travel Time	163,401 veh-h/y	1,023 ped-h/y	197,105 pers-h/y
Cost	5,286,619 \$/y	25,792 \$/y	5,312,411 \$/y
Fuel Consumption	313,004 L/y		
Carbon Dioxide	739,304 kg/y		
Hydrocarbons	86 kg/y		
Carbon Monoxide	662 kg/y		
NOx	751 kg/y		

MOVEMENT SUMMARY

 **Site: 101 [Valetta/Findon AM -SV +SD]**

New Site

Signals - Actuated Isolated Cycle Time = 60 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Rd (S)											
1	L2	182	1.7	0.420	22.9	LOS C	4.3	30.6	0.87	0.16	40.5
2	T1	776	3.9	1.335	323.6	LOS F	105.6	763.9	1.00	3.24	9.4
Approach		958	3.5	1.335	266.4	LOS F	105.6	763.9	0.97	2.65	11.0
North: Findon Rd (N)											
8	T1	803	2.9	0.729	10.9	LOS B	17.5	125.6	0.78	0.71	50.9
9	R2	257	4.5	1.256	265.1	LOS F	30.1	218.5	1.00	2.09	10.8
Approach		1060	3.3	1.256	72.5	LOS E	30.1	218.5	0.84	1.04	26.7
West: Valetta Rd (W)											
10	L2	514	2.3	2.447	1325.0	LOS F	141.0	1006.2	1.00	4.94	2.6
12	R2	366	0.0	0.801	29.2	LOS C	10.5	73.5	0.97	0.84	37.2
Approach		880	1.3	2.447	785.6	LOS F	141.0	1006.2	0.99	3.23	4.2
All Vehicles		2898	2.8	2.447	353.1	LOS F	141.0	1006.2	0.93	2.24	8.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P3	North Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P4	West Full Crossing	53	18.4	LOS B	0.1	0.1	0.79	0.79	
All Pedestrians		158	22.4	LOS C			0.86	0.86	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

INTERSECTION SUMMARY

 **Site: 101 [Valetta/Findon PM -SV +SD]**

New Site

Signals - Actuated Isolated Cycle Time = 60 seconds (User-Given Phase Times)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	19.2 km/h	2.7 km/h	19.0 km/h
Travel Distance (Total)	2770.0 veh-km/h	5.4 ped-km/h	3329.4 pers-km/h
Travel Time (Total)	144.3 veh-h/h	2.0 ped-h/h	175.2 pers-h/h
Demand Flows (Total)	2731 veh/h	158 ped/h	3435 pers/h
Percent Heavy Vehicles (Demand)	0.9 %		
Degree of Saturation	1.328	0.044	
Practical Spare Capacity	-32.2 %		
Effective Intersection Capacity	2056 veh/h		
Control Delay (Total)	94.29 veh-h/h	0.84 ped-h/h	113.98 pers-h/h
Control Delay (Average)	124.3 sec	19.1 sec	119.5 sec
Control Delay (Worst Lane)	320.6 sec		
Control Delay (Worst Movement)	320.6 sec	24.4 sec	320.6 sec
Geometric Delay (Average)	2.1 sec		
Stop-Line Delay (Average)	122.2 sec		
Idling Time (Average)	110.2 sec		
Intersection Level of Service (LOS)	LOS F	LOS B	
95% Back of Queue - Vehicles (Worst Lane)	96.4 veh		
95% Back of Queue - Distance (Worst Lane)	678.9 m		
Queue Storage Ratio (Worst Lane)	0.83		
Total Effective Stops	4053 veh/h	123 ped/h	4987 pers/h
Effective Stop Rate	1.48 per veh	0.78 per ped	1.45 per pers
Proportion Queued	0.85	0.78	0.85
Performance Index	373.6	2.7	376.2
Cost (Total)	4477.22 \$/h	50.09 \$/h	4527.31 \$/h
Fuel Consumption (Total)	351.9 L/h		
Carbon Dioxide (Total)	828.6 kg/h		
Hydrocarbons (Total)	0.080 kg/h		
Carbon Monoxide (Total)	0.770 kg/h		
NOx (Total)	0.467 kg/h		

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	1,310,653 veh/y	75,789 ped/y	1,648,573 pers/y
Delay	45,258 veh-h/y	402 ped-h/y	54,711 pers-h/y
Effective Stops	1,945,369 veh/y	59,077 ped/y	2,393,520 pers/y
Travel Distance	1,329,592 veh-km/y	2,584 ped-km/y	1,598,095 pers-km/y
Travel Time	69,270 veh-h/y	954 ped-h/y	84,078 pers-h/y
Cost	2,149,065 \$/y	24,042 \$/y	2,173,107 \$/y
Fuel Consumption	168,909 L/y		
Carbon Dioxide	397,732 kg/y		
Hydrocarbons	39 kg/y		
Carbon Monoxide	370 kg/y		
NOx	224 kg/y		

MOVEMENT SUMMARY

 **Site: 101 [Valetta/Findon PM -SV +SD]**

New Site

Signals - Actuated Isolated Cycle Time = 60 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Rd (S)											
1	L2	326	0.3	1.245	255.1	LOS F	37.3	261.6	1.00	2.11	11.1
2	T1	709	0.7	1.328	320.6	LOS F	96.4	678.9	1.00	3.13	9.4
Approach		1036	0.6	1.328	300.0	LOS F	96.4	678.9	1.00	2.81	9.9
North: Findon Rd (N)											
8	T1	908	1.0	0.660	5.6	LOS A	14.8	104.8	0.59	0.54	54.9
9	R2	378	1.1	0.842	30.6	LOS C	11.0	77.8	0.99	0.85	37.2
Approach		1286	1.1	0.842	13.0	LOS B	14.8	104.8	0.71	0.63	48.2
West: Valetta Rd (W)											
10	L2	248	1.7	0.550	27.3	LOS C	6.6	46.7	0.90	0.80	38.0
12	R2	160	0.7	0.586	32.7	LOS C	4.7	32.7	0.95	0.79	35.9
Approach		408	1.3	0.586	29.4	LOS C	6.6	46.7	0.92	0.80	37.2
All Vehicles		2731	0.9	1.328	124.3	LOS F	96.4	678.9	0.85	1.48	19.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P3	North Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P4	West Full Crossing	53	8.6	LOS A	0.0	0.0	0.53	0.53	
All Pedestrians		158	19.1	LOS B			0.78	0.78	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

APPENDIX F

SCENARIO 2 MODELLING (ALL DPA SITES)

APPENDIX F.1

FINDON ROAD/GRANGE ROAD

INTERSECTION SUMMARY

 **Site: TS048 [Grange Rd / Findon Rd - AM -SV +SD -MC +MCD +ALDI]**

AM -SV +SD -MC +MCD +ALDI

Signals - Actuated Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	17.2 km/h	1.9 km/h	17.0 km/h
Travel Distance (Total)	4288.6 veh-km/h	8.1 ped-km/h	5154.3 pers-km/h
Travel Time (Total)	248.8 veh-h/h	4.3 ped-h/h	302.9 pers-h/h
Demand Flows (Total)	4205 veh/h	211 ped/h	5257 pers/h
Percent Heavy Vehicles (Demand)	2.6 %		
Degree of Saturation	1.384	0.048	
Practical Spare Capacity	-35.0 %		
Effective Intersection Capacity	3039 veh/h		
Control Delay (Total)	165.24 veh-h/h	2.61 ped-h/h	200.89 pers-h/h
Control Delay (Average)	141.5 sec	44.6 sec	137.6 sec
Control Delay (Worst Lane)	393.7 sec		
Control Delay (Worst Movement)	354.9 sec	49.6 sec	354.9 sec
Geometric Delay (Average)	2.4 sec		
Stop-Line Delay (Average)	139.0 sec		
Idling Time (Average)	138.9 sec		
Intersection Level of Service (LOS)	LOS F	LOS E	
95% Back of Queue - Vehicles (Worst Lane)	81.9 veh		
95% Back of Queue - Distance (Worst Lane)	580.2 m		
Queue Storage Ratio (Worst Lane)	0.71		
Total Effective Stops	5401 veh/h	182 ped/h	6662 pers/h
Effective Stop Rate	1.28 per veh	0.86 per ped	1.27 per pers
Proportion Queued	0.96	0.86	0.96
Performance Index	682.0	5.3	687.4
Cost (Total)	7957.24 \$/h	109.13 \$/h	8066.38 \$/h
Fuel Consumption (Total)	624.4 L/h		
Carbon Dioxide (Total)	1475.1 kg/h		
Hydrocarbons (Total)	0.151 kg/h		
Carbon Monoxide (Total)	1.446 kg/h		
NOx (Total)	1.594 kg/h		

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	2,018,527 veh/y	101,053 ped/y	2,523,285 pers/y
Delay	79,313 veh-h/y	1,253 ped-h/y	96,429 pers-h/y
Effective Stops	2,592,242 veh/y	87,138 ped/y	3,197,830 pers/y
Travel Distance	2,058,507 veh-km/y	3,865 ped-km/y	2,474,075 pers-km/y
Travel Time	119,428 veh-h/y	2,079 ped-h/y	145,393 pers-h/y
Cost	3,819,476 \$/y	52,384 \$/y	3,871,861 \$/y
Fuel Consumption	299,708 L/y		
Carbon Dioxide	708,030 kg/y		
Hydrocarbons	72 kg/y		
Carbon Monoxide	694 kg/y		
NOx	765 kg/y		

MOVEMENT SUMMARY

 **Site: TS048 [Grange Rd / Findon Rd - AM -SV +SD -MC +MCD +ALDI]**

AM -SV +SD -MC +MCD +ALDI

Signals - Actuated Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Road (S)											
1	L2	178	3.6	0.410	30.4	LOS C	7.7	55.6	0.82	0.80	40.3
2	T1	515	1.4	1.384	354.9	LOS F	81.9	580.2	0.98	2.11	8.5
3	R2	359	2.9	1.207	247.4	LOS F	48.7	349.2	1.00	1.46	11.5
Approach		1052	2.3	1.384	263.3	LOS F	81.9	580.2	0.96	1.67	11.0
East: Grange Road (E)											
4	L2	209	2.5	0.712	49.4	LOS D	16.4	118.2	0.93	0.94	33.6
5	T1	481	3.9	0.712	41.9	LOS D	16.9	122.6	0.91	0.82	35.3
6	R2	160	2.6	0.552	35.1	LOS D	5.7	40.7	0.94	0.78	37.5
Approach		851	3.3	0.712	42.5	LOS D	16.9	122.6	0.92	0.84	35.2
North: Findon Road (N)											
7	L2	129	2.4	0.480	52.9	LOS D	10.9	77.5	0.88	0.90	32.6
8	T1	485	0.0	1.192	194.3	LOS F	51.8	362.7	0.98	1.56	13.9
9	R2	236	4.5	0.726	58.3	LOS E	13.3	96.5	0.97	0.83	30.3
Approach		851	1.6	1.192	135.1	LOS F	51.8	362.7	0.96	1.26	18.3
West: Grange Road (W)											
10	L2	248	3.0	1.104	126.2	LOS F	55.0	395.5	1.00	1.26	16.3
11	T1	903	3.4	1.104	139.0	LOS F	57.6	415.0	1.00	1.43	16.7
12	R2	301	1.0	0.774	33.2	LOS C	11.7	82.6	0.94	0.83	38.2
Approach		1453	2.8	1.104	114.9	LOS F	57.6	415.0	0.99	1.28	18.8
All Vehicles		4205	2.6	1.384	141.5	LOS F	81.9	580.2	0.96	1.28	17.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	40.1	LOS E	0.1	0.1	0.82	0.82	
P2	East Full Crossing	53	48.7	LOS E	0.2	0.2	0.90	0.90	
P3	North Full Crossing	53	40.1	LOS E	0.1	0.1	0.82	0.82	
P4	West Full Crossing	53	49.6	LOS E	0.2	0.2	0.91	0.91	
All Pedestrians		211	44.6	LOS E			0.86	0.86	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

INTERSECTION SUMMARY

 **Site: TS048 [Grange Rd / Findon Rd - PM -SV +SD -MC +MCD +ALDI]**

PM -SV +SD -MC +MCD +ALDI

Signals - Actuated Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	15.0 km/h	1.9 km/h	14.9 km/h
Travel Distance (Total)	4664.6 veh-km/h	8.1 ped-km/h	5605.6 pers-km/h
Travel Time (Total)	310.5 veh-h/h	4.3 ped-h/h	376.9 pers-h/h
Demand Flows (Total)	4574 veh/h	211 ped/h	5699 pers/h
Percent Heavy Vehicles (Demand)	0.9 %		
Degree of Saturation	1.531	0.048	
Practical Spare Capacity	-41.2 %		
Effective Intersection Capacity	2987 veh/h		
Control Delay (Total)	218.30 veh-h/h	2.61 ped-h/h	264.57 pers-h/h
Control Delay (Average)	171.8 sec	44.6 sec	167.1 sec
Control Delay (Worst Lane)	522.9 sec		
Control Delay (Worst Movement)	410.0 sec	49.6 sec	410.0 sec
Geometric Delay (Average)	2.4 sec		
Stop-Line Delay (Average)	169.4 sec		
Idling Time (Average)	169.1 sec		
Intersection Level of Service (LOS)	LOS F	LOS E	
95% Back of Queue - Vehicles (Worst Lane)	99.5 veh		
95% Back of Queue - Distance (Worst Lane)	696.7 m		
Queue Storage Ratio (Worst Lane)	0.85		
Total Effective Stops	6252 veh/h	182 ped/h	7683 pers/h
Effective Stop Rate	1.37 per veh	0.86 per ped	1.35 per pers
Proportion Queued	0.97	0.86	0.97
Performance Index	762.6	5.3	768.0
Cost (Total)	9888.93 \$/h	109.13 \$/h	9998.06 \$/h
Fuel Consumption (Total)	694.2 L/h		
Carbon Dioxide (Total)	1634.2 kg/h		
Hydrocarbons (Total)	0.167 kg/h		
Carbon Monoxide (Total)	1.532 kg/h		
NOx (Total)	0.878 kg/h		

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	2,195,369 veh/y	101,053 ped/y	2,735,495 pers/y
Delay	104,785 veh-h/y	1,253 ped-h/y	126,995 pers-h/y
Effective Stops	3,000,737 veh/y	87,138 ped/y	3,688,022 pers/y
Travel Distance	2,239,021 veh-km/y	3,865 ped-km/y	2,690,690 pers-km/y
Travel Time	149,028 veh-h/y	2,079 ped-h/y	180,912 pers-h/y
Cost	4,746,687 \$/y	52,384 \$/y	4,799,071 \$/y
Fuel Consumption	333,198 L/y		
Carbon Dioxide	784,436 kg/y		
Hydrocarbons	80 kg/y		
Carbon Monoxide	735 kg/y		
NOx	421 kg/y		

MOVEMENT SUMMARY

 **Site: TS048 [Grange Rd / Findon Rd - PM -SV +SD -MC +MCD +ALDI]**

PM -SV +SD -MC +MCD +ALDI

Signals - Actuated Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Road (S)											
1	L2	267	0.4	0.361	37.9	LOS D	12.2	85.9	0.78	0.87	37.0
2	T1	448	0.0	1.218	236.4	LOS F	58.1	406.8	0.99	1.76	12.0
3	R2	229	0.0	0.685	57.7	LOS E	12.8	89.5	0.96	0.82	30.5
Approach		945	0.1	1.218	136.9	LOS F	58.1	406.8	0.92	1.28	18.1
East: Grange Road (E)											
4	L2	323	0.7	1.224	227.0	LOS F	86.1	608.3	1.00	1.46	11.1
5	T1	864	1.5	1.224	239.9	LOS F	86.1	608.3	1.00	1.73	11.3
6	R2	292	0.4	0.865	36.1	LOS D	11.5	80.8	1.00	0.85	37.1
Approach		1479	1.1	1.224	196.9	LOS F	86.1	608.3	1.00	1.50	13.0
North: Findon Road (N)											
7	L2	115	1.8	0.617	54.5	LOS D	12.8	90.2	0.93	0.89	32.4
8	T1	635	0.0	1.531	410.0	LOS F	99.5	696.7	0.98	2.15	7.5
9	R2	305	2.4	1.078	139.9	LOS F	29.8	212.8	1.00	1.17	17.8
Approach		1055	0.9	1.531	293.2	LOS F	99.5	696.7	0.98	1.73	10.1
West: Grange Road (W)											
10	L2	176	3.0	0.780	55.6	LOS E	19.0	135.8	0.97	0.96	32.0
11	T1	627	1.5	0.780	45.7	LOS D	23.3	165.1	0.96	0.87	34.1
12	R2	292	0.0	0.978	60.4	LOS E	16.2	113.5	1.00	0.97	29.8
Approach		1095	1.3	0.978	51.2	LOS D	23.3	165.1	0.97	0.91	32.5
All Vehicles		4574	0.9	1.531	171.8	LOS F	99.5	696.7	0.97	1.37	15.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	40.1	LOS E	0.1	0.1	0.82	0.82	
P2	East Full Crossing	53	48.7	LOS E	0.2	0.2	0.90	0.90	
P3	North Full Crossing	53	40.1	LOS E	0.1	0.1	0.82	0.82	
P4	West Full Crossing	53	49.6	LOS E	0.2	0.2	0.91	0.91	
All Pedestrians		211	44.6	LOS E			0.86	0.86	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

APPENDIX F.2

FINDON ROAD/HARTLEY ROAD

INTERSECTION SUMMARY

▽ Site: 101 [AM Exist -SV +SD -EMC +MCD +ALDI]

New Site

Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	36.3 km/h	36.3 km/h
Travel Distance (Total)	1725.5 veh-km/h	2070.6 pers-km/h
Travel Time (Total)	47.5 veh-h/h	57.0 pers-h/h
Demand Flows (Total)	2691 veh/h	3229 pers/h
Percent Heavy Vehicles (Demand)	1.4 %	
Degree of Saturation	1.026	
Practical Spare Capacity	-4.4 %	
Effective Intersection Capacity	2624 veh/h	
Control Delay (Total)	18.32 veh-h/h	21.99 pers-h/h
Control Delay (Average)	24.5 sec	24.5 sec
Control Delay (Worst Lane)	518.1 sec	
Control Delay (Worst Movement)	518.1 sec	518.1 sec
Geometric Delay (Average)	1.4 sec	
Stop-Line Delay (Average)	23.1 sec	
Idling Time (Average)	18.3 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	46.5 veh	
95% Back of Queue - Distance (Worst Lane)	331.4 m	
Queue Storage Ratio (Worst Lane)	1.33	
Total Effective Stops	1066 veh/h	1279 pers/h
Effective Stop Rate	0.40 per veh	0.40 per pers
Proportion Queued	0.39	0.39
Performance Index	113.1	113.1
Cost (Total)	1353.72 \$/h	1353.72 \$/h
Fuel Consumption (Total)	164.2 L/h	
Carbon Dioxide (Total)	387.7 kg/h	
Hydrocarbons (Total)	0.035 kg/h	
Carbon Monoxide (Total)	0.433 kg/h	
NOx (Total)	0.376 kg/h	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,291,453 veh/y	1,549,743 pers/y
Delay	8,795 veh-h/y	10,555 pers-h/y
Effective Stops	511,770 veh/y	614,124 pers/y
Travel Distance	828,256 veh-km/y	993,907 pers-km/y
Travel Time	22,814 veh-h/y	27,377 pers-h/y
Cost	649,784 \$/y	649,784 \$/y
Fuel Consumption	78,814 L/y	
Carbon Dioxide	186,117 kg/y	
Hydrocarbons	17 kg/y	
Carbon Monoxide	208 kg/y	
NOx	180 kg/y	

MOVEMENT SUMMARY

▽ Site: 101 [AM Exist -SV +SD -EMC +MCD +ALDI]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Rd (S)											
2	T1	1120	1.3	1.026	33.9	LOS D	46.5	331.4	0.53	0.44	30.6
3	R2	283	3.7	1.026	73.0	LOS F	46.5	331.4	1.00	0.83	21.0
Approach		1403	1.8	1.026	41.8	NA	46.5	331.4	0.63	0.52	28.0
East: Hartley Rd (E)											
4	L2	232	1.4	0.419	13.4	LOS B	1.9	13.7	0.77	0.98	41.9
6	R2	6	16.7	0.605	518.1	LOS F	1.5	12.4	1.00	1.03	6.3
Approach		238	1.8	0.605	26.8	LOS D	1.9	13.7	0.78	0.99	33.7
North: Findon Rd (N)											
7	L2	167	2.5	0.502	5.6	LOS A	0.0	0.0	0.00	0.09	57.3
8	T1	882	0.6	0.502	0.1	LOS A	0.0	0.0	0.00	0.09	58.5
Approach		1049	0.9	0.502	1.0	NA	0.0	0.0	0.00	0.09	58.2
All Vehicles		2691	1.4	1.026	24.5	NA	46.5	331.4	0.39	0.40	36.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: P:\2018\18270 DPA Findon Road Kidman Park North\SIDRA\20181204TSXXXXkidmanparkdevV2.sip7

INTERSECTION SUMMARY

▽ Site: 101 [PM Exist -SV +SD -EMC +MCD +ALDI]

New Site
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	23.8 km/h	23.8 km/h
Travel Distance (Total)	1597.3 veh-km/h	1916.7 pers-km/h
Travel Time (Total)	67.1 veh-h/h	80.5 pers-h/h
Demand Flows (Total)	2527 veh/h	3033 pers/h
Percent Heavy Vehicles (Demand)	0.3 %	
Degree of Saturation	3.206	
Practical Spare Capacity	-75.0 %	
Effective Intersection Capacity	788 veh/h	
Control Delay (Total)	38.17 veh-h/h	45.80 pers-h/h
Control Delay (Average)	54.4 sec	54.4 sec
Control Delay (Worst Lane)	2164.4 sec	
Control Delay (Worst Movement)	2164.4 sec	2164.4 sec
Geometric Delay (Average)	1.0 sec	
Stop-Line Delay (Average)	53.3 sec	
Idling Time (Average)	53.4 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	30.3 veh	
95% Back of Queue - Distance (Worst Lane)	215.5 m	
Queue Storage Ratio (Worst Lane)	0.41	
Total Effective Stops	602 veh/h	722 pers/h
Effective Stop Rate	0.24 per veh	0.24 per pers
Proportion Queued	0.36	0.36
Performance Index	111.1	111.1
Cost (Total)	2038.22 \$/h	2038.22 \$/h
Fuel Consumption (Total)	166.5 L/h	
Carbon Dioxide (Total)	391.9 kg/h	
Hydrocarbons (Total)	0.038 kg/h	
Carbon Monoxide (Total)	0.420 kg/h	
NOx (Total)	0.175 kg/h	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,213,137 veh/y	1,455,764 pers/y
Delay	18,320 veh-h/y	21,984 pers-h/y
Effective Stops	288,839 veh/y	346,607 pers/y
Travel Distance	766,684 veh-km/y	920,020 pers-km/y
Travel Time	32,205 veh-h/y	38,646 pers-h/y
Cost	978,344 \$/y	978,344 \$/y
Fuel Consumption	79,930 L/y	
Carbon Dioxide	188,101 kg/y	
Hydrocarbons	18 kg/y	
Carbon Monoxide	202 kg/y	
NOx	84 kg/y	

MOVEMENT SUMMARY

▽ Site: 101 [PM Exist -SV +SD -EMC +MCD +ALDI]

New Site

Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Rd (S)											
2	T1	882	0.0	0.806	14.0	LOS B	14.6	102.6	0.57	0.17	42.2
3	R2	140	2.3	0.806	37.6	LOS E	14.6	102.6	1.00	0.29	33.7
Approach		1022	0.3	0.806	17.2	NA	14.6	102.6	0.63	0.18	40.8
East: Hartley Rd (E)											
4	L2	229	1.4	0.792	33.6	LOS D	4.4	31.4	0.96	1.28	30.3
6	R2	52	2.0	3.206	2164.4	LOS F	30.3	215.5	1.00	1.72	1.5
Approach		281	1.5	3.206	424.7	LOS F	30.3	215.5	0.96	1.36	5.0
North: Findon Rd (N)											
7	L2	54	0.0	0.578	5.6	LOS A	0.0	0.0	0.00	0.03	58.0
8	T1	1171	0.0	0.578	0.1	LOS A	0.0	0.0	0.00	0.03	59.4
Approach		1224	0.0	0.578	0.3	NA	0.0	0.0	0.00	0.03	59.3
All Vehicles		2527	0.3	3.206	54.4	NA	30.3	215.5	0.36	0.24	23.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: P:\2018\18270 DPA Findon Road Kidman Park North\SIDRA\20181204TSXXXXkidmanparkdevV2.sip7

APPENDIX F.3

FINDON ROAD/VALETTA ROAD

INTERSECTION SUMMARY

 **Site: 101 [Valetta/Findon AM -SV +SD -EMC +MCD +ALDI]**

New Site

Signals - Actuated Isolated Cycle Time = 60 seconds (User-Given Phase Times)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	7.2 km/h	2.5 km/h	7.1 km/h
Travel Distance (Total)	3142.6 veh-km/h	5.4 ped-km/h	3776.6 pers-km/h
Travel Time (Total)	439.0 veh-h/h	2.1 ped-h/h	529.0 pers-h/h
Demand Flows (Total)	3098 veh/h	158 ped/h	3875 pers/h
Percent Heavy Vehicles (Demand)	1.3 %		
Degree of Saturation	2.691	0.044	
Practical Spare Capacity	-66.6 %		
Effective Intersection Capacity	1151 veh/h		
Control Delay (Total)	378.10 veh-h/h	0.98 ped-h/h	454.70 pers-h/h
Control Delay (Average)	439.4 sec	22.4 sec	422.4 sec
Control Delay (Worst Lane)	1543.8 sec		
Control Delay (Worst Movement)	1543.8 sec	24.4 sec	1543.8 sec
Geometric Delay (Average)	2.3 sec		
Stop-Line Delay (Average)	437.1 sec		
Idling Time (Average)	415.8 sec		
Intersection Level of Service (LOS)	LOS F	LOS C	
95% Back of Queue - Vehicles (Worst Lane)	163.4 veh		
95% Back of Queue - Distance (Worst Lane)	1167.7 m		
Queue Storage Ratio (Worst Lane)	1.13		
Total Effective Stops	7733 veh/h	136 ped/h	9416 pers/h
Effective Stop Rate	2.50 per veh	0.86 per ped	2.43 per pers
Proportion Queued	0.93	0.86	0.93
Performance Index	916.2	2.9	919.1
Cost (Total)	14203.02 \$/h	53.73 \$/h	14256.75 \$/h
Fuel Consumption (Total)	772.5 L/h		
Carbon Dioxide (Total)	1821.1 kg/h		
Hydrocarbons (Total)	0.215 kg/h		
Carbon Monoxide (Total)	1.577 kg/h		
NOx (Total)	1.251 kg/h		

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	1,486,990 veh/y	75,789 ped/y	1,860,177 pers/y
Delay	181,488 veh-h/y	471 ped-h/y	218,256 pers-h/y
Effective Stops	3,712,031 veh/y	65,407 ped/y	4,519,844 pers/y
Travel Distance	1,508,467 veh-km/y	2,584 ped-km/y	1,812,744 pers-km/y
Travel Time	210,731 veh-h/y	1,023 ped-h/y	253,901 pers-h/y
Cost	6,817,448 \$/y	25,792 \$/y	6,843,240 \$/y
Fuel Consumption	370,821 L/y		
Carbon Dioxide	874,141 kg/y		
Hydrocarbons	103 kg/y		
Carbon Monoxide	757 kg/y		
NOx	600 kg/y		

MOVEMENT SUMMARY

 **Site: 101 [Valetta/Findon AM -SV +SD -EMC +MCD +ALDI]**

New Site

Signals - Actuated Isolated Cycle Time = 60 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Rd (S)											
1	L2	199	0.5	0.449	22.5	LOS C	4.6	32.1	0.85	0.16	40.6
2	T1	838	1.5	1.426	405.5	LOS F	130.5	925.2	1.00	3.67	7.7
Approach		1037	1.3	1.426	332.0	LOS F	130.5	925.2	0.97	3.00	9.1
North: Findon Rd (N)											
8	T1	820	0.0	0.731	10.9	LOS B	17.9	125.2	0.78	0.71	50.9
9	R2	295	4.3	1.439	426.6	LOS F	46.6	338.1	1.00	2.68	7.3
Approach		1115	1.1	1.439	120.8	LOS F	46.6	338.1	0.84	1.23	19.6
West: Valetta Rd (W)											
10	L2	564	2.4	2.691	1543.8	LOS F	163.4	1167.7	1.00	5.19	2.2
12	R2	382	0.0	0.836	29.5	LOS C	11.1	77.5	0.99	0.85	37.1
Approach		946	1.4	2.691	932.3	LOS F	163.4	1167.7	0.99	3.44	3.6
All Vehicles		3098	1.3	2.691	439.4	LOS F	163.4	1167.7	0.93	2.50	7.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P3	North Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P4	West Full Crossing	53	18.4	LOS B	0.1	0.1	0.79	0.79	
All Pedestrians		158	22.4	LOS C			0.86	0.86	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

INTERSECTION SUMMARY

 **Site: 101 [Valetta/Findon PM -SV +SD -EMC +MCD +ALDI]**

New Site

Signals - Actuated Isolated Cycle Time = 60 seconds (User-Given Phase Times)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	17.9 km/h	2.7 km/h	17.8 km/h
Travel Distance (Total)	2994.3 veh-km/h	5.4 ped-km/h	3598.5 pers-km/h
Travel Time (Total)	167.1 veh-h/h	2.0 ped-h/h	202.5 pers-h/h
Demand Flows (Total)	2952 veh/h	158 ped/h	3700 pers/h
Percent Heavy Vehicles (Demand)	0.4 %		
Degree of Saturation	1.374	0.044	
Practical Spare Capacity	-34.5 %		
Effective Intersection Capacity	2148 veh/h		
Control Delay (Total)	112.81 veh-h/h	0.84 ped-h/h	136.21 pers-h/h
Control Delay (Average)	137.6 sec	19.1 sec	132.5 sec
Control Delay (Worst Lane)	361.7 sec		
Control Delay (Worst Movement)	361.7 sec	24.4 sec	361.7 sec
Geometric Delay (Average)	2.2 sec		
Stop-Line Delay (Average)	135.4 sec		
Idling Time (Average)	122.6 sec		
Intersection Level of Service (LOS)	LOS F	LOS B	
95% Back of Queue - Vehicles (Worst Lane)	107.6 veh		
95% Back of Queue - Distance (Worst Lane)	753.2 m		
Queue Storage Ratio (Worst Lane)	0.92		
Total Effective Stops	4621 veh/h	123 ped/h	5668 pers/h
Effective Stop Rate	1.57 per veh	0.78 per ped	1.53 per pers
Proportion Queued	0.87	0.78	0.86
Performance Index	324.7	2.7	327.4
Cost (Total)	5202.37 \$/h	50.09 \$/h	5252.46 \$/h
Fuel Consumption (Total)	388.7 L/h		
Carbon Dioxide (Total)	914.2 kg/h		
Hydrocarbons (Total)	0.089 kg/h		
Carbon Monoxide (Total)	0.828 kg/h		
NOx (Total)	0.331 kg/h		

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	1,416,758 veh/y	75,789 ped/y	1,775,899 pers/y
Delay	54,150 veh-h/y	402 ped-h/y	65,381 pers-h/y
Effective Stops	2,217,871 veh/y	59,077 ped/y	2,720,521 pers/y
Travel Distance	1,437,262 veh-km/y	2,584 ped-km/y	1,727,298 pers-km/y
Travel Time	80,208 veh-h/y	954 ped-h/y	97,203 pers-h/y
Cost	2,497,138 \$/y	24,042 \$/y	2,521,180 \$/y
Fuel Consumption	186,589 L/y		
Carbon Dioxide	438,822 kg/y		
Hydrocarbons	43 kg/y		
Carbon Monoxide	397 kg/y		
NOx	159 kg/y		

MOVEMENT SUMMARY

 **Site: 101 [Valetta/Findon PM -SV +SD -EMC +MCD +ALDI]**

New Site

Signals - Actuated Isolated Cycle Time = 60 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Findon Rd (S)											
1	L2	341	0.0	1.298	301.5	LOS F	43.4	304.0	1.00	2.31	9.7
2	T1	737	0.0	1.374	361.7	LOS F	107.6	753.2	1.00	3.35	8.5
Approach		1078	0.0	1.374	342.7	LOS F	107.6	753.2	1.00	3.02	8.9
North: Findon Rd (N)											
8	T1	980	0.0	0.707	6.0	LOS A	17.1	119.4	0.63	0.58	54.6
9	R2	431	1.5	0.962	39.6	LOS D	15.5	110.0	1.00	0.98	34.1
Approach		1411	0.4	0.962	16.3	LOS B	17.1	119.4	0.75	0.70	46.1
West: Valetta Rd (W)											
10	L2	287	1.8	0.637	27.9	LOS C	7.8	55.6	0.92	0.82	37.8
12	R2	176	0.0	0.641	33.0	LOS C	5.2	36.1	0.96	0.80	35.8
Approach		463	1.1	0.641	29.9	LOS C	7.8	55.6	0.94	0.81	37.0
All Vehicles		2952	0.4	1.374	137.6	LOS F	107.6	753.2	0.87	1.57	17.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P3	North Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P4	West Full Crossing	53	8.6	LOS A	0.0	0.0	0.53	0.53	
All Pedestrians		158	19.1	LOS B			0.78	0.78	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.