NORWEST MARKETOWN PLANNING PROPOSAL

(Brackey)

Winner and

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TRAFFIC & PARKING STUDY

PREPARED FOR MULPHA

October 2023

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QUALITY STATEMENT

PROJECT MANAGER	PROJECT TECHNICAL LEA	AD
Fred Gennaoui	Fred Gennaoui	
PREPARED BY		
Fred Gennaoui		16/03/23
CHECKED BY		
Fred Gennaoui		25/05/23
Fred Gennaoui	- 	22/06/23
APPROVED FOR ISSUE BY		
Fred Gennaoui		25/08/23

SYDNEY

Mulpha NORWEST

Norwest Marketown Planning Proposal

CONTENTS

1.	Introduction1
1.1	Background1
1.2	Site Location, Description and Context
1.3	Study Approach2
2.	Transport Environment
2.1	Sustainable Transport
2.2	Walking and Cycling
3.	The Proposal
3.1	Norwest Marketown – Indicative Reference Scheme
3.2	Proposed Planning Controls
4.	Parking Requirements
4.1	Parking Demand
4.2	Proposed Parking Supply11
4.3	Access and Parking Layout12
4.4	Access to Loading Facilities
5.	Traffic Conditions14
5.1	The Road Network14
5.2	Operation of Existing Road System14
5.3	Existing Peak Hourly Trip Generation and Distribution17
5.4	Traffic Impact of Proposed Development
5.5	Access to Hillsong
5.6	Council's Draft Precinct Plan
6.	Summary and Conclusions
6.1	Access and Parking
6.2	Traffic Impact
6.3	Conclusions and Recommendations

Appendices

Appendix A	Trip Generation of Hotel
Appendix B	Preliminary Parking Layouts

- Appendix C Existing Traffic Volumes
- Concept of Carriageway Capacity and Level of Service Appendix D
- Appendix E Appendix F Guidelines for Evaluation of Intersection Capacity
- Sidra Results for Existing Condition
- Appendix G Sidra Results for Future Condition

1. Introduction

1.1 Background

This report has been prepared, on behalf of Norwest City Trust (Mulpha Norwest), to support the submission and assessment of the Norwest City Marketown Planning Proposal. The proposal seeks to amend The Hills Local Environmental Plan 2019 (THLEP 2019) to insert revised planning controls for land situated at 4-6 Century Circuit, Norwest adjacent to the Norwest Metro Station and within the Norwest Strategic Centre.

The Norwest City Marketown Planning Proposal aims to facilitate the long-planned transformation of 46,455 sqm of strategically important land presently containing the Norwest Marketown Shopping Centre and adjoining lands comprising the Carlile Swimming Centre. The site is situated along a major regional throughfare in Norwest Boulevarde, connecting to Old Windsor Road to the west and Windsor Road to the east.

This Planning Proposal will facilitate the appropriate planning controls to facilitate the site's future redevelopment for a contemporary transit-oriented and truly mixed-use precinct. The site has a capacity to deliver a range of employment generating uses in support of the surrounding Norwest Business Park, through commercial, retail, office, entertainment, tourist/visitor accommodation and community floorspace. These uses are further enhanced through the proposal's introduction of residential uses and the potential for a diversity of future emerging housing typologies. Mulpha's vision for sustainable development practices are at the heart of the concept for the site and a range of environmental sustainability initiatives and aspirations are sought, including renewable energy and building efficiencies.

Development planned for the site will be supported by a range of facilities that will benefit occupants of the site and the broader region, together with infrastructure improvements and upgrades and the delivery of generous plazas, public squares and open space, facilitating access to an enhanced Norwest Lake foreshore. Education and collaboration facilities are a primary focus of community life for Norwest Marketown.

1.2 Site Location, Description and Context

The site is located at 4-6 Century Circuit, Norwest within The Hills LGA. Norwest is approximately 12km north of the Parramatta CBD, and 35km northwest of the Sydney CBD. The site is strategically located within the north eastern portion of Norwest Business Park. The Park accommodates an extensive amount of employment land such as office and business premises and contains a range of facilities and amenities, including childcare centres, medical facilities, supermarkets, and a range of smaller retail tenants. It also incorporates recreational areas as well as pedestrian and bicycle linkages.

As shown in **Figure 1.1**, the site is also directly adjacent to the Norwest Metro railway station. Following its opening in 2019, surrounding each Metro station is an identified precinct that contributes to the Sydney Norwest Urban Renewal Corridor. In the context of this corridor, the site is situated within the Norwest Precinct.



Figure 1-1: Location of the site in its surrounding context (Source: Google Maps, edits by Ethos Urban

The worker population within Norwest Business Park includes around 30,000 workers, being one of Greater Sydney's major employment areas. The workforce includes a large portion of professionals and clerical/service workers. Health care and social assistance, retail trade, professional, scientific, and technical services are the largest employing industries in the locality.

The site is situated on the northern side of Norwest Boulevarde, between Brookhollow Avenue (west) and Century Circuit (east). It comprises two allotments which are legally described as Lot 2 in DP 1213272 (4 Century Circuit) and Lot 5080 in DP1008602 (6 Century Circuit). Both allotments are owned by Mulpha. The site has a frontage of approximately 185m to Norwest Boulevard and incorporates Century Circuit which extends eastward within the southern portion of the site. This site was formerly part of the North Sydney Brick and Tile Company's Brick Works Holding and as noted previously now forms part of the Norwest Business Park. An aerial view of the site, the relevant allotments and the immediate locality is provided in **Figure 1.2**.



The Site

NOT TO SCALE

Figure 1.2: Site Location

Source: Nearmap, edits by Ethos Urban

1.3 Study Approach

Gennaoui Consulting has been commissioned to investigate the traffic implications and parking requirements of the latest Planning Proposal, and associated access. The following approach was adopted to assess the traffic impacts of the Planning Proposal:

- The estimate of car parking supply in relation to Council requirements; in this regard the likely impact of public transport particularly the completed North-West rail corridor, including stations at Norwest and Bella Vista, on mode of travel will be determined to establish parking requirements and traffic forecasts associated with this planning proposal.
- Assessment of existing traffic conditions using recent traffic counts at all intersections along Norwest Boulevarde between Windsor Road and Reston Grange; these counts were supplemented by counts at the intersection of Solent Circuit with Fairway Drive (roundabout), and two roundabouts within Marketown;
- Determine the existing trip generation of the current development based on the latest counts.
- Estimate future traffic generation and distribution of retail and office developments, residential units and Hotel (serviced apartments); and
- Assessment of traffic impacts of the Planning Proposal on the approach roads and critical intersections to assess their suitability to accommodate future traffic.

2. Transport Environment

2.1 Sustainable Transport

The site has excellent access to sustainable transport facilities, including bus services along Norwest Boulevarde, and walking and cycling facilities. In addition, the North-West Metro line completed in May 2019 included two stations at Norwest and Bella Vista.

2.1.1 North West Metro

The Norwest Metro Station is located at the corner of Norwest Boulevarde with Brookhollow Avenue, approximately 150 metres walking distance from the site (**Figure 2-1**). The station forms part of the North West Metro line which is planned to eventually serve metros to the Sydney CBD, Bankstown and Hurstville as part of the government's 20-year Sydney's Rail Future strategy. Accordingly, the addition of metro services within the vicinity of the site provides excellent access to the wider Sydney area. It is pertinent to note that the Norwest Metro Station will be directly connected to Marketown by an underground walkway under Norwest Boulevarde.



Figure 2-1: Location of Norwest Metro Station and Bus Stops

It is pertinent to this Planning Proposal that the Bella Vista Station Precinct Finalisation Report (2017) prepared by TfNSW, states that currently the majority of trips to and from the precinct are made by private vehicles, and that a mode share goal of 53% for public and active transport for trips made both to and from the precinct over time is a realistic goal. In addition to the new metro line, ways to achieve this goal include:

- all Sydney Metro stations have been planned with bus interchange facilities according to anticipated future service levels;
- improvements to the rapid bus and suburban bus network;
- significantly improving walking connectivity and amenity in the precinct;
- providing improved cycling links and facilities;
- upgrade of Norwest Boulevarde including the signalization of the intersections with Lexington Drive, and intersection upgrades at Old Windsor Road and Winsor Road.

2.1.2 Buses

Bus stops are located on both sides of Norwest Boulevarde, adjacent to the site. The locations of the bus stops and the bus network map shown in **Figure 2.1**. The bus services and the frequency of the services is provided in **Table 2.1**.



Figure 2-1: Hillsbus (Northern Western Sydney) Network Map

Bus Route No.	Bus Route	Frequency
613X	Bella Vista to City QVB	Every 20 to 25 minutes in peak periods. Bus service is not available during off-peak periods.
614X	City QVB to Crestwood	Every 10 to 25 minutes in peak periods. Bus service is not available during off-peak periods.
618X	City to Norwest Business Park	Every 15 minutes in peak periods, and every 40 minutes during off-peak periods
628	Norwest to Chatswood	Every 15 minutes in peak periods, and every 40 minutes during off-peak periods
714	Bella Vista to Seven Hills via West Baulkham Hills	Every 20 to 30 minutes in peak periods. Bus service is not available during off-peak periods.
715	Castle Hill to Seven Hill	Every 40 minutes in the morning peak and every 30 minutes in the afternoon peak. Bus service is not available during off- peak periods.
745	St Marys to Castle Hill	Every 12 to 25 minutes in peak periods, and up to 32 minutes during off-peak periods
T62	Castle Hill to Parramatta	Every 12 to 25 minutes in peak periods, and up to 32 minutes during off-peak periods
T64	Rouse Hill Town Centre to Parramatta	Every 40 to 50 minutes in peak periods, and every 60 minutes during off-peak periods
T70	Blacktown to Castle Hill	Every 40 to 50 minutes in peak periods, and every 60 minutes during off-peak periods

Table 2-1: Available Bus Services

2.2 Walking and Cycling

The site has excellent walking facilities, with footpaths provided on both sides of all roads within the vicinity of the site.

Figure 2-3 shows the existing cycle routes in the vicinity of the site. South of the site, Coorumbene Court forms part of the RMS strategic shared path network. This is a path that provides accessibility at a defined "low difficulty' level for users. It is a particularly convenient linkage with respect to the site, once the proposed shared path along Brookhollow Avenue is completed. The shared pathway provides for strategic linking with the wider walking and cycling networks across Sydney.

In fact, this path will play a key role in improving connectivity and encouraging mode shift. TfNSW and Mulpha-Norwest propose upgrades of the pathway system serving Marketown and the metro station.



Figure 2-3: RMS Cycle Finder (3 May 2023

3. The Proposal

3.1 Norwest Marketown – Indicative Reference Scheme

Mulpha's vision for the site is a revitalised and vibrant mixed-use precinct that increases the productivity of employment generating land, provides essential services and increases the provision of housing close to transport. The precinct will provide essential services and a range of new community facilities and open space areas that will benefit the broader community. This will enable the creation of a vibrant and rejuvenated centre that fosters an attractive place to live, work and play.

The Norwest Marketown – Indicative Reference Scheme, as prepared by FJC Studio, included as **Figure 3-1**, represents an optimised and refined reference scheme, to guide best practice design and the preparation of detailed planning controls to achieve an attractive transit-oriented development precinct with high amenity.



Figure 3-1: Indicative Reference Scheme - Ground

Key features of the Norwest Marketown - Indicative Reference Scheme are detailed below and summarised in **Table 3-1**:

- A master planned urban design of new building blocks, public streets, squares, and open spaces.
- A total development density of up to 232,375 m² Gross Floor Area (GFA) comprising a Floor Space Ratio of 5.0:1. This includes the following components:
 - 117,330m² of employment generating floorspace comprising commercial, entertainment, retail and hotel accommodation;
 - > 102,523m² of residential floorspace comprising approximately 854 apartments; and
 - > 12,523m² of community indoor recreation, civic and education floorspace.
- Building heights above ground ranging from 5 storeys to 36 storeys.

- A Lower Ground level providing a direct connection to Norwest Metro through to Norwest Lakes at grade with retail and food and beverage opportunities.
- Basement parking, loading, and servicing across 5 sub-terranean levels, with spaces for some 2,600 cars, which are intended to be allocated by way of a parking management system.
- Substantial open space provisions including:
 - > Lake Avenue pedestrian linkage connecting Norwest Boulevarde to Norwest Lake
 - Sarden Terrace cascading open space, providing an enhanced Norwest Lake Foreshore
 - > Norwest Public Square local passive open space and alfresco dining.
- Community and civic buildings such as the Glass House.
- Significant enhancements to the existing Century Circuit, including intersections with Norwest Boulevarde, the provision of internalised local streets and pedestrian connections and staged contribution within the site boundary to a future northern connection to Fairway Drive.
- Complementary on and off-site infrastructure to be delivered by way of a future Planning Agreement.

Table 3-1: Proposed Norwest Marketown Redevelopment at Norwest (m² GFA)

Stage	Planning Proposal Target
Residential	
Apartments	
1 bedroom	213
2 bedrooms	472
3 bedrooms	169
Total Units	854
Hotel	
Hotel 200 rooms / staff 40 persons	8,585 m ² GFA
Commercial	
Retail m ² GFA	28,154
Office m ² GFA	80,591
Total Commercial m ² GFA	108,745
Community & Leisure Facilities	
Childcare Centre (90 children + 14 staff)	1000
Swimming Learning Centre	800
Gymnasium	1,250
Cinema	3,111
Library	2,000
Educational Facilities	2,000
Community	2,361
Sub-Total Non-Residential GFA m ²	12,522
Total Non-Residential GFA m ²	121,267

3.2 Proposed Planning Controls

The Planning Proposal Justification Report (2023) prepared by Ethos Urban, details the intention to insert new planning provisions covering Norwest Marketown, through the amendment of the THLEP 2019. Specifically, the Planning Proposal will:

- Seek a rezoning of the site from E1 Local Centre to MU1 Mixed Use.
- Seek an increase in overall height within the site from RL116m to RL216m.
- Seek an increase to Floor Space Ratio from 1.49:1 to 5.0:1, comprising a minimum 'commercial premises' and 'entertainment facility' FSR of 2.5:1 and a maximum 'residential flat buildings', 'shop top housing' and 'boarding houses' FSR of 2.21:1 and 854 dwellings.
- Dwelling size and mix requirements consistent with THLEP 2019 and Council's strategic goals for housing.
- Car parking provisions in relation to dwellings, dwelling visitors, retail and commercial uses.
- Additional Permitted Uses (Schedule 1) to allow for the land uses of: recreation area, retail premises, recreation facility (outdoor), water recreation structure, waterbody (artificial) and wharf/boating facilities, within the land zoned SP2 Infrastructure within the site.

- Corresponding site-specific Development Control Plan which will address provisions such as:
 - > Relationship to other Hills Shire DCP provisions
 - Urban Context
 - > Desired Future Character and Principles
 - Public domain and Open Space
 - > Built form.
 - Active frontages.
 - > Solar access and overshadowing.
 - > Vehicle access and pedestrian connectivity
 - > Landscape.
 - Design Excellence
 - Sustainability.
 - > Wind.
 - > Staging and implementation.

The proposal is in response to the Draft Norwest Precinct Plan which was on exhibition from 2 May 2023 until 31 July 2023. According to the Draft Plan, Norwest Marketown is identified within 'Focus Area 2' was earmarked as being subject to 'market driven' change and that changes to the planning framework would be driven by landowner-initiated planning proposals, along with associated amendments to the DCP, Public Domain Plan and appropriate infrastructure contribution mechanisms.

4. Parking Requirements

4.1 Parking Demand

Given the following circumstances, it is reasonable to adopt the following parking rates for the proposed redevelopment of the Marketown site:

- The development is in very close proximity to the Norwest Metro station;
- The proposed development is expected to be completed over a decade;
- The larger a commercial development the lower the rate of parking requirement;
- State Government policy to reduce parking where adequate public transport services are provided; and
- The Sydney Metro objective to reduce the car mode of travel in the precinct from over 90 percent to about 50 percent (section 2.1.1).

It is therefore proposed to adopt the following parking rates for each land use.

4.1.1 Residential Apartments

At its meeting held on 25 October 2016, the Hills Shire Council adopted a Mayoral minute No 9/ 2016 concerning housing mix and diversity within the Sydney Metro Norwest Corridor which included an "incentivised" car parking policy rate of:

- One space per apartment
- One visitor space per five units.

for developments meeting Council's requirements for apartments units mix and size. This planning proposal meets these requirements and car parking for tenants has been calculated accordingly. However, a visitor rate of 1 space per 12 units is proposed which is more in line with proximity of the Metro line and availability of considerable number of spaces in the complex noting that many visitors would be also avail themselves of the retail and community facilities and services in the Development.

Thus, a minimum of 925 spaces for residents and their visitors would be provided if the proposed rates are adopted. The proposed parking supply is in accordance with Council's Mayoral minute and reflects the proximity of the development to the Norwest Metro station and public bus services.

4.1.2 Retail & Office

The following proposed rates were suggested in Council's Report titled Norwest Strategic Centre – Draft Precinct Plan and Engagement Strategy (FP224) submitted to Council on 8 November 2022 and currently on exhibition.

Proposed Commercial Parking Rates	
Minimum	Maximum
Inner Walkable Catchment: 1 space per 100m ² of GFA Outer Walkable Catchment: 1 space per 75m ² of GFA	Inner Walkable Catchment: 1 space per 75m ² of GFA Outer Walkable Catchment: 1 space per 60m ² of GFA
Proposed Batail Barking Bates	
Froposeu netali Farking nates	
Minimum	Maximum

The following rates were adopted for this Planning Proposal:

- Retail: a rate of 1 space per 37 m² GFA has been adopted. Thus some 761 spaces would be required.
- Office / Commercial: a rate of 1 space per 100 m² GFA has been adopted necessitating 806 spaces.

4.1.3 Hotel (Serviced Apartments)

Being in proximity of a major public transport hub, the following assumptions were used to estimate the likely parking requirements for the hotel:

- Staff: 40 of which 50% drive to work necessitating 20 car spaces
- Accommodation: 200 rooms with 80% peak occupancy on 90% of time that is 160 occupied rooms; with 40% of patrons travelling by Metro, taxis and coaches; and the remaining 60% of patrons driving requiring 96 car spaces.

The parking requirements of the Hotel during the day and evening are included in Appendix A. Overall, a peak demand of 116 spaces would be required.

4.1.4 Other Facilities

The following Council's requirements have also been adopted:

- Child Care Centre:
 - > 1 space per 6 children 90 children requiring 15 spaces; and
 - > 1 space per staff 14 staff requiring 14 spaces.
- Gymnasium:
 - > 1 space per 25 m² GFA for 1,250 m² requiring 50 spaces.
 - Other community Facilities
 - The existing swimming learning centre has a provision of 35 spaces. A similar provision has been assumed within the new development.
 - There are no specific rates for Cinema & Library facilities. It is anticipated that these facilities would mostly be used by patrons living in the development and already having other purposes in the centre. A nominal allowance for 35 and 20 spaces have been made for the cinema and library respectively.
 - It has further been assumed that the Education facility and community public area would necessitate some 20 spaces each.

4.1.5 Overall Parking

The application of the above rates to estimate the parking demand of the Planning Proposal resulted in a requirement of 2,817 spaces as noted in Table 4.1.

Table 4.1:	Parking	Requirement fo	or Development
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	PROPOSED	PROPOSED RAT	ES FOR DEVELOPMENT
LAND USE	DEVELOPMENT	Rate	No.
Residential	Units		
1 bedroom	213	1.0	213
2 bedrooms small	472	1.0	472
3 bedrooms large	169	1.0	169
Residents Spaces	854		854
Visitor Spaces		1 per 12 units	71
Total Residential	854		925
Hotel			
Rooms	200	Pofor Appondix A	96
Staff	40 persons	Relei Appellaix A	20
Total Hotel			116
Commercial	GFA		
Retail **	28,154 m ²	1 per 37m ² GFA	761
Office	80,591 m ²	1 per 100m ² GFA	806
Total Commercial m ² GFA	108,745 m²		1,567
Other Facilities			
Child Care Centre	90 children 14 staff	1 per staff + 1 per 6 children	29

	PROPOSED	PROPOSED RATE	ES FOR DEVELOPMENT
LAND USE	DEVELOPMENT	Rate	No.
Swimming pool	800 m ²	As per existing centre	35
Gymnasium	1,250 m ²	1 per 25m ² GFA	50
Cinema	3,111m ²		35
Librarium/Community/ Educational	6,361 m²		60
Sub Total			209
Total Development			2,817

4.2 Proposed Parking Supply

It is pertinent to this application that the Bella Vista Station Precinct Finalisation Report (2017) prepared by TfNSW, states that currently the majority of trips to and from the precinct are made by private vehicles, and that a mode share goal of 53% for public and active transport for trips made both to and from the precinct over time is a realistic goal. In addition to the metro line, ways to achieve this goal include:

- All Sydney Metro stations have been planned with bus interchange facilities according to anticipated future service levels;
- Improvements to the rapid bus and suburban bus network;
- Significantly improving walking connectivity and amenity in the precinct;
- Providing improved cycling links and facilities; and
- Availability of Metro Connect bus shuttle service.

At ultimate development of Marketown, there will also be 9 residential/commercial buildings accommodating about 2000 residents. Furthermore, the Quarters residential precinct will have 12 buildings including the three completed buildings to the west of Natura Rise, with a potential of 1,040 units accommodating a population of between 2,500 and 3,000 residents.

It is therefore reasonable to assume that the proposed non-residential component within the proposed Marketown will be used in part by these residents, and therefore would not generate additional parking or trips.

The travel mode assumptions in **Table 4.2** were therefore adopted in relation to business premises, gymnasium and child-care centre. It should be noted they are well below the target stipulated in the Bella Vista Station Precinct Finalisation Report (2017) prepared by TfNSW, of an ultimate mode share goal of 53% for public and active transport for trips made both to and from the precinct.

Table 4.2: Targets for Mode Share

	Walking from nearby residential area & use of public transport	By Car
Business Premises	25%	75%
Gymnasium	25%	75%
Child Care Centre	20%	80%

As a result, some 1,672 spaces would be sufficient to cater for the non-residential component of the proposed Marketown development as noted in **Table 4.3**. The proposed parking rate for Business Premises is effectively 1 space per 133 m² GFA.

Commercial Land Use	Spaces	Discount	Spaces
Business premises	806	25%	604
Retail	761		761
Gymnasium	50	25%	38
Child Care Centre	29	20%	23
Other facilities	130		130
Hotel	116		116
Total Non-residential	1,892		1,672
Residential	925		925
Total	2,817		2,597

Table 4.3: Proposed Parking supply for Commercial land Uses

Including the requirement for the residential component estimated at 925 spaces, approximately 2,600 spaces would be needed. This demand can be reduced by a further 50 to 100 spaces if 10 to 20 car share spaces are provided to offset up to 100 spaces.

It is proposed to supply the 2,600 parking spaces in a multi-level basement car park.

A Green Travel Plan will be prepared in support of reducing parking supply for non-residential component of the development, and to encourage the use of the Metro and buses, as well active transport within the area.

4.3 Access and Parking Layout

Approximately 2,600 spaces are proposed in six basement levels. Preliminary layouts are included in Appendix A. Access to the car park will be accessed from the following locations shown in **Figure 4.1**.



Figure 4-1: Indicative Reference Scheme - Lower Ground Level

- Western side of the site accessed via the main driveway servicing retail establishment;
- At rear of the site also accessed via the main driveway, servicing retail and community facilities;
- Eastern side of the site via Century Circuit east, north of Century Circuit, servicing commercial;
- Eastern side of the site off Century Circuit east, servicing residential;
- Eastern side of the site off Century Circuit east, servicing the Hotel;
- Under proposed building on site of existing swim centre servicing residential.

A detailed assessment of all access driveway to the basement car parks will be carried out in conjunction with the Development Application for the proposal. This assessment will also include an analysis of the parking layout and internal circulation.

4.4 Access to Loading Facilities

Loading facilities are proposed to be accessed off Century Circuit east as shown in Figure 4-2.

A preliminary assessment has been carried out to ensure that articulated vehicles can be used to service the retail facilities and major supermarkets. Swept Path of articulated vehicles into and out of the loading area are illustrated in **Figure 4-2**.



Figure 4.1: Access to and From Loading Area by an Articulated Vehicle

Adjustment to the access driveway will be required at Century Circuit east at Norwest Boulevarde to accommodate articulated vehicle left-hand turning movements.

A detailed assessment of the loading facility and access driveway will be carried out in conjunction with the Development Application for the proposal.

5. Traffic Conditions

5.1 The Road Network

Main access to most areas within the Norwest Business Park is provided by Norwest Boulevarde, which is under the care and control of Transport for NSW. Importantly this road functions as a regional connector used by traffic travelling between the M7/Old Windsor Road and Windsor Road/Showground Road.

The Marketown redevelopment will continue to be accessed through the intersection of Norwest Boulevarde with Brookhollow Avenue and Century Circuit West. Access to the site will also be provided via Century Circuit East.

Norwest Boulevarde has a four-lane divided carriageway. Traffic signals are installed at the intersections of Norwest Boulevarde with Old Windsor Road, with Brookhollow Avenue, with Solent Circuit east and with Windsor Road; additional turning lanes are provided at all these locations.

Two-lane circulating roundabouts control the intersections of Norwest Boulevarde with Columbia Circuit, with Solent Circuit/Reston Grange, with Westwood Way/Edgewater Dr and with Lexington Dr/Elizabeth MacArthur Dr. It has a posted speed limit of 60km/hr.

Windsor Road has a four-lane divided carriageway excluding long turning lanes at Norwest Boulevarde and Showground Road. The median along Norwest Boulevarde between Brookhollow Avenue and Solent Circuit East restrict traffic to and from Century Circuit East to left turn in and out only.

Solent Circuit has a four-lane divided carriageway. At Burbank Place it has a continuous median restricting access to and from Burbank Place to left turning only movements.

Fairway Drive provides access to the Balmoral Estate to the north of the Business Park and connects to Windsor Road. It has a four-lane undivided carriageway including parking on both sides. It is controlled by a one lane circulating roundabout at Solent Circuit; the roundabout also provides access to the Hillsong site.

5.2 Operation of Existing Road System

5.2.1 Traffic Counts

Traffic volume counts were carried out at the following locations on 15 September 2022.

- Norwest Boulevarde with Windsor Road (signalised)
- Norwest Boulevarde with Colombia Court (roundabout)
- Norwest Boulevarde with Solent Circuit east (signalised)
- Norwest Boulevarde with Brookhollow Avenue and Century Circuit (signalised)
- Norwest Boulevarde with Solent Circuit East & Reston Grange (Roundabout)
- Norwest Boulevarde with Fairway Drive (roundabout)
- Century Circuit with access to Hillsong and Shopping centre car park (roundabout)
- Century Circuit with access to Basement Car park (roundabout)

Traffic volumes peaked between 8:15 and 9:15 am and from 4:15 to 5:15 pm during the morning and afternoon respectively. The peak hour counts are included in Appendix C.

5.2.2 Existing Operation of Major Approach Roads

The concepts of mid-block carriageway capacity and Level of Service (LoS) are described in **Appendix D** together with criteria for their assessment. The Tables in Appendix C are based on Table 5.1 of section 5.2 of the Austroads Guide to Traffic Management (AGTM) Part 3 – Traffic Studies and Analysis. This Table (reproduced below) sets out typical mid-block capacities for various types of urban roads with interrupted flow, with unflared major intersections and with interruptions from cross and turning traffic at minor intersections."

Table 5.1. Typical min-block capacities for arban roads with interrupted now
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Type of lane	One-way mid-block capacity (pc/h)
Median or inner lane	
Divided road	1000
Undivided road	900
Middle lane (of a 3 lane carriageway)	
Divided road	900
Undivided road	1000
Kerb lane	
 Adjacent to parking lane 	900
Occasional parked vehicles	600
Clearway conditions	900

It should be noted that the assessment is of the available capacity of roadway at mid-block irrespective of constraints or otherwise at an intersection. It is a reflection of whether the roadway should have a two, four or six lanes carriageway. Constraints identified at intersections should be assessed and resolved independently for the mid-block section.

The volumes allocated to different levels of service were also derived from Austroads which suggests that volumes at Los D being 90% of the capacity (Los E). Level of service A is generally about 50% to 60% of the capacity for Los E. When improvements to isolated intersections are being considered, but without any change to upstream conditions, the figures in Table 5.1 above can be taken as limiting values.

Austroads suggests that peak period mid-block traffic volumes may increase to 1200 to 1400 pc/h/lane on any approach road when the some or all of the following conditions exist or can be implemented:

- Adequate flaring at major upstream intersections;
- Uninterrupted flow from a wider carriageway upstream of an intersection approach and flowing at capacity;
- Control or absence of crossing or entering traffic at minor intersections by major road priority controls;
- Control or absence of parking;
- Control or absence of right turns by banning turning at difficult intersections;
- High volume flows of traffic from upstream intersection during more than one phase of a signal cycle; and
- Good co-ordination of traffic signals along the route.

Therefore, the volumes in the table for uninterrupted flows conditions within **Appendix D** are approximately 40% higher than those for interrupted flow conditions.

The base existing traffic volumes along Windsor Road, Norwest Boulevarde and Solent Circuit are summarised in **Table 5.1**, together with their appropriate level of service.

The absence of traffic movements entering/crossing Windsor Road and Norwest Boulevarde from major developments, being access denied roads, means that the service one-way hourly volumes included in Table D1 of **Appendix D** could be used for these two roads.

Norwest Boulevarde operates at a good LoS of "B" or better. To the north of Norwest Boulevarde, Windsor Road operates at a very good level of service "A".

Solent Circuit and Century Circuit operate at a very good Level of Service "A".

			AM PEAK		РМ РЕАК			
LOCATION	LANES	East/N orth	South/West	LoS	East/North	South/West	LoS	
Uninterrupted Volumes (Table 2 Append	ix B)		^	· · · · ·				
Windsor Road								
North of Norwest Blvd	4DCL	993	2173	А	2152	1594	А	
South of Norwest Blvd	4DCL	1568	1758	А	1689	1719	Α	
Norwest Boulevarde*								
Windsor to Columbia	4DCL	1320	2,310	В	2,067	1,481	А	
Columbia to Solent Cir (east)	4DCL	1210	1,516	А	1,570	1,279	А	
Century East to Brookhollow	4DCL	1,024	1,179	А	1099	1214	А	
Brookhollow to Reston Gr	4DCL	1,408	1207	А	1,370	1,503	А	
Reston Grange to Westwood Dr	4DCL	1496	1382	А	1380	1549	А	
Interrupted Volumes (Table 1 Appendix B) Century East to Brookhollow								
Solent Circuit								
Norwest Blvd to Inglewood Pl	4DP	770	368	А	312	587	А	
West of Fairview Dr	4DP	338	477	А	533	434	А	
Century Circuit West								
Norwest Blvd to Car Park access	4D	445	150	А	476	367	А	
Century Circuit East								
Norwest Blvd to Basement Car Park	20	102	141	А	53	240	А	

Table 5-1: Existing Base Carriageway Level of Service

5.2.3 Operation of Existing Critical Intersections

The concepts of intersection capacity and level of service, as defined in the Guidelines published by TfNSW (then RTA 2002), are described in **Appendix E** together with criteria for their assessment. The assessment of the level of service of traffic signals is based on the evaluation of the average delay (seconds/vehicle) of vehicles on all approaches. The assessment of the level of service of roundabouts and signed controlled intersections is based on the average delay (seconds/vehicle) of the critical movement.

An analysis of the operation of critical intersections in the vicinity of the site was carried out using the SIDRA computer modelling program. The results of this analysis are summarised in **Table 5.2**, and detailed in **Appendix F**.

Table 5.2: Existing Operation of Intersections

		۹M	PM		
INTERSECTION	Delay sec/v	LoS	Delay sec/v	Los	
Traffic Signals					
Norwest Boulevarde with Windsor Road	25.6	В	32.9	C	
Norwest Boulevarde with Solent Circuit (east)	19.3	В	19.7	В	
Norwest Boulevarde with Brookhollow Avenue	32.6	С	33.7	С	
Roundabouts					
Norwest Boulevarde with:					
 Brookhollow Ave / Columbia Court 	15.3	В	16.3	В	
 Solent Circuit / Reston Grange 	20.1	В	15.9	В	
Solent Circuit with Fairway Drive	11.8	A	14.7	В	

The traffic signals at the intersection of Norwest Boulevarde with Windsor Road operates at a satisfactory level of service "B" and" C" during the morning and afternoon peak periods.

The intersection of Solent Circuit East with Norwest Boulevarde operates at a good level of service "B" during the morning and afternoon peak hours. The installation of traffic signals at the intersection of Solent Circuit (East) with Norwest Boulevarde were provided by Mulpha who carried out the work, in accordance with plans approved by Transport for NSW.

The intersection of Norwest Boulevarde with Brookhollow Avenue and Century Circuit operates at a satisfactory Level of Service "C".

The roundabout at Norwest Boulevarde with Columbia Court and Brookhollow Avenue currently operates at a good level of service "B" during both the morning and afternoon peak periods. However, the queue likely to be generated along Norwest Boulevarde at Windsor Road during the afternoon is longer (~140m) than the distance between Windsor Road and the roundabout (125m) thus extending beyond the roundabout and affecting its operation. To address this issue, it is understood that TfNSW is planning the replacement of the roundabout with traffic signals with the banning of the right turning movements from Norwest Boulevarde.

The roundabout controlling the intersection of Norwest Boulevarde with Solent Circuit and Reston Grange operates at a good level of service "B" during both the morning and afternoon periods.

The roundabout at the junction of Solent Circuit with Fairway Drive operates a good level of service "B" or better.

5.3 Existing Peak Hourly Trip Generation and Distribution

A multi-level basement car park is to be provided to service the commercial, residential and hotel respectively. Access to the site will continue to be via:

- The main vehicular access off Norwest Boulevarde along Century Circuit west;
- Century Circuit East off Norwest Boulevarde; at this stage access is limited to left turn in and out due to the presence of a median in Norwest Boulevarde.

5.3.1 Existing Trip Generation of Marketown

The current approach and departure routes for trips currently generated by the Marketown Shopping Centre were derived from the traffic counts and are summarised in **Table 5.3**.

AM Peak		Arrival			Departure	
Approach Roads	Century West	Century East	Two Way	Century	Century	Two Way
Norwest Boulevard (West)	111	15	126	84		84
Reston Grange	27	4	31	10		10
Fairway Drive	10	1	11	14		14
Windsor Rd (North)	90	0	90		38	38
Windsor Rd (South	72	0	72		74	74
Brookhollow Ave	24	0	24	21		21
Sub-Total	334	20	354	129	112	241
Hillsong / Century Developments	51		51	12		12
Total	385	20	405	141	112	253
PM Peak		Arrival			Departure	
Approach Roads	Century West	Century East	Two Way	Century	Century	Two Way
Norwest Boulevarde (West)	184	20	204	198		198
Reston Grange	23	2	25	57		57
Fairway Drive	20	2	22	11		11
Windsor Rd (North)	108		108	22	79	101
Windsor Rd (South)	60		60	23	86	109
Brookhollow Ave	17		17	25		25
Sub-Total	412	24	436	336	165	501
Hillsong / Century Developments	63		63	25		25

Table 5.3: Trip Distribution of Existing Traffic

During the morning period, about 660 vehicle trips were generated during the peak hour from 8:15 to 9:15 am; a higher trip generation of just over 1,020 vehicles was recorded during the afternoon period from 4:15 to 5:15 pm. The peak hourly trips accessing each access driveways to Marketown are included in **Table 5.3**.

5.4 Traffic Impact of Proposed Development

5.4.1 Trip Generation of Planning Proposal

The following approach was adopted to estimate the trip generations of the latest proposed development.

5.4.1.1 Residential

The RMS Technical Directive 04a (2013) indicates that the average trip generation rates for high density residential buildings near railway stations is an average 0.19 trips/units based on a range of 0.07 to 0.32 trips/units (from 8 high density buildings) during the morning peak hour. During the afternoon peak hour, the adopted rate is 0.15 vehicle trips/units based on a range of 0.06 to 0.41 trips/units.

The RMS rates of 0.19 and 0.15 trips per unit has been adopted for the proposed high density residential buildings. Thus, the residential component of the Marketown redevelopment would generate about 170 trips and 136 trips during the morning and afternoon peak hours respectively.

5.4.1.2 Retail

The RMS Traffic Direction (RMS, Ta4, 2013) suggests for shopping centres with sizes between 20,000 and 30,000 m^2 a rate of 5.9 trips per 100 m^2 GLFA. Assuming that GLFA is about 75 percent of GFA, about 1,246 trips would be generated during the afternoon peak for the retail component of the development.

For the purpose of this assessment, it has been assumed that the retail component would generate during the morning peak hour about 50 percent of afternoon trips or about 622 trips.

5.4.1.3 Office

The RMS rates stipulated in Traffic Direction 4A/2013) of 1.6 trip per 100 m² GFA and 1.2 trip per 100 m² GFA for the morning and afternoon peak hours generally correspond to a parking rate of 1 space per 40 m² GFA.

A parking rate of 1 space per 100 m² GFA is proposed for the office component of this development. It is therefore considered appropriate to adopt trip generation rates reduced accordingly to 0.64 trip per 100 m² and 0.48 trip per 100 m² for the AM and PM peak respectively. Thus about 520 and 380 trips are most likely to be generated during the morning and afternoon peak hours respectively.

The rational for this approach is the very close proximity of the Norwest City Development to the Metro station and bus stops in Norwest Boulevarde,

5.4.1.4 Gymnasium

It has been assumed that each space would generate two trips, one arriving and one departing during the peak hours. Thus, for the 50 required spaces, some 100 trips are expected during each of the peak hours.

5.4.1.5 Child Care Centre

The RMS guide suggests the following trip generation rates for Child Care Centres:

- AM Peak = 0.8 X No of children; and
- PM Peak = 0.7 X No of children.

The proposal for 90 children is therefore expected to generate 72 and 63 trips during the morning and afternoon peak periods.

5.4.1.6 Swimming pool

It has been assumed that each of the 35 required spaces would generate two trips, one arriving and one departing during the peak hours. Thus, some 70 trips have been assumed to occur during the morning and afternoon peak hours.

5.4.1.7 Cinema

This facility is not likely to generate any traffic before 9.00am. During the afternoon peak a nominal trip generation of about 50 trips has been assumed. The peak generation of the cinema is likely to occur during the evenings and on weekends.

5.4.1.8 Library/Community/ Education

These facilities are not likely to generate any substantial traffic before 9.00am. During the afternoon peak a nominal trip generation of about 20 trips has been assumed for each facility.

5.4.1.9 Hotel

The trip generation of the hotel was estimated from the anticipated time of arrival and departure of patrons and staff as shown in **Appendix A**. Thus about 50 and 45 trips would be generated during the morning and afternoon peak hour respectively.

5.4.1.10 Overall Trip Generation

The proposed Planning proposal for the Marketown redevelopment is expected to generate approximately 1,667 and 2,160 vehicle trips during the morning and afternoon peak hours respectively as noted in **Table 5.4.** It should be noted that the estimated trip generation is conservative, noting that the Sydney Metro objective is to reduce the car mode of travel in the precinct by about 40 to 50 percent (ref section 2.3.2).

La		AM PEAI	(PM PEAK			
		Arr	Dep	Total	Arr	Dep	Total
Residential	854 units	51	111	162	77	51	128
Retail	28.154 m ² GFA	311	311	622	623	623	1,246
Office	80,591 m ² GFA	326	190	516	77	306	384
Child Care	1000 m ² GFA	38	34	72	29	34	63
Swimming	750 m ² GFA	35	35	70	35	35	70
Gymnasium	1,250 m ² GFA	50	50	100	50	50	100
Cinema	3,111 m ² GFA	0	0	0	25	25	50
Library/Commu	6,361 m ² GFA	40	35	75	35	40	75
Hotel	200 rooms	15	34	49	29	16	45
Total		866	800	1,667	980	1,180	2,161
Existing Trips		405	253	658	499	526	1,025
Additional Trips		461	547	1,008	008 481 654		

 Table 5.4: Trip Generation of Planning Proposal for Marketown Redevelopment

5.4.2 Trip Distribution and Assignment of Additional Trips

The proposed redevelopment of Marketown will effectively increase the current trip generation of the site by about 1,000 trips during the morning and afternoon. The route distribution for approaching and departing traffic accessing each of the two entry driveways, derived from **Table 5.3** is included in **Table 5.5**.

Table 5.5: Trip Distribution of Additional Traffic on Road Network

AM Peak		Arrival		Departure			
Approach Roads	Century West	Century	Two Way	Century	Century	Two-Way	
Norwest Boulevard (West)	33%	75%	36%	65%	0%	35%	
Reston Grange	8%	20%	9%	8%	0%	4%	
Fairway Drive	3%	5%	3%	11%	0%	6%	
Windsor Rd (North)	27%	0%	25%	0%	34%	16%	
Windsor Rd (South	22%	0%	20%	0%	66%	31%	
Brookhollow Ave	7%	0%	7%	16%	0%	9%	
Total	100%	100%	100%	100%	100%	100%	
				Departure			
PM Peak		Arrival			Departure		
PM Peak Approach Roads	B Century West	Arrival Century	Two Way	Century	Departure Century	Two-Way	
PM Peak Approach Roads Norwest Boulevarde(West)	B Century West 45%	Arrival Century 83%	Two Way 47%	Century 59%	Departure Century 0%	Two-Way 40%	
PM Peak Approach Roads Norwest Boulevarde(West) Reston Grange	B Century West 45% 6%	Arrival Century 83% 8%	Two Way 47% 6%	Century 59% 17%	Departure Century 0% 0%	Two-Way 40% 11%	
PM Peak Approach Roads Norwest Boulevarde(West) Reston Grange Fairway Drive	B Century West 45% 6% 5%	Arrival Century 83% 8% 8%	Two Way 47% 6% 5%	Century 59% 17% 3%	Departure Century 0% 0% 0%	Two-Way 40% 11% 2%	
PM Peak Approach Roads Norwest Boulevarde(West) Reston Grange Fairway Drive Windsor Rd (North)	B Century West 45% 6% 5% 26%	Arrival Century 83% 8% 8% 0%	Two Way 47% 6% 5% 25%	Century 59% 17% 3% 7%	Departure Century 0% 0% 0% 48%	Two-Way 40% 11% 2% 20%	
PM Peak Approach Roads Norwest Boulevarde(West) Reston Grange Fairway Drive Windsor Rd (North) Windsor Rd (South)	B Century West 45% 6% 5% 26% 15%	Arrival Century 83% 8% 0% 0%	Two Way 47% 6% 5% 25% 14%	Century 59% 17% 3% 7% 7%	Departure Century 0% 0% 0% 48% 52%	Two-Way 40% 11% 2% 20% 22%	
PM Peak Approach Roads Norwest Boulevarde(West) Reston Grange Fairway Drive Windsor Rd (North) Windsor Rd (South) Brookhollow Ave	B Century West 45% 6% 5% 26% 15% 4%	Arrival Century 83% 8% 0% 0% 0% 0%	Two Way 47% 6% 5% 25% 14% 4%	Century 59% 17% 3% 7% 7% 7% 7%	Departure Century 0% 0% 0% 52% 0%	Two-Way 40% 11% 2% 20% 22% 5%	

The distribution assumes that the existing road network and traffic controls remains in place It has also been assumed that trips between Hillsong and adjacent Century Buildings, and the proposed development will not increase.

5.4.3 Impact on Major Approach Roads

The route distribution for approaching and departing traffic, included in **Table 5.5**, was then adopted to assign the additional traffic attracted and generated by the proposed Marketown Development to the road network as noted in **Table 5.6**.

			Arrival			Departure				
Approach Roads		Century West	Century East	Total	Centurv West	Century East	Total			
AM PEAK										
Norwest Bvd	West	146	17	163	199	0	199			
Reston Grange	South	35	5	40	24	0	24			
Fairwav Drive	North	13	1	14	33	0	33			
Windsor Rd	North	118	0	118	0	82	82			
Windsor Rd	South	95	0	95	0	1600	160			
Brookhollow Ave		32	0	32	50	0	49			
Total		439	23	461	306	242	548			
PM PEAK										
Norwest Bvd	West	204	19	224	269	0	269			
Reston Grange	South	26	2	27	78	0	78			
Fairway Drive	North	22	2	24	15	0	15			
Windsor Rd	North	120	0	120	25	98	124			
Windsor Rd	South	67	0	67	27	107	134			
Brookhollow		19	0	19	34	0	34			
Total		458	23	481	448	205	653			

Table 5.6: Distribution of Additional Trips Generated by the Proposed Development

The carriageway traffic volumes, including the Marketown redevelopment along Norwest Boulevard, Solent Circuit, Windsor Road and other approach roads are summarised in **Table 5.7**, together with their appropriate level of service.

Table 5.7: Carriageway Level of Service with Planning Proposal

			AM PEAK			PM PEAK		
Roads	Lanes	East/North	South/West	LoS	East/North	South/West	LoS	
Uninterrupted Volumes (Table 2 Appendix D)							
Windsor Road								
North of Norwest Blvd	4DCL	1,075	2,291	В	2,267	1,701	В	
South of Norwest Blvd	4DCL	1,663	1,917	A	1,749	1,843	А	
Norwest Boulevarde*								
Windsor Rd to Columbia	4DCL	1,561	2,523	В	2,306	1,648	В	
Columbia to Solent Cir (east)	4DCL	1,451	1,729	A	1,809	1,446	А	
Solent Cir (east) to Century east	4DCL	1,268	1,429	A	1,540	1,385	А	
Century East to Brookhollow	4DCL	1,047	1,179	А	1,169	1,381	А	
Brookhollow to Reston Gr	4DCL	1,625	1,462	А	1,617	1,838	А	
Reston Grange to Westwood Dr	4DCL	1,694	1,545	A	1,580	1,798	А	
Interrupted Volumes (Table 1 Appendix B)								
Solent Circuit								
Norwest Blvd to Inglewood Pl	4DP	803	382	A	326	609	А	
West of Fairview Dr	4DP	371	491	A	547	456	А	
Century Circuit West								
Norwest Blvd to rear Car Park access	4D	884	454	A	886	782	А	
Century Circuit East								
Norwest Blvd to Century Ct	20	125	382	A	74	430	A	

The section of Norwest Boulevarde between Windsor Road and Columbia Place would operate at level of service "B", the remaining length of this road would continue to operate at a level of service "A".

To the north of Norwest Boulevarde, Windsor Road would operate at level of service "B". To the south of Norwest Boulevarde, Windsor Road would continue to operate at a level of service "A".

Century Circuit would continue to operate at a very good level of service "A".

5.4.4 Impact on Critical Intersections

An analysis of the operation of the intersections likely to be impacted by the Planning Proposal was also carried out using the SIDRA computer intersection modelling program. The results of this analysis are included in **Appendix G** and summarised in **Table 5.8**.

The traffic signals at the intersection of Norwest Boulevarde with Windsor Road would operate at level of service "C" and worsen to a still acceptable level of service "D", during the morning and afternoon peak periods.

The roundabout controlling the intersection of Norwest Boulevarde with Columbia Court and Brookhollow Avenue is expected to continue to operate at a good level of service "B". However, the queue likely to be generated along Norwest Boulevarde at Windsor Road will be longer than the distance between Windsor Road and the roundabout (125m) thus extending well beyond the roundabout and affecting its operation. The proposed replacement of the roundabout by TfNSW with traffic signals will alleviate the situation.

The signalised intersection of Norwest Boulevarde with Solent Circuit east would operate at a good level of service "B" in the morning and afternoon peak.

The roundabout at the intersection of Norwest Boulevarde with Solent Circuit and Reston Grange would operate at an acceptable Level of Service "D" or better. However, it is pertinent to note that Mulpha has offered and Council/TfNSW accepted a monetary contribution of \$5 million.

	AN	١	PM	
INTERSECTION	Delay sec/v	LoS	Delay sec/v	Los
Traffic Signals				
Norwest Boulevarde with Windsor Road	31.3	С	46.1	D
Norwest Boulevarde with Solent Circuit (east)	19.6	В	19.8	В
Norwest Boulevarde with Brookhollow/Century Circuit	88.7	F	163.9	F
Norwest Boulevarde with Brookhollow/Century Circuit **	39.7	С	46.2	D
Roundabouts				
Norwest Boulevarde with:				
Brookhollow Ave / Columbia Court	18.5	В	21.0	В
Solent Circuit / Reston Grange	54.6	D	23.3	В
Fairway Drive with Solent Circuit	12.5	A	15.2	В

Table 5.8: Operation of Intersections with Planning Proposal

** With suggested improvements

The signalised intersection of Norwest Boulevarde with Brookhollow Avenue and Century Circuit would operate at a very poor level of service "F" in the morning and afternoon peak. The following improvements, illustrated in **Figure 5.1**, would considerably improve the operation of this intersection:

- Provision of an additional right turn lane in Norwest Boulevarde into Century Circuit west.
- Extend a right turn lane from Century Circuit west into Norwest Boulevarde for a length of 200 m. This will necessitate the removal of the roundabout at the access of Hillsong; . Access to Hillsong and Century Estate via Norwest Boulevarde will be retained for both left and right-hand turning movements. Hillsong egress via Century Circuit west will be provided via the proposed extension within the Norwest Marketown site.
- Provision of an additional kerbside lane in Brookhollow Drive to cater exclusively for the left turn movement into Norwest Boulevarde. The existing two lanes would cater for the through and right turn movements.

The implementation of these improvements at the intersection of Norwest Boulevarde with Brookhollow Avenue and Century Circuit, as shown in **Figure 5,1**, will result in levels of service "C" and "D" during the morning and afternoon peak hours respectively.



Figure 5.1: Proposed layout at intersection of Norwest Bvd, Brookhollow and Century Ct West

The roundabout at the intersection of Fairway Drive with Solent Circuit would operate at a good Level of Service "B" or better. There is no need to upgrade this intersection arising from the proposed development at Norwest Marketown.

5.5 Access to Hillsong

Currently, access to and from the Hillsong site can be gained off Century Ct West as shown in Figure 5.2.



Figure 5.2: Existing Access to Hillsong

The anticipated volumes along Century Ct West will necessitate the removal of the existing roundabout at the entry of the Hillsong Site. Furthermore, the driveway along the western boundary accessing the parking at the rear of the site will be as illustrated in **Figure 5.3**.



Figure 5.3: Access to Hillsong

The following movements will be affected at the location of the existing Roundabout:

- Provision of an exclusive right turn lane from Century Ct west to Century Ct
- Exit from Century Ct restricted to left turn only to Century Ct West
- Only entry to Hillsong would be permitted.

As discussed above the volume of traffic accessing and departing the site in the future will necessitate the removal of the roundabout. The existing volume of traffic at the roundabout for the morning and afternoon peak hours are shown in **Figures 5.4** & **5.5** respectively.



The existing volumes accessing and exiting Hillsong can currently negotiate the roundabout given the current volumes of traffic accessing Marketown.

The considerable increase in volumes accessing and departing Marketown in the future will necessitate the removal of the roundabout.

The removal of the roundabout and the increased traffic volumes at this location accessing and departing Marketown will have the following impact on Hillsong traffic:

- Traffic entering the Hillsong from Norwest Boulevarde would be able to use Century Ct west and turn left into Hillsong,
- Direct access from Century Ct to Hillsong would not be permitted as shown in Figure 5.3,
- Existing volume of traffic exiting Hillsong would find it very difficult to cross the two-way flows along Century Ct west. It would be easier for this traffic to use the other exist driveways to Fairway Drive and Solent Circuit

It is also proposed to include a pedestrian crossing along the main driveway to facilitate access to Marketown from Hillsong. In order that the continuous flow of pedestrian does not impede the traffic flows along driveway, it is recommended that Pedestrian signals be provided at this location.

5.6 Council's Draft Precinct Plan

Council has placed on exhibition the "Draft Precinct Plan- Norwest Strategic Centre" which include the Marketown Site. The Plan proposes major improvements reproduced below.

5.6.1 Road Network

Major improvements suggested in the Draft Precinct Plan which will directly impact access to and from Marketown includes:

- Upgrade of Norwest Boulevarde, Columbia Court and Brookhollow Avenue intersection (signalisation including restricted right turn movements onto Brookhollow Avenue and Columbia Court)
- Signalisation of Norwest Boulevarde and Reston Grange intersection
- Ensuring that the road network continues to operate at an acceptable level of service will require the implementation of a combination of measures including
 - Reduced parking rates that recognise the accessibility of high frequency public transport services to and from the Strategic Centre.
 - Modal shift toward increased public transport usage to access the Strategic Centre (assisted through reduced parking rates, improved access to Metro Stations, the delivery of a mass transit link between Norwest and Parramatta and connectivity and public domain improvements).
 - Upgrades and expansion of certain roads and intersections to increase capacity. This will contain the impact, as much as possible, to the walkable catchment of each Metro Station, whilst ensuring that traffic continues to flow efficiently.
- Signalisation of Fairway Drive and Solent Circuit intersection, particularly if the proposed Draft Norwest Precinct Plan proposal for a link road between Norwest Boulevarde and Solent Circuit is to progress.
 - > New connection from Columbia Way to Spurway Drive
 - Completion of Spurway Drive.
 - > Upgrade of Columbia Way to a public road.
 - > New Road Link between Spurway Drive and Maitland Place.
 - > New Road Link between Columbia Court and Spurway Drive (and associated intersection upgrades).
 - A new road connection is proposed alongside the Norwest Hillsong Campus, providing a direct connection from Norwest Boulevarde to Solent Circuit. Council has indicated this may take the form of a "slow way" with potential pedestrian and cycle access.

In view of comments made in section 5.5 above in relation to access to and from Hillsong at Century Circuit west, the provision of a direct connection from Norwest Boulevarde to Solent Circuit could only be supported if the current exit at Century Circuit west is prohibited. The new roadway should be a Shared Link servicing future developments in the Hillsong site (slow speed for use by pedestrians and cyclists). A connection allowing Marketown vehicles to use the proposed roadway to access Fairway Drive would be supported.

In the case of the installation of traffic signals at the intersection of Solent Circuit (East) with Norwest Boulevarde, Mulpha carried out the work, in accordance with plans approved by Transport for NSW.

5.6.2 **Regional Rail Connections**

- Extend the metro from Tallawong to St Marys.
- Potential mass-transit connection from Norwest to Parramatta.
- The Regional Traffic Modelling will assist in enabling the road network to operate more efficiently.

5.6.3 Cycling and Pedestrian Upgrades

- Provision of a new bridge across Windsor Road from the Service Precinct to Norwest
- Various pedestrian crossings proposed across Norwest Boulevarde.

6. Summary and Conclusions

6.1 Access and Parking

Mulpha Norwest is proposing to proceed with a major redevelopment of the site to provide a large shopping centre, new office buildings, residential towers and a hotel. The Planning Proposal would accommodate up to 232,375 m² Gross Floor Area (GFA) including 80,590 m² GFA of office space, about 28,150 m² GFA of retail, up to 854 apartments, and 200 rooms hotel. It will also include approximately 12,000 m² GFA of community and ancillary facilities such as a child care centre, gymnasium, swimming learning centre, a cinema and library.

These facilities are likely to require the provision of about 2,600 spaces; 925 spaces for residents and their visitors, and about 1,675 spaces for the commercial and hotel components of the development. It is proposed to supply the required number of parking spaces in a multi-level basement car park.

6.2 Traffic Impact

The Marketown development currently generates about 660 and 1,025 vehicle trips during the morning and afternoon peak hours respectively. Overall, the proposal for the Marketown redevelopment is expected to generate about 1,660 and 2,160 vehicle trips during the morning and afternoon peak hours respectively. Thus, the redevelopment of the site would effectively result in a net increase of about 1,010 and 1,040 additional trips during the morning and afternoon peak hours respectively. The proposed development will only marginally affect the level of service of all major approach roads to the site.

The section of Norwest Boulevarde between Windsor Road and Columbia Place would operate at level of service "B", the remaining length of this road would continue to operate at a level of service "A".

The traffic signals at the intersection of Norwest Boulevarde with Windsor Road, with Solent Circuit east and with Reston Grange and Solent Circuit would operate at level of service "D" or better. The roundabout at the intersection of Fairway Drive with Solent Circuit would operate at a good Level of Service "B" or better.

The roundabout controlling the intersection of Norwest Boulevarde with Columbia Court and Brookhollow Avenue is expected to operate at a good level of service "B". However, the queue likely to be generated along Norwest Boulevarde at Windsor Road will be longer (~250m) than the distance between Windsor Road and the roundabout (125m) thus extending well beyond the roundabout and affecting its operation. To address this issue, it is understood that TfNSW is planning the replacement of the roundabout with traffic signals with the banning of the right turning movements from Norwest Boulevarde.

The signalised intersection of Norwest Boulevarde with Brookhollow Avenue and Century Circuit would operate at a very poor level of service "F" in the morning and afternoon peak respectively. The following improvements would improve the operation of this intersection which will result in LoS "D" or better.

Extend a right turn lane from Century Circuit west into Norwest Boulevarde for a length of 200 m. This will necessitate the removal of the roundabout at the access of Hillsong. Access to Hillsong and Century Estate will be retained for both left and right-hand turning movements from Norwest Boulevarde. Hillsong egress via Century Circuit west will be provided via the proposed driveway extension within the Norwest Marketown site.

6.3 Conclusions and Recommendations

It should be noted that prior to the Development Application stage, the number of parking spaces of each land use would be reviewed. The proposed development would have a marginal impact on the surrounding road network providing the following recommended measures are implemented:

- At the signalised intersection of Norwest Boulevarde with Brookhollow Avenue and Century Circuit
 - > Provision of an additional right turn lane in Norwest Boulevarde into Century Circuit west.
 - Provision of an additional kerbside lane in Brookhollow Drive to cater exclusively for the left turn movement into Norwest Boulevarde. The existing two lanes would cater for the through and right turn movements.
- Adjustment to the access driveway will be required at Century Circuit east at Norwest Boulevarde to accommodate articulated vehicle left-hand turning movements.

Furthermore, a Green Travel Plan should be prepared in support of reducing parking supply of the development, and to encourage the use of the Metro and buses, as well active transport within the area.

APPENDICES

Appendix A Trip Generation of Hotel

APPENDIX A

HOTEL

Location: Market Town NORWEST PARKING ESTIMATION & TRAFFIC GENERATION

		Staff			Rooms			Total		Hourly	Trips (en	d period)
PERIOD ENDING	Arr	Dep	Acc	Arr	Dep	Acc	Arr	Dep	Acc	Arr	Dep	Total
			7			96			103			
0.30 AM			7			96	0	0	103			
1.00 AM			7			96	0	0	103			
1.30 AM			7			96	0	0	103			
2.00 AM			7			96	0	0	103	0	0	0
2.30 AM			7			96	0	0	103	0	0	0
3.00 AM			7			96	0	0	103	0	0	0
3.30 AM			7			96	0	0	103	0	0	0
4.00 AM			7			96	0	0	103	0	0	0
4.30 AM			7			96	0	0	103	0	0	0
5.00 AM			7			96	0	0	103	0	0	0
5.30 AM			/			96	0	0	103	0	0	0
6.00 AM	-		/		-	96	0	0	103	0	0	0
6.30 AM	5	•	12		1	89	5	1	101	5	7	12
7.00 AM	10	2	20		12	11	10	14	97	15	21	36
7.30 AM	5	5	20		15	62 47	5	20	82 67	15	34	49
8.00 AW			20		10	47	0	10	07 52	5	30	40
0.30 AIVI			20		14	33 22	0	14	00 42	0	29	29
9.00 AM			20		10	20 12	0	10	40	0	24	24
9.30 AW			20		5	13 8	0	5	28	0	20 15	20
10.00 AM			20		5	2	0	5	20	0	10	15
10.30 AW			20		5 3	3	0	2 3	20	0	10 8	10 Q
11 00 AM			20		5	0	0	0	20	0	0 3	0
11.00 AM			20			0	0	0	20	0	0	5
12 00 PM			20			0	0	0	20	0	0	0
12.00 PM			20			0	0	0	20	0	0	0
1.00 PM			20			0	0	0	20	0	0	0
130 PM			20			0 0	0 0	0 0	20	0 0	Õ	0
2.00 PM			20			0	0	0	20	0	0	0
2.30 PM	6	4	22			0	6	4	22	6	4	10
3.00 PM	7	7	22	4		4	11	7	26	17	11	28
3.30 PM	7	9	20	11		15	18	9	35	29	16	45
4.00 PM			20	11		26	11	0	46	29	9	38
4.30 PM			20	11		37	11	0	57	22	0	22
5.00 PM			20	13		50	13	0	70	24	0	24
5.30 PM			20	13		63	13	0	83	26	0	26
6.00 PM			20	10		73	10	0	93	23	0	23
6.30 PM			20	9		82	9	0	102	19	0	19
7.00 PM			20	7		89	7	0	109	16	0	16
7.30 PM			20	5		94	5	0	114	12	0	12
8.00 PM			20	2		96	2	0	116	7	0	7
8.30 PM			20			96	0	0	116	2	0	2
9.00 PM			20			96	0	0	116	0	0	0
9.30 PM			20			96	0	0	116	0	0	0
10.00 PM			20			96	0	0	116	0	0	0
10.30 PM	3		23			96	3	0	119	3	0	3
11.00 PM	4	7	20			96	4	7	116	7	7	14
11.30 PM		6	14			96	0	6	110	4	13	17
12.00 PM		7	7			96	0	7	103	0	13	13

APPENDIX B: Preliminary Parking Layouts



fjcstudio

Scale	0	10	20	50m
1:1000 @ A3				





1/8/2023

fjcstudio formerly fjmtstudio

20B1 — Indicative Lower Ground Level Plan MULPHA — NORWEST







28/7/2023



20B6 — Level -6 Residential Parking MULPHA — NORWEST **Scale** 1:1000 @ A3

0






28/7/2023

fjcstudio

20B5 — Level -5 Residential Parking MULPHA — NORWEST

Scale 1:1000 @ A3

0









28/7/2023

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20B4 — Level -4 Commercial Parking MULPHA — NORWEST

Scale 1:1000 @ A3

0







1/8/2023

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Scale



0



fjcstudio

APPENDIX C - Existing Traffic Volumes





APPENDIX D- Concept of Carriageway Capacity and Level of Service

Concept of Carriageway Capacity and Level of Service

The capacity of major streets within an urban area can be based on an assessment of their operating Level of Service.

Level of service is defined by Austroads as a "qualitative measure of the effects of a number of features, which include speed and travel time, traffic interruptions, freedom to manoeuvre, safety, driving comfort and convenience, and operating costs. Levels of service are designated from A to F from best (free flow conditions) to worst (forced flow with stop start operation, long queues and delays) as follows:

*LEVELS OF SERVICE

- A Free flow (almost no delays);
- B Stable flow (slight delays);
- C Stable flow (acceptable delays);
- D Approaching unstable flow (tolerable delays);
- E Unstable flow (congestion; intolerable delays); and
- F Forced flow (jammed).

A service volume, as defined by Austroads, is the maximum number of vehicles that can pass over a given section of roadway in one direction for one hour while operating conditions are maintained at a specified level of service. It is suggested that ideally arterial and sub-arterial roads should not exceed service volumes at level of service C. At this level, whilst most drivers are restricted in their freedom to manoeuvre, operating speeds are still reasonable and acceptable delays experienced. However, in urban situations, arterial and sub-arterial roads operating at Level of Service D are still considered adequate. Traffic Volumes along urban roads with interrupted and uninterrupted flow conditions are included in **Table D-1** and **D-2** respectively.

	LEVEL OF SERVICE							
DESCRIPTION	A	В	С	D	E			
2 Lane Undivided	540	630	710	810	900			
4 Lane Undivided	900	1050	1200	1350	1500			
4 Lane Undivided with Clearways	1080	1260	1440	1620	1800			
4 Lane Divided with Clearways	1140	1330	1520	1710	1900			
4 Lane Divided with Clearways, limited access and limited intersections	1610	1870	2140	2410	2670			
6 Lane Undivided	1440	1680	1920	2160	2400			
6 Lane Divided with Clearway	1740	2030	2320	2610	2900			

Table D-1: Level of Service Interrupted Flow Conditions along Urban Roads (One Way Hourly Volumes)

Table D-2: Level of Service Uninterrupted Flow Conditions along Urban Roads (One Way Hourly Volumes)

	LEVEL OF SERVICE								
DESCRIPTION	A	В	С	D	E				
4 Lane Undivided (13m)	1260	1470	1680	1890	2100				
4 Lane Undivided with Clearways	1510	1760	2010	2270	2520				
4 Lane Divided with Clearways	1600	1860	2130	2400	2660				
4 Lane Divided with Clearways, limited access and limited intersections	2250	2620	3000	3380	3740				
6 Lane Undivided	2020	2350	2690	3020	3360				
6 Lane Divided with Clearway	2440	2840	3250	3660	4060				
6 Lane Divided with Clearways, limited access and limited intersections	3375	3930	4500	5070	5610				

* 40% higher than base volumes in Table D-1

APPENDIX E: Guidelines for Evaluation of Intersection Capacity

Guidelines for Evaluation of Intersection Capacity

The RTA has included in the "Guide to Traffic Generating Developments" (2002) a section on the assessment of intersections. The assessment of the level of service of an intersection is based on the evaluation of the following Measures of Effectiveness:

- (a) Average delay (seconds/veh) (all forms of control)
- (b) Delay to critical movement (seconds/veh) (all forms of control)
- (c) Degree of saturation (traffic signals and roundabouts)
- (d) Cycle length (traffic signals)

The latest SIDRA software was used to calculate the relevant intersection parameters.

The best indicator of the level of service at an intersection is the average delay experienced by vehicles at that intersection. For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (with Stop and Give Way signs or operating under the T-junction rule) the critical movement for level of service assessment should be that with the highest average delay.

With traffic signals, delays per approach tend to be equalised, subject to any over-riding requirements of signal co-ordination as well as to variations within individual movements. With roundabouts and priority - control intersections, the critical criterion for assessment is the movement with the highest delay per vehicle. With this type of control the volume balance might be such that some movements suffer high levels of delay while other movements have minimal delay. An overall average delay for the intersection of 25 seconds might not be satisfactory if the average delay on one movement is 60 seconds.

The average delay for level of service E should be no more than 70 seconds. The accepted maximum practical cycle length for traffic signals under saturated conditions is 120 - 140 seconds. Under these conditions 120 seconds is near maximum for two and three phase intersections and 140 seconds near maximum for more complex phase designs. Drivers and pedestrians expect cycle lengths of these magnitudes and their inherent delays in peak hours. A cycle length of 140 seconds for an intersection which is almost saturated has an average vehicle delay of about 70 seconds, although this can vary. If the average vehicle delay is more than 70 seconds, the intersection is assumed to be at Level of Service F.

Table E-1 sets out average delays for different levels of service. There is no consistent correlation betweendefinitions of levels of service for road links as defined elsewhere in this section, and the ranges set out inTable D1. In assigning a level of service, the average delay to motoring the public needs to beconsidered, keeping in mind the location of the intersection. For example, drivers in inner-urban areas ofSydney have a higher tolerance of delay than drivers in country areas.Table E-1 provides a recommendedbaseline for assessment.

Level of Service	Average Delay per Veicle (seconds/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
Α	less than 14	Good operation	Good operation
В	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
с	29 - 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, required other control mode

Table E-1: Level of Service Critera for Intersections

The figures in **Table E-1** are intended as a guide only. Any particular assessment should take into account site-specific factors including maximum queue lengths (and their effect on lane blocking), the influence of nearby intersections and the sensitivity of the location to delays. In many situations, a comparison of the current and future average delay provides a better appreciation of the impact of a proposal, and not simply the change in the level of service.

The intersection degree of saturation (DS) can also be used to measure the performance of isolated intersections. At intersections controlled by traffic signals, both queue length and delays increase rapidly as DS approaches 1.0. An upper limit of 0.9 is appropriate. When DS exceeds 0.8 - 0.85, overflow queues start to become a problem. Satisfactory intersection operation is generally achieved with a DS of about 0.7 - 0.8. (Note that these figures are based on isolated signalised intersections with cycle lengths of 120 seconds. In co-ordinated signal systems DS might be actively maximised at key intersections). Although in some situations additional traffic does not alter the level of service, particularly where the level of service is E or F, additional capacity may still be required. This is particularly appropriate for service level F, where small increases in flow can cause disproportionately greater increases in delay. In this situation, it is advisable to consider means of control to maintain the existing level of absolute delay. Suggested criteria for the evaluation of the capacity of signalised intersections based on the Degree of Saturation are summarised in **Table E-2**.

Table E-2: Criteria for Evaluating Capacity of Signalised Intersections*

Level of Service	Optimum Cycle Length (Seconds) (Co)	Volume/Saturation Y	Intersection Degree of Saturation X
A/B - Very good operation	< 90	< 0.70	< 0.80
C - Satisfactory	90-120	0.70-0.80	0.80-0.85
D - Poor but manageable	120-140	0.80-0.85	0.85-0.90
E/F - Bad, extra capacity required	>140	>0.85	> 0.90

* Source: Roads & Traffic Authority (2002)

APPENDIX F: Sidra Results for Existing Conditions

SITE LAYOUT

Site: 0397 [01 Winsor Rd/Norwest Blvd AM Ex (Site Folder: General)]

22033 01 Winsor Rd/Norwest Blvd AM Ex Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Coordinated

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



Site: 0397 [01 Winsor Rd/Norwest Blvd AM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

01 Winsor Rd/Norwest Blvd AM Ex

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 100 seconds (Site Practical Cycle Time)

Vehic	le M	ovemen	t Perfo	rma	nce										
Mov ID	Turn	Mov Class	Derr Fl [Total veh/h	nand Iows HV] %	Ar Fl [Total] veh/h	rival lows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% E Qu [Veh. veh	Back Of leue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South	Wins	sor Rd (S	outh)												
1	L2	All MCs	998	2.8	998	2.8	0.596	28.1	LOS B	18.1	129.4	0.80	0.83	0.80	36.4
2	T1	All MCs	529	2.5	529	2.5	*0.673	34.7	LOS C	11.5	82.1	0.92	0.77	0.93	42.3
Appro	ach		1527	2.7	1527	2.7	0.673	30.4	LOS C	18.1	129.4	0.84	0.81	0.84	38.8
North:	Wins	or Rd (No	orth)												
8	T1	All MCs	877	2.5	877	2.5	0.211	6.7	LOS A	5.4	38.3	0.41	0.35	0.41	62.2
9	R2	All MCs	1250	2.7	1250	2.7	*0.817	21.8	LOS B	22.4	160.3	0.75	0.83	0.79	40.7
Appro	ach		2127	2.6	2127	2.6	0.817	15.6	LOS B	22.4	160.3	0.61	0.64	0.63	49.6
West:	Norw	est Blvd													
10	L2	All MCs	422	6.9	422	6.9	0.173	12.3	LOS A	3.6	26.3	0.37	0.68	0.37	46.2
12	R2	All MCs	842	3.2	842	3.2	*0.736	49.0	LOS D	13.5	97.1	0.99	0.87	1.06	27.5
Appro	ach		1264	4.4	1264	4.4	0.736	36.7	LOS C	13.5	97.1	0.79	0.81	0.83	31.8
All Ve	nicles		4918	3.1	4918	3.1	0.817	25.6	LOS B	22.4	160.3	0.73	0.73	0.75	40.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov D Crossing	Input	Dem.	Aver.	Level of	AVERAGE	BACK OF	Prop.	Eff.	Travel	Travel	Aver.
ID crocoing	VOI.	FIOW	Delay	Service	[Ped	Dist]	Que	Rate	nme	DISI.	Speed
	ped/h	ped/h	sec		ped	m			sec	m	m/sec
North: Winsor	Rd (Nor	th)									
P3 Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	59.7	20.0	0.34
West: Norwes	t Blvd										
P4 Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	59.7	20.0	0.34
All Pedestrians	100	105	44.3	LOS E	0.1	0.1	0.94	0.94	59.7	20.0	0.34

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.

PHASING SUMMARY

Site: 0397 [01 Winsor Rd/Norwest Blvd AM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 01 Winsor Rd/Norwest Blvd AM Ex Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 100 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog Phase Times determined by the program Phase Sequence: Variable Phasing Input Phase Sequence: A, B, C Output Phase Sequence: A, B, C Reference Phase: Phase A

Phase Timing Summary

Phase	Α	В	С
Phase Change Time (sec)	0	25	73
Green Time (sec)	19	42	21
Phase Time (sec)	25	48	27
Phase Split	25%	48%	27%
Phase Frequency (%)	100.0	100.0	100.0

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase VAR: Variable Phase

\implies	Normal Movement	\rightarrow	Permitted/Opposed
$ \longrightarrow $	Slip/Bypass-Lane Movement	$ \longrightarrow $	Opposed Slip/Bypass-Lane
	Stopped Movement		Turn On Red
\implies	Other Movement Class (MC) Running	\implies	Undetected Movement
	Mixed Running & Stopped MCs	$ \longrightarrow $	Continuous Movement
	Other Movement Class (MC) Stopped	•	Phase Transition Applied

Site: 0397 [01 Winsor Rd/Norwest Blvd PM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

01 Winsor Rd/Norwest Blvd PM Ex

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 100 seconds (Site Practical Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Derr F [Total veh/h	nand Iows HV] %	Ar Fl [Total] veh/h	rival lows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% B Que [Veh. veh	ack Of eue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South	: Wins	or Rd (S	outh)												
1	L2	All MCs	506	3.4	506	3.4	0.236	17.0	LOS B	5.8	41.7	0.51	0.72	0.51	43.9
2	T1	All MCs	1149	1.5	1149	1.5	*0.891	30.1	LOS C	27.7	196.0	0.96	0.93	1.07	44.7
Appro	ach		1655	2.1	1655	2.1	0.891	26.1	LOS B	27.7	196.0	0.82	0.86	0.90	44.5
North:	Wins	or Rd (No	orth)												
8	T1	All MCs	627	4.0	627	4.0	0.158	0.4	LOS A	0.2	1.7	0.03	0.02	0.03	69.5
9	R2	All MCs	917	3.8	917	3.8	*0.874	53.0	LOS D	24.8	179.0	1.00	0.98	1.21	26.5
Appro	ach		1544	3.9	1544	3.9	0.874	31.6	LOS C	24.8	179.0	0.60	0.59	0.73	38.9
West:	Norw	est Blvd													
10	L2	All MCs	962	2.5	962	2.5	0.462	19.9	LOS B	13.6	97.0	0.63	0.78	0.63	41.2
12	R2	All MCs	1061	1.5	1061	1.5	*0.875	57.4	LOS E	19.4	137.4	1.00	0.99	1.25	25.2
Appro	ach		2023	2.0	2023	2.0	0.875	39.6	LOS C	19.4	137.4	0.82	0.89	0.96	30.9
All Ve	hicles		5222	2.6	5222	2.6	0.891	32.9	LOS C	27.7	196.0	0.76	0.79	0.87	37.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov D Crossing	Input	Dem.	Aver.	Level of	AVERAGE	BACK OF	Prop.	Eff.	Travel	Travel	Aver.
ID crocoing	VOI.	FIOW	Delay	Service	[Ped	Dist]	Que	Rate	nme	DISI.	Speed
	ped/h	ped/h	sec		ped	m			sec	m	m/sec
North: Winsor	Rd (Nor	th)									
P3 Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	59.7	20.0	0.34
West: Norwes	t Blvd										
P4 Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	59.7	20.0	0.34
All Pedestrians	100	105	44.3	LOS E	0.1	0.1	0.94	0.94	59.7	20.0	0.34

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.

PHASING SUMMARY

Site: 0397 [01 Winsor Rd/Norwest Blvd PM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 01 Winsor Rd/Norwest Blvd PM Ex Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 100 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog Phase Times determined by the program Phase Sequence: Variable Phasing Input Phase Sequence: A, B, C Output Phase Sequence: A, B, C Reference Phase: Phase A

Phase Timing Summary

Phase	Α	В	С
Phase Change Time (sec)	0	37	72
Green Time (sec)	31	29	22
Phase Time (sec)	37	35	28
Phase Split	37%	35%	28%
Phase Frequency (%)	100.0	100.0	100.0

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase VAR: Variable Phase

\implies	Normal Movement	\rightarrow	Permitted/Opposed
$ \longrightarrow $	Slip/Bypass-Lane Movement	$ \longrightarrow $	Opposed Slip/Bypass-Lane
	Stopped Movement		Turn On Red
\implies	Other Movement Class (MC) Running	\implies	Undetected Movement
	Mixed Running & Stopped MCs	$ \longrightarrow $	Continuous Movement
	Other Movement Class (MC) Stopped	•	Phase Transition Applied

SITE LAYOUT

W Site: 02 [02 Norwest Blvd/Columbia Ct/Brookhollow Ave AM

Ex (Site Folder: General)]

22033 02 Norwest Blvd/Columbia Ct/Brookhollow Ave AM Ex Site Category: (None) Roundabout

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



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V Site: 02 [02 Norwest Blvd/Columbia Ct/Brookhollow Ave AM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

02 Norwest Blvd/Columbia Ct/Brookhollow Ave AM Ex Site Category: (None) Roundabout

Vehicle Movement Performance Mov Turn Mov Demand Arrival Dec. Aver. Level of 95% Back Of Prop. Eff. Aver. Aver.															
Mov ID	Turn	Mov Class	Dem Fl [Total	nand Iows HV 1	Ar Fl [Total	rival ows HV 1	Deg. Satn	Aver. Delay	Level of Service	95% B Que [Veh.	ack Of eue Dist 1	Prop. Que	Eff. Stop Rate	Aver. No. of Cvcles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m			- ,	km/h
South:	Broo	khollow A	ve												
1	L2	All MCs	54	1.9	54	1.9	0.153	9.8	LOS A	0.8	5.4	0.84	0.87	0.84	48.8
2	T1	All MCs	7	0.0	7	0.0	0.230	7.5	LOS A	1.3	9.6	0.89	0.87	0.89	42.8
3	R2	All MCs	109	1.8	109	1.8	0.230	13.1	LOS A	1.3	9.6	0.89	0.87	0.89	46.5
3u	U	All MCs	1	0.0	1	0.0	0.230	15.0	LOS B	1.3	9.6	0.89	0.87	0.89	42.3
Approa	ach		171	1.8	171	1.8	0.230	11.8	LOS A	1.3	9.6	0.87	0.87	0.87	47.0
East: I	Norwe	est Blvd (E	East)												
4	L2	All MCs	474	0.4	474	0.4	0.823	6.0	LOS A	11.2	80.2	0.72	0.56	0.72	58.0
5	T1	All MCs	1363	4.0	1363	4.0	0.823	6.7	LOS A	11.6	83.6	0.75	0.58	0.76	57.5
6	R2	All MCs	320	0.6	320	0.6	0.823	12.8	LOS A	11.6	83.6	0.77	0.60	0.80	55.5
6u	U	All MCs	76	3.9	76	3.9	0.823	15.5	LOS B	11.6	83.6	0.77	0.60	0.80	54.7
Approa	ach		2233	2.7	2233	2.7	0.823	7.7	LOS A	11.6	83.6	0.75	0.58	0.76	57.2
North:	Colu	ımbia Ct													
7	L2	All MCs	100	1.0	100	1.0	0.137	5.4	LOS A	0.7	4.9	0.74	0.74	0.74	51.5
8	T1	All MCs	8	0.0	8	0.0	0.089	5.9	LOS A	0.4	2.8	0.72	0.82	0.72	43.8
9	R2	All MCs	37	2.7	37	2.7	0.089	11.5	LOS A	0.4	2.8	0.72	0.82	0.72	47.6
9u	U	All MCs	1	0.0	1	0.0	0.089	13.4	LOS A	0.4	2.8	0.72	0.82	0.72	43.3
Approa	ach		146	1.4	146	1.4	0.137	7.0	LOS A	0.7	4.9	0.73	0.77	0.73	49.9
West:	Norw	est Blvd (West)												
10	L2	All MCs	70	4.3	70	4.3	0.604	8.9	LOS A	5.6	40.6	0.79	0.74	0.92	57.0
11	T1	All MCs	971	5.3	971	5.3	0.604	9.4	LOS A	5.6	40.6	0.80	0.75	0.93	57.1
12	R2	All MCs	98	0.0	98	0.0	0.604	15.3	LOS B	5.4	38.8	0.80	0.77	0.94	55.6
12u	U	All MCs	4	0.0	4	0.0	0.604	18.0	LOS B	5.4	38.8	0.80	0.77	0.94	55.6
Approa	ach		1143	4.7	1143	4.7	0.604	9.9	LOS A	5.6	40.6	0.80	0.75	0.93	56.9
All Veh	nicles		3693	3.2	3693	3.2	0.823	8.5	LOS A	11.6	83.6	0.77	0.65	0.82	56.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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V Site: 02 [02 Norwest Blvd/Columbia Ct/Brookhollow Ave PM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

02 Norwest Blvd/Columbia Ct/Brookhollow Ave PM Ex Site Category: (None) Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Den F	nand lows H\/ 1	Ar Fl [Total	rival lows H\/ 1	Deg. Satn	Aver. Delay	Level of Service	95% E Qu [Veh	Back Of eue Dist 1	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m		- Titato		km/h
South:	Broo	khollow A	ve												
1	L2	All MCs	87	1.1	87	1.1	0.161	7.1	LOS A	0.7	4.8	0.70	0.77	0.70	50.7
2	T1	All MCs	8	12.5	8	12.5	0.342	5.9	LOS A	1.8	12.7	0.75	0.83	0.77	43.6
3	R2	All MCs	267	0.7	267	0.7	0.342	11.0	LOS A	1.8	12.7	0.75	0.83	0.77	47.7
3u	U	All MCs	1	0.0	1	0.0	0.342	13.0	LOS A	1.8	12.7	0.75	0.83	0.77	43.2
Approa	ach		363	1.1	363	1.1	0.342	9.9	LOS A	1.8	12.7	0.74	0.82	0.75	48.3
East: N	Vorwe	est Blvd (I	East)												
4	L2	All MCs	207	1.0	207	1.0	0.547	5.5	LOS A	4.1	29.8	0.47	0.49	0.47	59.2
5	T1	All MCs	1062	4.7	1062	4.7	0.547	5.9	LOS A	4.1	29.8	0.47	0.52	0.47	59.0
6	R2	All MCs	93	0.0	93	0.0	0.547	11.6	LOS A	4.0	29.2	0.48	0.54	0.48	57.3
6u	U	All MCs	66	1.5	66	1.5	0.547	14.3	LOS A	4.0	29.2	0.48	0.54	0.48	57.0
Approa	ach		1428	3.7	1428	3.7	0.547	6.6	LOS A	4.1	29.8	0.47	0.52	0.47	58.8
North:	Colu	ımbia Ct													
7	L2	All MCs	313	0.3	313	0.3	0.571	11.6	LOS A	4.1	29.0	0.94	1.01	1.23	47.8
8	T1	All MCs	13	0.0	13	0.0	0.208	8.8	LOS A	1.0	7.2	0.83	0.90	0.83	42.4
9	R2	All MCs	66	0.0	66	0.0	0.208	14.3	LOS A	1.0	7.2	0.83	0.90	0.83	46.4
9u	U	All MCs	1	0.0	1	0.0	0.208	16.3	LOS B	1.0	7.2	0.83	0.90	0.83	42.0
Approa	ach		393	0.3	393	0.3	0.571	12.0	LOS A	4.1	29.0	0.92	0.99	1.15	47.3
West:	Norw	est Blvd (West)												
10	L2	All MCs	48	4.2	48	4.2	0.724	9.7	LOS A	8.4	60.3	0.82	0.77	1.01	56.7
11	T1	All MCs	1381	2.6	1381	2.6	0.724	10.1	LOS A	8.4	60.3	0.83	0.78	1.03	57.0
12	R2	All MCs	88	1.1	88	1.1	0.724	16.3	LOS B	8.2	58.3	0.84	0.80	1.06	55.2
12u	U	All MCs	5	20.0	5	20.0	0.724	19.8	LOS B	8.2	58.3	0.84	0.80	1.06	51.1
Approa	ach		1522	2.6	1522	2.6	0.724	10.5	LOS A	8.4	60.3	0.83	0.79	1.03	56.9
All Veh	nicles		3706	2.6	3706	2.6	0.724	9.1	LOS A	8.4	60.3	0.69	0.71	0.80	55.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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SITE LAYOUT

Site: 4601 [03 Norwest Blvd/Solent CCT AM Ex (Site Folder: General)]

22033 03 Norwest Blvd/Solent CCT AM Ex Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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



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Site: 4601 [03 Norwest Blvd/Solent CCT AM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

03 Norwest Blvd/Solent CCT AM Ex

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Dem Fl [Total veh/h	nand Iows HV] %	Ar Fl [Total] veh/h	rival lows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% B Que [Veh. veh	ack Of eue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
North	East: I	Norwest E	Blvd (Ea	ast)											
5	T1	All MCs	1125	4.8	1125	4.8	0.421	7.8	LOS A	11.6	84.4	0.51	0.46	0.51	59.1
6	R2	All MCs	325	0.6	325	0.6	*0.565	45.8	LOS D	6.9	48.2	0.97	0.80	0.97	29.6
Appro	ach		1450	3.9	1450	3.9	0.565	16.3	LOS B	11.6	84.4	0.62	0.54	0.62	48.3
North	West:	Solent CO	СТ												
7	L2	All MCs	311	0.6	311	0.6	0.265	23.6	LOS B	6.0	41.9	0.72	0.74	0.72	36.1
9	R2	All MCs	33	12.1	33	12.1	*0.265	47.8	LOS D	4.5	32.8	0.82	0.76	0.82	36.1
Appro	ach		344	1.7	344	1.7	0.265	25.9	LOS B	6.0	41.9	0.73	0.75	0.73	36.1
South	West:	Norwest	Blvd (V	Vest)											
10	L2	All MCs	129	0.8	129	0.8	0.557	26.8	LOS B	15.9	115.9	0.80	0.74	0.80	42.3
11	T1	All MCs	842	6.5	842	6.5	* 0.557	20.5	LOS B	15.9	117.7	0.80	0.72	0.80	46.6
Appro	ach		971	5.8	971	5.8	0.557	21.3	LOS B	15.9	117.7	0.80	0.72	0.80	45.8
All Ve	hicles		2765	4.3	2765	4.3	0.565	19.3	LOS B	15.9	117.7	0.70	0.63	0.70	45.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance													
Mov Crossing	Input Vol	Dem. Flow	Aver. Delav	Level of Service			Prop. Que	Eff. Stop	Travel Time	Travel Dist	Aver. Speed		
	V 01.	11000	Delay	0011100	[Ped	Dist]	Quo	Rate	TIME	D101.	opeed		
	ped/h	ped/h	sec		ped	m			sec	m	m/sec		
NorthWest: Solent CCT													
P3 Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37		
SouthWest: No	orwest B	lvd (Wes	st)										
P4 Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37		
All Pedestrians	100	105	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37		

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.

PHASING SUMMARY

Site: 4601 [03 Norwest Blvd/Solent CCT AM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 03 Norwest Blvd/Solent CCT AM Ex Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Site Phasing & Timing dialog Phase Times determined by the program Phase Sequence: Variable Phasing Input Phase Sequence: A, B, C Output Phase Sequence: A, B, C Reference Phase: Phase A

Phase Timing Summary												
Phase	Α	В	С									
Phase Change Time (sec)	0	45	65									
Green Time (sec)	39	14	19									
Phase Time (sec)	45	20	25									
Phase Split	50%	22%	28%									
Phase Frequency (%)	100.0	100.0	100.0									

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase VAR: Variable Phase



Site: 4601 [03 Norwest Blvd/Solent CCT PM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

03 Norwest Blvd/Solent CCT PM Ex

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Derr Fl [Total veh/h	nand Iows HV] %	Ar Fl [Total] veh/h	rival lows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% B Que [Veh. veh	ack Of eue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
North	East: I	Norwest E	Blvd (Ea	ast)											
5	T1	All MCs	1006	4.8	1006	4.8	0.377	7.5	LOS A	10.0	72.5	0.49	0.44	0.49	59.4
6	R2	All MCs	225	0.0	225	0.0	*0.606	51.1	LOS D	5.0	35.3	1.00	0.80	1.05	28.1
Appro	ach		1231	3.9	1231	3.9	0.606	15.5	LOS B	10.0	72.5	0.58	0.50	0.59	49.4
North	West:	Solent CO	СТ												
7	L2	All MCs	381	0.5	381	0.5	0.495	27.7	LOS B	11.7	82.1	0.83	0.80	0.83	34.7
9	R2	All MCs	161	1.9	161	1.9	*0.495	40.6	LOS C	7.7	54.7	0.92	0.80	0.92	35.1
Appro	ach		542	0.9	542	0.9	0.495	31.5	LOS C	11.7	82.1	0.86	0.80	0.86	34.8
South	West:	Norwest	Blvd (V	Vest)											
10	L2	All MCs	113	0.9	113	0.9	0.630	24.6	LOS B	20.3	145.6	0.79	0.73	0.79	43.7
11	T1	All MCs	1149	3.3	1149	3.3	*0.630	18.2	LOS B	20.4	147.0	0.79	0.72	0.79	48.5
Appro	ach		1262	3.1	1262	3.1	0.630	18.8	LOS B	20.4	147.0	0.79	0.72	0.79	47.9
All Ve	hicles		3035	3.0	3035	3.0	0.630	19.7	LOS B	20.4	147.0	0.72	0.65	0.72	45.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance													
Mov	Input	Dem.	Aver.	Level of	AVERAGE	BACK OF	Prop.	Eff.	Travel	Travel	Aver.		
ID Crossing	Vol.	Flow	Delay	Service	QUE [Ped	:UE Dist]	Que	Stop Rate	lime	Dist.	Speed		
	ped/h	ped/h	sec		ped	m			sec	m	m/sec		
NorthWest: Solent CCT													
P3 Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37		
SouthWest: No	orwest B	lvd (Wes	st)										
P4 Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37		
All Pedestrians	100	105	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37		

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.

PHASING SUMMARY

Site: 4601 [03 Norwest Blvd/Solent CCT PM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 03 Norwest Blvd/Solent CCT PM Ex Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Site Phasing & Timing dialog Phase Times determined by the program Phase Sequence: Variable Phasing Input Phase Sequence: A, B, C Output Phase Sequence: A, B, C Reference Phase: Phase A

Phase Timing Summary												
Phase	Α	В	С									
Phase Change Time (sec)	0	50	65									
Green Time (sec)	44	9	19									
Phase Time (sec)	50	15	25									
Phase Split	56%	17%	28%									
Phase Frequency (%)	100.0	100.0	100.0									

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase VAR: Variable Phase



SITE LAYOUT

Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave AM

Ex (Site Folder: General)]

22033 04 Norwest Blvd/Century Cct/Brookhollow Ave AM Ex Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Coordinated

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



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Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave AM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

04 Norwest Blvd/Century Cct/Brookhollow Ave AM Ex

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 90 seconds (Site Practical Cycle Time) Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Dem F [Total veh/h	nand lows HV] %	Ar Fl [Total veh/h	rival lows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Ba Que [Veh. veh	ack Of eue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South	East:	Brookholl	ow Ave												
1	L2	All MCs	118	3.4	118	3.4	0.303	35.3	LOS C	5.1	36.5	0.85	0.76	0.85	36.4
2	T1	All MCs	24	0.0	24	0.0	*0.303	29.5	LOS C	5.1	36.5	0.85	0.76	0.85	27.6
3	R2	All MCs	30	0.0	30	0.0	0.063	31.8	LOS C	1.0	7.0	0.79	0.68	0.79	37.6
Appro	ach		172	2.3	172	2.3	0.303	33.8	LOS C	5.1	36.5	0.84	0.74	0.84	35.7
North	East:	Norwest	Blvd (E	ast)											
4	L2	All MCs	17	5.9	17	5.9	0.052	31.5	LOS C	0.7	5.9	0.73	0.66	0.73	38.8
5	T1	All MCs	884	6.7	884	6.7	0.816	27.4	LOS B	17.9	131.5	0.93	0.85	1.00	46.0
6	R2	All MCs	218	0.9	218	0.9	* 0.818	53.1	LOS D	10.4	73.5	1.00	0.94	1.24	24.4
Appro	ach		1119	5.5	1119	5.5	0.818	32.4	LOS C	17.9	131.5	0.94	0.86	1.04	41.5
North	Nest:	Century (Cct												
7	L2	All MCs	15	0.0	15	0.0	0.283	51.0	LOS D	1.6	11.3	0.99	0.72	0.99	25.2
8	T1	All MCs	21	0.0	21	0.0	0.283	46.0	LOS D	1.6	11.3	0.99	0.72	0.99	23.3
9	R2	All MCs	113	0.9	113	0.9	0.459	50.7	LOS D	2.6	18.2	1.00	0.75	1.00	24.4
Appro	ach		149	0.7	149	0.7	0.459	50.1	LOS D	2.6	18.2	1.00	0.74	1.00	24.3
South	West:	Norwest	Blvd (\	(Vest))										
10	L2	All MCs	199	1.0	199	1.0	*0.329	18.8	LOS B	4.3	30.8	0.78	0.77	0.78	26.5
11	T1	All MCs	925	6.1	925	6.1	*0.851	28.9	LOS C	19.5	143.2	0.95	0.89	1.05	45.2
12	R2	All MCs	199	1.5	199	1.5	0.750	50.3	LOS D	9.1	64.5	1.00	0.89	1.14	32.1
Appro	ach		1323	4.6	1323	4.6	0.851	30.6	LOS C	19.5	143.2	0.93	0.87	1.02	40.0
All Ve	hicles		2763	4.6	2763	4.6	0.851	32.6	LOS C	19.5	143.2	0.93	0.85	1.02	39.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance													
Mov	Input	Dem.	Aver.	Level of	AVERAGI	E BACK OF	Prop.	Eff.	Travel	Travel	Aver.		
ID Crossing	Vol.	Flow	Delay	Service	QL I Ped	JEUE Dist 1	Que	Stop Rate	Time	Dist.	Speed		
	ped/h	ped/h	sec		ped	m		Trato	sec	m	m/sec		
SouthEast: Brookhollow Ave													

P1 Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37
NorthEast: No	rwest Blvo	l (East)									
P2 Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37
NorthWest: Ce	ntury Cct										
P3 Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37
All Pedestrians	150	158	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37

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.

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PHASING SUMMARY

Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave AM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 04 Norwest Blvd/Century Cct/Brookhollow Ave AM Ex Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 90 seconds (Site Practical Cycle Time) Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog

Phase Times determined by the program Phase Sequence: Variable Phasing Input Phase Sequence: A*, B1*, B2*, C, D, E Output Phase Sequence: A*, C, D, E Reference Phase: Phase C (* Variable Phase)

Phase Timing Summary

Phase	Α	С	D	E
Phase Change Time (sec)	71	0	30	59
Green Time (sec)	13	24	23	6
Phase Time (sec)	19	30	29	12
Phase Split	21%	33%	32%	13%
Phase Frequency (%)	100.0	100.0	100.0	100.0

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence Phase A VAR Phase C REF Phase D Century Cct Norwest Blvd (East) Century Cct Norwest Blvd (East) Century Cct Norwest Blvd (East) ンノ~ 14 シノン 115 シノ~ 4 >/~ 210 71~ ふへく ふへく 2/2 Norwest Blvd (West) Norwest Blvd (West) Norwest Blvd (West) Brookhollow Ave Brookhollow Ave Brookhollow Ave Phase E Norwest Blvd (East) Century Cct 14 ۶۷Ż >1~ ふくく Norwest Blvd (West) Brookhollow Ave

REF: Reference Phase VAR: Variable Phase



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Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave PM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

04 Norwest Blvd/Century Cct/Brookhollow Ave PM Ex

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 100 seconds (Site Practical Cycle Time) Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance															
Mov	Turn	Mov	Den	nand	Ar	rival	Deg.	Aver.	Level of	95% E	Back Of	Prop.	Eff.	Aver.	Aver.
ID		Class	- Total	lows	Total	OWS	Satn	Delay	Service	Qu U/ch	eue	Que	Stop	No. of	Speed
			veh/h	пvј %	veh/h	⊓vj %	v/c	sec		veh	m Dist j		Nale	Cycles	km/h
SouthEast: Brookhollow Ave															
1	L2	All MCs	211	0.9	211	0.9	0.519	42.3	LOS C	9.9	70.0	0.92	0.81	0.92	34.3
2	T1	All MCs	20	0.0	20	0.0	*0.519	36.0	LOS C	9.9	70.0	0.92	0.81	0.92	25.2
3	R2	All MCs	20	0.0	20	0.0	0.045	35.8	LOS C	0.7	5.2	0.80	0.67	0.80	36.1
Appro	ach		251	0.8	251	0.8	0.519	41.2	LOS C	9.9	70.0	0.91	0.80	0.91	33.8
NorthEast: Norwest Blvd (East)															
4	L2	All MCs	26	0.0	26	0.0	0.063	32.7	LOS C	1.0	8.3	0.72	0.68	0.72	38.1
5	T1	All MCs	940	6.3	940	6.3	0.796	26.8	LOS B	19.9	146.3	0.90	0.81	0.94	46.3
6	R2	All MCs	191	0.0	191	0.0	*0.791	57.3	LOS E	9.9	69.4	1.00	0.91	1.19	23.2
Appro	ach		1157	5.1	1157	5.1	0.796	32.0	LOS C	19.9	146.3	0.91	0.82	0.97	41.9
North	West:	Century (Cct												
7	L2	All MCs	45	0.0	45	0.0	0.376	52.4	LOS D	3.4	23.7	0.98	0.75	0.98	24.5
8	T1	All MCs	26	0.0	26	0.0	0.376	47.4	LOS D	3.4	23.7	0.98	0.75	0.98	22.6
9	R2	All MCs	293	1.0	293	1.0	0.795	57.1	LOS E	7.7	54.6	1.00	0.94	1.23	22.7
Appro	ach		364	0.8	364	0.8	0.795	55.8	LOS D	7.7	54.6	1.00	0.91	1.18	22.9
South	West:	Norwest	t Blvd (\	Nest)											
10	L2	All MCs	255	0.8	255	0.8	*0.361	18.3	LOS B	5.7	40.6	0.74	0.77	0.74	26.7
11	T1	All MCs	992	4.4	992	4.4	*0.831	28.2	LOS B	22.0	158.9	0.92	0.85	0.99	45.6
12	R2	All MCs	81	1.2	81	1.2	0.338	50.7	LOS D	3.7	26.3	0.95	0.77	0.95	32.0
Appro	ach		1328	3.5	1328	3.5	0.831	27.7	LOS B	22.0	158.9	0.89	0.83	0.94	41.1
All Ve	hicles		3100	3.6	3100	3.6	0.831	33.7	LOS C	22.0	158.9	0.91	0.83	0.98	38.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov	Input	Dem.	Aver.	Level of	AVERAG	E BACK OF	Prop.	Eff.	Travel	Travel	Aver.	
ID Crossing	Vol.	Flow	Delay	Service	QL [Ped	IEUE Dist 1	Que	Stop Rate	Time	Dist.	Speed	
	ped/h	ped/h	sec		ped	m			sec	m	m/sec	
SouthEast: Brookhollow Ave												

P1 Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	59.7	20.0	0.34	
NorthEast: Norwest Blvd (East)												
P2 Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	59.7	20.0	0.34	
NorthWest: Ce	ntury Cct											
P3 Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	59.7	20.0	0.34	
All Pedestrians	150	158	44.3	LOS E	0.1	0.1	0.94	0.94	59.7	20.0	0.34	

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.

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PHASING SUMMARY

Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave PM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 04 Norwest Blvd/Century Cct/Brookhollow Ave PM Ex Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 100 seconds (Site Practical Cycle Time) Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog

Phase Times determined by the program Phase Sequence: Variable Phasing Input Phase Sequence: A*, B1*, B2*, C, D, E Output Phase Sequence: A*, C, D, E Reference Phase: Phase C (* Variable Phase)

Phase Timing Summary

Phase	Α	С	D	E
Phase Change Time (sec)	81	0	35	65
Green Time (sec)	13	29	24	10
Phase Time (sec)	19	35	30	16
Phase Split	19%	35%	30%	16%
Phase Frequency (%)	100.0	100.0	100.0	100.0

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence Phase A VAR Phase C REF Phase D Norwest Blvd (East) Century Cct Norwest Blvd (East) Century Cct Norwest Blvd (East) Century Cct ンイ 11 11 11 >/~ 210 71~ $\sqrt{1}$ ふくく へくく Norwest Blvd (West) Norwest Blvd (West) Norwest Blvd (West) Brookhollow Ave Brookhollow Ave Brookhollow Ave Phase E Norwest Blvd (East) Century Cct ' 🗸 > >1~ ᠵᢅᡞ Norwest Blvd (West) Brookhollow Ave

REF: Reference Phase VAR: Variable Phase



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SITE LAYOUT

V Site: 02 [05 Norwest Blvd/Solent Cct/ Reston Grange AM Ex

(Site Folder: General)]

22033 02 Norwest Blvd/Columbia Ct/Brookhollow Ave AM Ex Site Category: (None) Roundabout

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



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V Site: 02 [05 Norwest Blvd/Solent Cct/ Reston Grange AM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

02 Norwest Blvd/Columbia Ct/Brookhollow Ave AM Ex Site Category: (None) Roundabout

Vehic	le Mo	ovement	Perfo	rma	nce										
Mov ID	Turn	Mov Class	Dem F [Total veh/ <u>h</u>	nand Iows HV] %	Ar Fl [Total veh/h	rival lows HV] %_	Deg. Satn v/c	Aver. Delay se <u>c</u>	Level of Service	95% B Que [Veh. veh	ack Of eue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South	East:	Reston G	range												
1	L2	All MCs	274	1.1	274	1.1	0.447	7.8	LOS A	2.4	17.2	0.78	0.86	0.91	50.3
2	T1	All MCs	248	0.4	248	0.4	0.602	7.2	LOS A	4.3	30.8	0.84	0.94	1.08	44.0
3	R2	All MCs	249	3.2	249	3.2	0.602	13.0	LOS A	4.3	30.8	0.84	0.94	1.08	44.0
3u	U	All MCs	1	0.0	1	0.0	0.602	14.9	LOS B	4.3	30.8	0.84	0.94	1.08	43.5
Appro	ach		772	1.6	772	1.6	0.602	9.3	LOS A	4.3	30.8	0.81	0.91	1.02	46.1
North	East: I	Norwest B	Blvd (Ea	ast)											
4	L2	All MCs	103	9.7	103	9.7	0.507	6.1	LOS A	3.2	23.5	0.57	0.54	0.57	47.6
5	T1	All MCs	896	4.9	896	4.9	0.507	6.3	LOS A	3.2	23.5	0.58	0.58	0.59	55.8
6	R2	All MCs	146	4.1	146	4.1	0.507	12.5	LOS A	3.2	23.2	0.59	0.62	0.60	46.4
6u	U	All MCs	2	0.0	2	0.0	0.507	15.0	LOS B	3.2	23.2	0.59	0.62	0.60	49.1
Appro	ach		1147	5.2	1147	5.2	0.507	7.1	LOS A	3.2	23.5	0.58	0.58	0.59	53.6
North\	Vest:	Solent Co	t												
7	L2	All MCs	87	5.7	87	5.7	0.340	7.5	LOS A	2.2	15.8	0.90	0.81	0.91	45.8
8	T1	All MCs	110	1.8	110	1.8	0.340	6.8	LOS A	2.2	15.8	0.90	0.81	0.91	45.2
9	R2	All MCs	154	4.5	154	4.5	0.365	14.6	LOS B	2.1	15.5	0.88	0.91	0.94	45.2
9u	U	All MCs	3	0.0	3	0.0	0.365	16.4	LOS B	2.1	15.5	0.88	0.91	0.94	41.5
Appro	ach		354	4.0	354	4.0	0.365	10.4	LOS A	2.2	15.8	0.89	0.85	0.92	45.3
South	West:	Norwest	Blvd (V	Vest)											
10	L2	All MCs	359	1.9	359	1.9	0.753	14.7	LOS B	10.3	74.1	0.99	0.96	1.43	47.3
11	T1	All MCs	1014	4.2	1014	4.2	0.753	14.4	LOS A	11.7	84.9	1.00	0.96	1.43	49.8
12	R2	All MCs	66	4.5	66	4.5	0.753	20.1	LOS B	11.7	84.9	1.00	0.96	1.43	47.0
12u	U	All MCs	4	0.0	4	0.0	0.753	22.6	LOS B	11.7	84.9	1.00	0.96	1.43	52.8
Appro	ach		1443	3.7	1443	3.7	0.753	14.8	LOS B	11.7	84.9	1.00	0.96	1.43	48.9
All Vel	nicles		3716	3.7	3716	3.7	0.753	10.8	LOS A	11.7	84.9	0.82	0.82	1.04	49.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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V Site: 02 [05 Norwest Blvd/Solent Cct/ Reston Grange PM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

02 Norwest Blvd/Columbia Ct/Brookhollow Ave PM Ex Site Category: (None) Roundabout

Vehic	le Mo	ovement	Perfo	rma	nce										
Mov ID	Turn	Mov Class	Den F [Total veb/b	nand lows HV] %	Ar Fl [Total] veh/h	rival lows HV] %	Deg. Satn	Aver. Delay	Level of Service	95% [Qu [Veh. veh	Back Of Ieue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South	East:	Reston G	range	70	VCH/H	70		300		<u>von</u>		_	_		KIII/II
1	L2	All MCs	177	1.7	177	1.7	0.351	8.3	LOS A	1.9	13.5	0.83	0.85	0.88	49.9
2	T1	All MCs	79	0.0	79	0.0	0.308	5.9	LOS A	1.8	13.0	0.83	0.79	0.83	44.1
3	R2	All MCs	124	7.3	124	7.3	0.308	11.8	LOS A	1.8	13.0	0.83	0.79	0.83	43.7
3u	U	All MCs	1	0.0	1	0.0	0.308	13.6	LOS A	1.8	13.0	0.83	0.79	0.83	43.6
Approa	ach		381	3.1	381	3.1	0.351	9.0	LOS A	1.9	13.5	0.83	0.82	0.86	46.6
NorthE	East: I	Norwest E	Blvd (Ea	ast)											
4	L2	All MCs	305	2.6	305	2.6	0.714	8.6	LOS A	6.4	46.6	0.79	0.82	0.99	46.7
5	T1	All MCs	1043	4.5	1043	4.5	0.714	9.4	LOS A	6.4	46.6	0.80	0.84	1.02	54.5
6	R2	All MCs	58	6.9	58	6.9	0.714	15.9	LOS B	6.2	45.2	0.80	0.85	1.04	45.6
6u	U	All MCs	3	33.3	3	33.3	0.714	19.9	LOS B	6.2	45.2	0.80	0.85	1.04	43.0
Approa	ach		1409	4.3	1409	4.3	0.714	9.5	LOS A	6.4	46.6	0.79	0.84	1.01	52.2
North	Vest:	Solent Co	ct												
7	L2	All MCs	117	2.6	117	2.6	0.386	6.4	LOS A	2.2	15.8	0.79	0.74	0.85	46.8
8	T1	All MCs	189	0.0	189	0.0	0.386	5.8	LOS A	2.2	15.8	0.79	0.74	0.85	45.7
9	R2	All MCs	275	1.1	275	1.1	0.460	13.6	LOS A	2.6	18.6	0.80	0.94	0.96	46.2
9u	U	All MCs	1	0.0	1	0.0	0.460	15.6	LOS B	2.6	18.6	0.80	0.94	0.96	42.0
Approa	ach		582	1.0	582	1.0	0.460	9.6	LOS A	2.6	18.6	0.80	0.83	0.90	46.1
South	Nest:	Norwest	Blvd (V	Vest)											
10	L2	All MCs	167	2.4	167	2.4	0.447	5.8	LOS A	3.5	25.2	0.55	0.52	0.55	51.6
11	T1	All MCs	1067	2.6	1067	2.6	0.447	5.8	LOS A	3.6	25.4	0.55	0.53	0.55	56.0
12	R2	All MCs	112	0.9	112	0.9	0.447	12.1	LOS A	3.6	25.4	0.55	0.54	0.55	50.7
12u	U	All MCs	1	0.0	1	0.0	0.447	14.8	LOS B	3.6	25.4	0.55	0.54	0.55	57.5
Approa	ach		1347	2.4	1347	2.4	0.447	6.3	LOS A	3.6	25.4	0.55	0.53	0.55	54.7
All Vel	nicles		3719	3.0	3719	3.0	0.714	8.3	LOS A	6.4	46.6	0.71	0.72	0.81	51.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Project: D:\Dropbox___DB current TEF projects_NR\22033 - Norwest Markettown 2022 - Gennaoui Consulting\22033_modelling\22033 sidra \22033 - Norwest Markettown Ex 230324.sip9

₩ Site: 06 [06 Solent Cct/Fairway Dr/Hillsong Church AM Ex

(Site Folder: General)]

22033 06 Solent Cct/Fairway Dr/Hillsong Church AM Ex Site Category: (None) Roundabout

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V Site: 06 [06 Solent Cct/Fairway Dr/Hillsong Church AM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 06 Solent Cct/Fairway Dr/Hillsong Church AM Ex Site Category: (None) Roundabout

Vehic	le Mo	ovement	Perfo	rma	nce										
Mov ID	Turn	Mov Class	Dem Fl [Total	nand Iows HV]	Ar Fl [Total]	rival lows HV]	Deg. Satn	Aver. Delay	Level of Service	95% B Que [Veh.	ack Of eue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
South	Hills	ong Chur	ven/n	%	ven/h	%	V/C	sec	_	ven	m			_	Km/h
1	1.2		1	0.0	1	0.0	0.027	66	1054	0.2	1 1	0.60	0.62	0.60	44.7
י ר	L2 T1		15	0.0	15	0.0	0.027	6.6		0.2	1.1	0.09	0.02	0.09	44.7
2	11		10	0.0	10	0.0	0.027	10.0		0.2	1.1	0.09	0.02	0.09	44.9
3	RZ	All MCs	3	0.0	3	0.0	0.027	10.9	LUSA	0.2	1.1	0.69	0.62	0.69	44.4
3u Appro	U	All MCs	20	0.0	20	0.0	0.027	12.6	LOSA	0.2	1.1	0.69	0.62	0.69	44.4
Appro	acri		20	0.0	20	0.0	0.027	7.5	LUSA	0.2	1.1	0.09	0.02	0.09	44.0
East: \$	Solen	t Cct (Eas	st)												
4	L2	All MCs	7	0.0	7	0.0	0.327	6.1	LOS A	2.2	15.8	0.73	0.70	0.73	43.6
5	T1	All MCs	66	1.5	66	1.5	0.327	6.2	LOS A	2.2	15.8	0.73	0.70	0.73	43.8
6	R2	All MCs	123	0.0	123	0.0	0.327	10.4	LOS A	2.2	15.8	0.73	0.70	0.73	43.3
6u	U	All MCs	77	1.3	77	1.3	0.327	12.2	LOS A	2.2	15.8	0.73	0.70	0.73	43.3
Appro	ach		273	0.7	273	0.7	0.327	9.8	LOS A	2.2	15.8	0.73	0.70	0.73	43.4
North:	Fairw	/ay Dr													
7	L2	All MCs	351	0.3	351	0.3	0.740	7.6	LOS A	9.6	67.0	0.82	0.73	0.95	43.7
8	T1	All MCs	81	0.0	81	0.0	0.740	7.5	LOS A	9.6	67.0	0.82	0.73	0.95	43.9
9	R2	All MCs	393	0.0	393	0.0	0.740	11.8	LOS A	9.6	67.0	0.82	0.73	0.95	43.4
9u	U	All MCs	8	0.0	8	0.0	0.740	13.6	LOS A	9.6	67.0	0.82	0.73	0.95	43.4
Appro	ach		833	0.1	833	0.1	0.740	9.6	LOS A	9.6	67.0	0.82	0.73	0.95	43.6
West:	Soler	nt Cct (We	est)												
10	L2	All MCs	130	4.6	130	4.6	0.301	4.4	LOS A	2.0	14.2	0.50	0.50	0.50	45.7
11	T1	All MCs	174	2.9	174	2.9	0.301	4.3	LOS A	2.0	14.2	0.50	0.50	0.50	46.0
12	R2	All MCs	11	0.0	11	0.0	0.301	8.6	LOS A	2.0	14.2	0.50	0.50	0.50	45.4
12u	U	All MCs	11	9.1	11	9.1	0.301	10.5	LOS A	2.0	14.2	0.50	0.50	0.50	45.3
Appro	ach		326	3.7	326	3.7	0.301	4.7	LOS A	2.0	14.2	0.50	0.50	0.50	45.8
All Vel	nicles		1452	1.0	1452	1.0	0.740	8.5	LOS A	9.6	67.0	0.73	0.67	0.80	44.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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V Site: 06 [06 Solent Cct/Fairway Dr/Hillsong Church PM Ex (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 06 Solent Cct/Fairway Dr/Hillsong Church PM Ex Site Category: (None) Roundabout

Vehic	le M	ovement	Perfo	rma	nce										
Mov ID	Turn	Mov Class	Dem Fl [Total	nand Iows HV]	Ar Fl [Total]	rival lows HV]	Deg. Satn	Aver. Delay	Level of Service	95% B Qu [Veh.	ack Of eue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
South	Hille		veh/h	%	veh/h	%	V/C	sec	_	veh	m	-	-	_	km/h
J				0.0	6	0.0	0 4 9 4	0.0		0.0	F 4	0.00	0.74	0.00	42.0
1			0	0.0	0	0.0	0.121	0.0	LOSA	0.8	5.4	0.80	0.71	0.80	43.9
2	11		60	0.0	60	0.0	0.121	8.0	LOSA	0.8	5.4	0.80	0.71	0.80	44.1
3	R2	All MCs	8	0.0	8	0.0	0.121	12.9	LOSA	0.8	5.4	0.80	0.71	0.80	43.6
3u	U	All MCs	1	0.0	1	0.0	0.121	14.7	LOSB	0.8	5.4	0.80	0.71	0.80	43.6
Appro	acn		75	0.0	75	0.0	0.121	9.2	LUSA	0.8	5.4	0.80	0.71	0.80	44.1
East: \$	Solen	t Cct (Eas	st)												
4	L2	All MCs	10	0.0	10	0.0	0.558	5.6	LOS A	4.6	32.4	0.69	0.66	0.71	43.9
5	T1	All MCs	158	0.6	158	0.6	0.558	5.6	LOS A	4.6	32.4	0.69	0.66	0.71	44.1
6	R2	All MCs	339	0.0	339	0.0	0.558	9.9	LOS A	4.6	32.4	0.69	0.66	0.71	43.6
6u	U	All MCs	82	1.2	82	1.2	0.558	11.7	LOS A	4.6	32.4	0.69	0.66	0.71	43.6
Appro	ach		589	0.3	589	0.3	0.558	8.9	LOS A	4.6	32.4	0.69	0.66	0.71	43.8
North:	Fairv	/ay Dr													
7	L2	All MCs	153	0.0	153	0.0	0.374	5.0	LOS A	2.6	18.2	0.61	0.61	0.61	44.9
8	T1	All MCs	43	0.0	43	0.0	0.374	5.0	LOS A	2.6	18.2	0.61	0.61	0.61	45.1
9	R2	All MCs	177	3.4	177	3.4	0.374	9.4	LOS A	2.6	18.2	0.61	0.61	0.61	44.5
9u	U	All MCs	4	0.0	4	0.0	0.374	11.0	LOS A	2.6	18.2	0.61	0.61	0.61	44.5
Appro	ach		377	1.6	377	1.6	0.374	7.1	LOS A	2.6	18.2	0.61	0.61	0.61	44.7
West:	Soler	nt Cct (We	est)												
10	L2	All MCs	301	1.3	301	1.3	0.611	8.8	LOS A	6.0	42.7	0.85	0.80	1.02	43.6
11	T1	All MCs	137	0.7	137	0.7	0.611	8.8	LOS A	6.0	42.7	0.85	0.80	1.02	43.8
12	R2	All MCs	3	33.3	3	33.3	0.611	14.7	LOS B	6.0	42.7	0.85	0.80	1.02	42.9
12u	U	All MCs	84	2.4	84	2.4	0.611	14.9	LOS B	6.0	42.7	0.85	0.80	1.02	43.2
Appro	ach		525	1.5	525	1.5	0.611	9.8	LOS A	6.0	42.7	0.85	0.80	1.02	43.6
All Vel	nicles		1566	1.0	1566	1.0	0.611	8.8	LOS A	6.0	42.7	0.73	0.69	0.79	43.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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APPENDIX G: Sidra Results for Future Conditions

Site: 0397 [01 Winsor Rd/Norwest Blvd AM Fu (Site Folder: General)]

22033 01 Winsor Rd/Norwest Blvd AM Fu Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Coordinated

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



Site: 0397 [01 Winsor Rd/Norwest Blvd AM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

01 Winsor Rd/Norwest Blvd AM Fu

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Site Practical Cycle Time)

Vehic	le M	ovement	t Perfo	rma	nce										
Mov ID	Turn	Mov Class	Dem Fl [Total veh/h	nand lows HV] %	Ar Fl [Total] veh/h	rival ows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% B Que [Veh. veh	ack Of eue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South	: Wins	or Rd (S	outh)												
1	L2	All MCs	1123	2.8	1123	2.8	0.762	35.8	LOS C	25.3	181.7	0.90	0.87	0.91	33.4
2	T1	All MCs	542	2.5	542	2.5	*0.721	39.8	LOS C	13.3	95.4	0.94	0.80	0.97	40.0
Appro	ach		1665	2.7	1665	2.7	0.762	37.1	LOS C	25.3	181.7	0.91	0.85	0.93	35.9
North:	Wins	or Rd (No	orth)												
8	T1	All MCs	889	2.5	889	2.5	0.213	7.2	LOS A	6.0	42.3	0.41	0.35	0.41	61.6
9	R2	All MCs	1403	2.7	1403	2.7	*0.882	25.6	LOS B	31.4	225.0	0.82	0.88	0.90	38.2
Appro	ach		2292	2.6	2292	2.6	0.882	18.5	LOS B	31.4	225.0	0.66	0.67	0.71	47.1
West:	Norw	est Blvd													
10	L2	All MCs	533	6.9	533	6.9	0.212	12.4	LOS A	4.8	35.5	0.37	0.69	0.37	46.2
12	R2	All MCs	1028	3.2	1028	3.2	*0.865	60.5	LOS E	20.2	145.0	1.00	0.97	1.21	24.3
Appro	ach		1561	4.5	1561	4.5	0.865	44.1	LOS D	20.2	145.0	0.78	0.87	0.92	28.9
All Ve	hicles		5518	3.2	5518	3.2	0.882	31.3	LOS C	31.4	225.0	0.77	0.78	0.84	37.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian M	loveme	ent Perf	ormanc	;e							
Mov	Input	Dem.	Aver.	Level of a	AVERAGE	BACK OF	Prop.	Eff.	Travel	Travel	Aver.
ID Crossing	Vol.	Flow	Delay	Service	QUE	UE	Que	Stop	Time	Dist.	Speed
					[Ped	Dist]		Rate			
	ped/h	ped/h	sec		ped	m			sec	m	m/sec
North: Winsor	Rd (Norl	th)									
P3 Full	50	53	49.3	LOS E	0.2	0.2	0.95	0.95	64.7	20.0	0.31
West: Norwest	Blvd										
P4 Full	50	53	49.3	LOS E	0.2	0.2	0.95	0.95	64.7	20.0	0.31
All Pedestrians	100	105	49.3	LOS E	0.2	0.2	0.95	0.95	64.7	20.0	0.31

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.

PHASING SUMMARY

Site: 0397 [01 Winsor Rd/Norwest Blvd AM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 01 Winsor Rd/Norwest Blvd AM Fu Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog Phase Times determined by the program Phase Sequence: Variable Phasing Input Phase Sequence: A, B, C Output Phase Sequence: A, B, C Reference Phase: Phase A

Phase Timing Summary

Phase	Α	В	С
Phase Change Time (sec)	0	26	80
Green Time (sec)	20	48	24
Phase Time (sec)	26	54	30
Phase Split	24%	49%	27%
Phase Frequency (%)	100.0	100.0	100.0

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Site: 0397 [01 Winsor Rd/Norwest Blvd PM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

01 Winsor Rd/Norwest Blvd PM Fu

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehic	le M	ovemen	t Perfo	rma	nce										
Mov ID	Turn	Mov Class	Derr Fl [Total veh/h	nand lows HV] %	Ar Fl [Total] veh/h	rival lows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% B Que [Veh. veh	ack Of eue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South	: Wins	sor Rd (S	outh)												
1	L2	All MCs	585	3.4	585	3.4	0.269	21.6	LOS B	10.0	71.7	0.51	0.73	0.51	40.4
2	T1	All MCs	1166	1.5	1166	1.5	*0.914	44.5	LOS D	42.1	298.2	0.99	0.95	1.08	38.1
Appro	ach		1751	2.1	1751	2.1	0.914	36.9	LOS C	42.1	298.2	0.83	0.88	0.89	38.6
North:	Wins	or Rd (No	orth)												
8	T1	All MCs	642	4.0	642	4.0	0.161	0.5	LOS A	0.4	2.7	0.03	0.02	0.03	69.3
9	R2	All MCs	1059	3.8	1059	3.8	*0.915	74.5	LOS F	42.8	309.6	1.00	1.00	1.17	21.4
Appro	ach		1701	3.9	1701	3.9	0.915	46.6	LOS D	42.8	309.6	0.63	0.63	0.74	32.2
West:	Norw	est Blvd													
10	L2	All MCs	1102	2.5	1102	2.5	0.492	23.8	LOS B	21.8	156.1	0.60	0.80	0.60	38.8
12	R2	All MCs	1201	1.5	1201	1.5	*0.903	79.3	LOS F	33.8	239.7	1.00	1.00	1.19	20.5
Appro	ach		2303	2.0	2303	2.0	0.903	52.7	LOS D	33.8	239.7	0.81	0.91	0.91	26.4
All Ve	hicles		5755	2.6	5755	2.6	0.915	46.1	LOS D	42.8	309.6	0.76	0.82	0.85	31.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian M	loveme	ent Perf	ormand	e:							
Mov	Input	Dem.	Aver.	Level of .	AVERAGE	BACK OF	Prop.	Eff.	Travel	Travel	Aver.
ID Crossing	Vol.	Flow	Delay	Service	QUE	UE	Que	Stop	Time	Dist.	Speed
	1/1	1.0			[Ped	Dist J		Rate			,
	ped/h	ped/h	sec		ped	m			sec	m	m/sec
North: Winsor	Rd (Nor	th)									
P3 Full	50	53	69.3	LOS F	0.2	0.2	0.96	0.96	84.7	20.0	0.24
West: Norwest	Blvd										
P4 Full	50	53	69.3	LOS F	0.2	0.2	0.96	0.96	84.7	20.0	0.24
All Pedestrians	100	105	69.3	LOS F	0.2	0.2	0.96	0.96	84.7	20.0	0.24

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.

PHASING SUMMARY

Site: 0397 [01 Winsor Rd/Norwest Blvd PM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 01 Winsor Rd/Norwest Blvd PM Fu Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 150 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog Phase Times determined by the program Phase Sequence: Variable Phasing Input Phase Sequence: A, B, C Output Phase Sequence: A, B, C Reference Phase: Phase A

Phase Timing Summary

Phase	Α	В	С
Phase Change Time (sec)	0	52	106
Green Time (sec)	46	48	38
Phase Time (sec)	52	54	44
Phase Split	35%	36%	29%
Phase Frequency (%)	100.0	100.0	100.0

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase VAR: Variable Phase

\implies	Normal Movement	\rightarrow	Permitted/Opposed
$ \longrightarrow $	Slip/Bypass-Lane Movement	$ \longrightarrow $	Opposed Slip/Bypass-Lane
	Stopped Movement		Turn On Red
\implies	Other Movement Class (MC) Running	\implies	Undetected Movement
	Mixed Running & Stopped MCs	$ \longrightarrow $	Continuous Movement
	Other Movement Class (MC) Stopped	•	Phase Transition Applied

W Site: 02 [02 Norwest Blvd/Columbia Ct/Brookhollow Ave AM

Fu (Site Folder: General)]

22033 02 Norwest Blvd/Columbia Ct/Brookhollow Ave AM Fu Site Category: (None) Roundabout

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



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V Site: 02 [02 Norwest Blvd/Columbia Ct/Brookhollow Ave AM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

02 Norwest Blvd/Columbia Ct/Brookhollow Ave AM Fu Site Category: (None) Roundabout

Vehic	Vehicle Movement Performance Mov Turn Mov Demand Arrival Deg Aver Level of 95% Back Of Prop Eff Aver Aver														
Mov ID	Turn	Mov Class	Dem Fl [Total	and lows HV]	Ar Fl [Total]	rival lows HV]	Deg. Satn	Aver. Delay	Level of Service	95% E Qu [Veh.	ack Of eue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
South	Broo	khollow A	veh/h	%	veh/h	%	V/C	sec	_	veh	m	_	_	_	km/h
30uur.			.ve 	1.0	E 6	1.0	0 159	0.0		0.9	E G	0.94	0.97	0.94	40.0
- -		All MCs		1.9		1.9	0.156	9.0		0.0	0.0	0.04	0.07	0.04	40.0
2		All MCs	1	0.0	1	0.0	0.237	1.5	LOSA	1.4	9.9	0.89	0.87	0.89	42.8
3	R2	All MCs	111	1.8	111	1.8	0.237	13.1	LOSA	1.4	9.9	0.89	0.87	0.89	46.5
3u Ammra	U	All MCs	1	0.0	1	0.0	0.237	15.0		1.4	9.9	0.89	0.87	0.89	42.3
Appro	acn		174	1.8	174	1.8	0.237	11.8	LUSA	1.4	9.9	0.88	0.87	0.88	47.0
East: I	Norwe	est Blvd (E	East)												
4	L2	All MCs	474	0.4	474	0.4	0.826	6.1	LOS A	11.6	82.8	0.74	0.56	0.74	57.9
5	T1	All MCs	1363	4.0	1363	4.0	0.826	6.7	LOS A	12.0	86.1	0.76	0.58	0.78	57.4
6	R2	All MCs	320	0.6	320	0.6	0.826	12.8	LOS A	12.0	86.1	0.79	0.60	0.81	55.4
6u	U	All MCs	76	3.9	76	3.9	0.826	15.6	LOS B	12.0	86.1	0.79	0.60	0.81	54.7
Appro	ach		2233	2.7	2233	2.7	0.826	7.7	LOS A	12.0	86.1	0.76	0.58	0.78	57.1
North:	Colu	mbia Ct													
7	L2	All MCs	100	1.0	100	1.0	0.171	6.6	LOS A	0.9	6.7	0.83	0.81	0.83	51.1
8	T1	All MCs	8	0.0	8	0.0	0.113	7.1	LOS A	0.5	3.8	0.80	0.88	0.80	43.2
9	R2	All MCs	37	2.7	37	2.7	0.113	12.7	LOS A	0.5	3.8	0.80	0.88	0.80	46.9
9u	U	All MCs	1	0.0	1	0.0	0.113	14.6	LOS B	0.5	3.8	0.80	0.88	0.80	42.8
Appro	ach		146	1.4	146	1.4	0.171	8.2	LOS A	0.9	6.7	0.82	0.83	0.82	49.4
West:	Norw	est Blvd (West)												
10	L2	All MCs	73	4.3	73	4.3	0.761	11.7	LOS A	9.9	72.2	0.92	0.87	1.23	55.4
11	T1	All MCs	1263	5.3	1263	5.3	0.761	12.3	LOS A	9.9	72.2	0.92	0.88	1.25	55.2
12	R2	All MCs	98	0.0	98	0.0	0.761	18.5	LOS B	9.4	68.4	0.92	0.90	1.27	53.6
12u	U	All MCs	4	0.0	4	0.0	0.761	21.1	LOS B	9.4	68.4	0.92	0.90	1.27	53.6
Appro	ach		1438	4.8	1438	4.8	0.761	12.8	LOS A	9.9	72.2	0.92	0.89	1.25	55.1
All Vel	nicles		3991	3.4	3991	3.4	0.826	9.7	LOS A	12.0	86.1	0.83	0.71	0.95	55.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Project: D:\Dropbox___DB current TEF projects_NR\22033 - Norwest Markettown 2022 - Gennaoui Consulting\22033_modelling\22033 sidra \22033 - Norwest Markettown FU 230324.sip9

V Site: 02 [02 Norwest Blvd/Columbia Ct/Brookhollow Ave PM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

02 Norwest Blvd/Columbia Ct/Brookhollow Ave PM Fu Site Category: (None) Roundabout

Vehicle Movement Performance Mov Turn Mov Demand Arrival Deg. Aver. Level of 95% Back Of Prop. Eff. Aver. Aver.															
Mov ID	Turn	Mov Class	Dem Fl [Total	nand lows HV]	Ar Fl [Total	rival lows HV]	Deg. Satn	Aver. Delay	Level of Service	95% B Qu [Veh.	ack Of eue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m			, í	km/h
South	Broo	khollow A	ve												
1	L2	All MCs	88	1.1	88	1.1	0.182	7.8	LOS A	0.8	5.7	0.75	0.82	0.75	50.2
2	T1	All MCs	9	12.5	9	12.5	0.394	7.1	LOS A	2.3	16.1	0.82	0.89	0.90	43.1
3	R2	All MCs	269	0.7	269	0.7	0.394	12.1	LOS A	2.3	16.1	0.82	0.89	0.90	47.1
3u	U	All MCs	1	0.0	1	0.0	0.394	14.1	LOS A	2.3	16.1	0.82	0.89	0.90	42.7
Appro	ach		367	1.1	367	1.1	0.394	10.9	LOS A	2.3	16.1	0.80	0.87	0.87	47.7
East: I	Norwe	est Blvd (B	East)												
4	L2	All MCs	209	1.0	209	1.0	0.633	5.7	LOS A	5.6	40.1	0.54	0.51	0.54	58.8
5	T1	All MCs	1280	4.7	1280	4.7	0.633	6.0	LOS A	5.6	40.1	0.55	0.53	0.55	58.6
6	R2	All MCs	93	0.0	93	0.0	0.633	11.8	LOS A	5.4	39.3	0.56	0.55	0.56	57.1
6u	U	All MCs	67	1.5	67	1.5	0.633	14.5	LOS A	5.4	39.3	0.56	0.55	0.56	56.7
Appro	ach		1649	3.8	1649	3.8	0.633	6.7	LOS A	5.6	40.1	0.55	0.53	0.55	58.5
North:	Colu	mbia Ct													
7	L2	All MCs	313	0.3	313	0.3	0.748	22.5	LOS B	6.6	46.0	1.00	1.18	1.62	41.9
8	T1	All MCs	13	0.0	13	0.0	0.256	10.7	LOS A	1.4	9.7	0.90	0.93	0.90	41.6
9	R2	All MCs	66	0.0	66	0.0	0.256	16.2	LOS B	1.4	9.7	0.90	0.93	0.90	45.4
9u	U	All MCs	1	0.0	1	0.0	0.256	18.2	LOS B	1.4	9.7	0.90	0.93	0.90	41.1
Appro	ach		393	0.3	393	0.3	0.748	21.0	LOS B	6.6	46.0	0.98	1.13	1.47	42.4
West:	Norw	est Blvd (West)												
10	L2	All MCs	50	4.2	50	4.2	0.861	13.8	LOS A	15.3	109.5	0.98	0.97	1.44	53.8
11	T1	All MCs	1657	2.6	1657	2.6	0.861	14.5	LOS A	15.3	109.5	0.99	0.98	1.47	53.7
12	R2	All MCs	89	1.1	89	1.1	0.861	21.0	LOS B	14.7	105.2	0.99	0.99	1.51	51.8
12u	U	All MCs	6	20.0	6	20.0	0.861	24.6	LOS B	14.7	105.2	0.99	0.99	1.51	48.2
Appro	ach		1802	2.6	1802	2.6	0.861	14.8	LOS B	15.3	109.5	0.99	0.98	1.47	53.6
All Vel	nicles		4211	2.8	4211	2.8	0.861	11.9	LOS A	15.3	109.5	0.80	0.81	1.06	53.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Site: 4601 [03 Norwest Blvd/Solent CCT AM Fu (Site Folder: General)]

22033 03 Norwest Blvd/Solent CCT AM Fu Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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



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Site: 4601 [03 Norwest Blvd/Solent CCT AM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

03 Norwest Blvd/Solent CCT AM Fu

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehic	Vehicle Movement Performance Mov Turn Mov Demand Arrival Deg. Aver. Level of 95% Back Of Prop. Eff. Aver. Aver.														
Mov ID	Turn	Mov Class	Dem Fl [Total veh/h	nand Iows HV] %	Ar Fl [Total] veh/h	rival lows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% B Qu [Veh. veh	ack Of eue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
North	East: I	Norwest E	Blvd (Ea	ast)											
5	T1	All MCs	1394	4.8	1394	4.8	0.522	8.6	LOS A	15.8	115.3	0.57	0.51	0.57	58.1
6	R2	All MCs	337	0.6	337	0.6	*0.683	49.4	LOS D	7.5	53.0	1.00	0.84	1.08	28.6
Appro	ach		1731	4.0	1731	4.0	0.683	16.6	LOS B	15.8	115.3	0.65	0.58	0.67	48.4
North	NorthWest: Solent CCT														
7	L2	All MCs	313	0.6	313	0.6	0.282	24.9	LOS B	6.2	43.9	0.75	0.75	0.75	35.6
9	R2	All MCs	37	12.1	37	12.1	*0.282	46.6	LOS D	4.8	34.6	0.84	0.76	0.84	35.7
Appro	ach		350	1.9	350	1.9	0.282	27.2	LOS B	6.2	43.9	0.76	0.75	0.76	35.6
South	West:	Norwest	Blvd (V	Vest)											
10	L2	All MCs	130	0.8	130	0.8	0.692	27.3	LOS B	22.1	161.5	0.86	0.78	0.86	42.2
11	T1	All MCs	1138	6.5	1138	6.5	*0.692	20.9	LOS B	22.1	163.5	0.86	0.77	0.86	46.4
Appro	ach		1268	5.9	1268	5.9	0.692	21.6	LOS B	22.1	163.5	0.86	0.77	0.86	45.8
All Ve	hicles		3349	4.5	3349	4.5	0.692	19.6	LOS B	22.1	163.5	0.74	0.67	0.75	45.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian M	Pedestrian Movement Performance											
Mov	Input	Dem.	Aver.	Level of	AVERAGE	BACK OF	Prop.	Eff.	Travel	Travel	Aver.	
ID Crossing	VOI.	FIOW	Delay	Service	QUE [Ped	Dist]	Que	Stop Rate	Iime	Dist.	Speed	
	ped/h	ped/h	sec		ped	m			sec	m	m/sec	
NorthWest: Sc	olent CC	т										
P3 Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37	
SouthWest: No	orwest B	lvd (Wes	st)									
P4 Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37	
All Pedestrians	100	105	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37	

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.

PHASING SUMMARY

Site: 4601 [03 Norwest Blvd/Solent CCT AM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 03 Norwest Blvd/Solent CCT AM Fu Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Site Phasing & Timing dialog Phase Times determined by the program Phase Sequence: Variable Phasing Input Phase Sequence: A, B, C Output Phase Sequence: A, B, C Reference Phase: Phase A

Phase Timing Summary	,		
Phase	Α	В	С
Phase Change Time (sec)	0	47	65
Green Time (sec)	41	12	19
Phase Time (sec)	47	18	25
Phase Split	52%	20%	28%
Phase Frequency (%)	100.0	100.0	100.0

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase VAR: Variable Phase



Site: 4601 [03 Norwest Blvd/Solent CCT PM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

03 Norwest Blvd/Solent CCT PM Fu

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehic	/ehicle Movement Performance /lov Turn Mov Demand Arrival Deg. Aver. Level of 95% Back Of Prop. Eff. Aver. Aver.														
Mov ID	Turn	Mov Class	Dem Fl [Total veh/h	nand Iows HV] %	Ar Fl [Total] veh/h	rival lows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% B Que [Veh. veh	ack Of eue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
North	East: I	Norwest B	lvd (Ea	ast)											
5	T1	All MCs	1222	4.8	1222	4.8	0.458	8.1	LOS A	13.0	94.9	0.53	0.48	0.53	58.7
6	R2	All MCs	225	0.0	225	0.0	*0.681	53.2	LOS D	5.2	36.4	1.00	0.84	1.12	27.6
Appro	ach		1447	4.0	1447	4.0	0.681	15.1	LOS B	13.0	94.9	0.60	0.53	0.62	50.0
North	NorthWest: Solent CCT														
7	L2	All MCs	383	0.5	383	0.5	0.511	28.5	LOS C	11.9	83.8	0.84	0.80	0.84	34.4
9	R2	All MCs	166	1.9	166	1.9	*0.511	40.7	LOS C	8.0	56.7	0.93	0.80	0.93	35.0
Appro	ach		549	0.9	549	0.9	0.511	32.2	LOS C	11.9	83.8	0.87	0.80	0.87	34.6
South	West:	Norwest	Blvd (V	Vest)											
10	L2	All MCs	114	0.9	114	0.9	0.751	25.7	LOS B	26.9	193.2	0.86	0.80	0.86	43.2
11	T1	All MCs	1427	3.3	1427	3.3	*0.751	19.3	LOS B	27.0	194.7	0.86	0.79	0.86	47.7
Appro	ach		1541	3.1	1541	3.1	0.751	19.8	LOS B	27.0	194.7	0.86	0.79	0.86	47.3
All Ve	hicles		3537	3.2	3537	3.2	0.751	19.8	LOS B	27.0	194.7	0.76	0.69	0.77	45.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian M	loveme	ent Perf	ormand	e:							
Mov	Input	Dem.	Aver.	Level of	AVERAGE	BACK OF	Prop.	Eff.	Travel	Travel	Aver.
D Crossing	Vol.	Flow	Delay	Service	QUE [Ped	:UE Dist]	Que	Stop Rate	lime	Dist.	Speed
	ped/h	ped/h	sec		ped	m			sec	m	m/sec
NorthWest: Sc	olent CC	т									
P3 Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37
SouthWest: No	orwest B	lvd (Wes	st)								
P4 Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37
All Pedestrians	100	105	39.3	LOS D	0.1	0.1	0.94	0.94	54.7	20.0	0.37

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.

PHASING SUMMARY

Site: 4601 [03 Norwest Blvd/Solent CCT PM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 03 Norwest Blvd/Solent CCT PM Fu Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Site Phasing & Timing dialog Phase Times determined by the program Phase Sequence: Variable Phasing Input Phase Sequence: A, B, C Output Phase Sequence: A, B, C Reference Phase: Phase A

Phase Timing Summary	,		
Phase	Α	В	С
Phase Change Time (sec)	0	51	65
Green Time (sec)	45	8	19
Phase Time (sec)	51	14	25
Phase Split	57%	16%	28%
Phase Frequency (%)	100.0	100.0	100.0

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase VAR: Variable Phase



Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave AM Fu]

22033 04 Norwest Blvd/Century Cct/Brookhollow Ave AM Fu Site Category: (None) Signals - Fixed Time Isolated



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Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave AM Fu]

22033

04 Norwest Blvd/Century Cct/Brookhollow Ave AM Fu

Site Category: (None)

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Move	Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h	
South	nEast: B	rookhollow A	ve										
1	L2	122	3.4	0.573	67.2	LOS E	12.1	86.2	0.97	0.81	0.97	26.2	
2	Τ1	55	0.0	0.573	62.7	LOS E	12.1	86.2	0.97	0.81	0.97	19.2	
3	R2	30	0.0	0.097	61.4	LOS E	1.9	13.0	0.88	0.71	0.88	27.2	
Appro	bach	207	2.0	0.573	65.2	LOS E	12.1	86.2	0.96	0.80	0.96	24.8	
North	East: N	orwest Blvd	(East)										
4	L2	18	5.9	0.049	44.1	LOS D	1.2	10.3	0.74	0.64	0.74	31.3	
5	T1	938	6.7	0.854	59.0	LOS E	35.3	259.9	0.99	0.96	1.10	27.7	
6	R2	435	0.9	1.003	117.2	LOS F	44.4	313.4	1.00	1.13	1.50	12.8	
Appro	bach	1391	4.9	1.003	77.0	LOS F	44.4	313.4	0.99	1.01	1.22	22.5	
North	West: C	entury Cct											
7	L2	15	0.0	0.330	68.0	LOS E	5.7	40.0	0.95	0.75	0.95	19.3	
8	T1	70	0.0	0.330	64.2	LOS E	5.7	40.0	0.95	0.75	0.95	19.5	
9	R2	369	0.9	1.001	124.5	LOS F	18.6	131.1	1.00	1.16	1.66	12.4	
Appro	bach	454	0.7	1.001	113.4	LOS F	18.6	131.1	0.99	1.08	1.52	13.3	
South	West: I	Norwest Blvc	l (West)										
10	L2	394	1.0	0.727	55.0	LOS D	26.1	186.1	0.96	0.86	0.96	15.3	
11	T1	998	6.1	1.017	118.4	LOS F	55.1	403.9	1.00	1.31	1.53	19.1	
12	R2	202	1.5	0.458	56.9	LOS E	12.6	89.4	0.91	0.81	0.91	28.1	
Appro	bach	1594	4.2	1.017	94.9	LOS F	55.1	403.9	0.98	1.13	1.31	19.2	
All Ve	hicles	3646	3.9	1.017	88.7	LOS F	55.1	403.9	0.98	1.06	1.28	19.9	

Site Level of Service (LOS) Method: Delay (RTA NSW). 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.

Move	Movement Performance - Pedestrians											
Mov	Description	Demand	Average	Level of	Average Bacl	k of Queue	Prop.	Effective				
ID	Description	Flow ned/b	Delay	Service	Pedestrian	Distance	Queued	Stop Rate				
		pean	300		peu							
P1	SouthEast Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96				
P2	NorthEast Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96				
P3	NorthWest Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96				
All Peo	destrians	158	69.3	LOS F			0.96	0.96				

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.

PHASING SUMMARY

Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave AM Fu]

22033 04 Norwest Blvd/Century Cct/Brookhollow Ave AM Fu Site Category: (None) Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time) Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog Phase Times determined by the program Phase Sequence: Variable Phasing Reference Phase: Phase C Input Phase Sequence: A*, B1*, B2*, C, D, E Output Phase Sequence: A*, C, D, E (* Variable Phase)

Phase Sequence: Variable Phasing Reference Phase: Phase C Input Phase Sequence: A*, B1*, B2*, C, D, E Movement Class: All Movement Classes





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Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave PM Fu]

22033

04 Norwest Blvd/Century Cct/Brookhollow Ave PM Fu

Site Category: (None)

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Move	Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h	
South	East: Bi	rookhollow A	ve										
1	L2	213	0.9	0.813	74.7	LOS F	18.7	131.7	1.00	0.91	1.13	24.7	
2	T1	36	0.0	0.813	70.2	LOS E	18.7	131.7	1.00	0.91	1.13	17.8	
3	R2	20	0.0	0.065	60.9	LOS E	1.2	8.6	0.87	0.69	0.87	27.3	
Appro	ach	269	0.8	0.813	73.1	LOS F	18.7	131.7	0.99	0.89	1.11	24.2	
North	East: N	orwest Blvd	(East)										
4	L2	26	0.0	0.069	48.2	LOS D	1.7	13.5	0.78	0.67	0.78	30.2	
5	T1	994	6.3	1.034	128.6	LOS F	56.4	414.6	1.00	1.35	1.59	18.0	
6	R2	359	0.0	1.115	194.6	LOS F	46.9	328.5	1.00	1.35	1.96	8.4	
Appro	ach	1379	4.5	1.115	144.3	LOS F	56.4	414.6	0.99	1.34	1.67	15.3	
North	West: C	entury Cct											
7	L2	95	0.0	0.349	55.3	LOS D	9.4	65.6	0.88	0.76	0.88	21.5	
8	T1	59	0.0	0.349	51.5	LOS D	9.4	65.6	0.88	0.76	0.88	21.6	
9	R2	628	1.0	1.137	214.5	LOS F	44.0	310.7	1.00	1.41	2.08	7.8	
Appro	ach	782	0.8	1.137	182.8	LOS F	44.0	310.7	0.98	1.28	1.85	8.9	
South	West: 1	Norwest Blvc	l (West)										
10	L2	487	0.8	1.139	211.8	LOS F	68.9	490.2	1.00	1.37	2.02	6.8	
11	T1	1030	4.4	1.139	184.9	LOS F	71.5	517.2	1.00	1.60	1.90	13.9	
12	R2	81	1.2	0.254	62.5	LOS E	5.1	36.4	0.91	0.76	0.91	26.9	
Appro	ach	1598	3.2	1.139	186.9	LOS F	71.5	517.2	1.00	1.48	1.89	11.8	
All Ve	hicles	4028	3.0	1.139	163.9	LOS F	71.5	517.2	0.99	1.36	1.75	12.9	

Site Level of Service (LOS) Method: Delay (RTA NSW). 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.

Move	Movement Performance - Pedestrians											
Mov	Description	Demand	Average	Level of	Average Bacl	k of Queue	Prop.	Effective				
ID	Description	Flow ned/b	Delay	Service	Pedestrian	Distance	Queued	Stop Rate				
		pean	300		peu							
P1	SouthEast Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96				
P2	NorthEast Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96				
P3	NorthWest Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96				
All Peo	destrians	158	69.3	LOS F			0.96	0.96				

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.

Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave AM

Fu Opt 5 (Site Folder: General)]

22033 04 Norwest Blvd/Century Cct/Brookhollow Ave AM Fu Opt 5 Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Coordinated

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Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave AM Fu Opt 5 (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

04 Norwest Blvd/Century Cct/Brookhollow Ave AM Fu Opt 5

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Site Practical Cycle Time) Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Dem Fl [Total veh/h	nand Iows HV] %	Ar Fl [Total] veh/h	rival lows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% B Qui [Veh. veh	ack Of eue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South	East:	Brookholl	ow Ave												
1	L2	All MCs	122	3.4	122	3.4	0.157	26.9	LOS B	4.0	28.6	0.65	0.71	0.65	39.6
2	T1	All MCs	55	0.0	55	0.0	0.119	35.5	LOS C	2.3	16.2	0.82	0.63	0.82	33.9
3	R2	All MCs	30	0.0	30	0.0	0.137	52.3	LOS D	1.5	10.3	0.93	0.71	0.93	31.1
Appro	ach		207	2.0	207	2.0	0.157	32.9	LOS C	4.0	28.6	0.73	0.69	0.73	36.5
North	East:	Norwest	Blvd (E	ast)											
4	L2	All MCs	18	5.9	18	5.9	0.041	25.8	LOS B	0.7	6.4	0.63	0.64	0.63	39.8
5	T1	All MCs	938	6.7	938	6.7	0.794	29.0	LOS C	21.6	159.1	0.89	0.80	0.93	45.1
6	R2	All MCs	435	0.9	435	0.9	*0.864	66.1	LOS E	13.0	91.7	1.00	0.97	1.28	28.3
Appro	ach		1391	4.9	1391	4.9	0.864	40.6	LOS C	21.6	159.1	0.92	0.85	1.03	38.0
North	West:	Century (Cct												
7	L2	All MCs	15	0.0	15	0.0	0.186	42.1	LOS C	3.7	25.6	0.84	0.67	0.84	35.6
8	T1	All MCs	70	0.0	70	0.0	*0.186	36.2	LOS C	3.7	25.6	0.84	0.67	0.84	33.4
9	R2	All MCs	369	0.9	369	0.9	*0.846	63.8	LOS E	10.9	76.8	1.00	0.99	1.27	28.3
Appro	ach		454	0.7	454	0.7	0.846	58.8	LOS E	10.9	76.8	0.97	0.93	1.19	29.2
South	West:	Norwest	Blvd (\	(Vest											
10	L2	All MCs	394	1.0	394	1.0	0.482	28.4	LOS B	14.8	105.5	0.74	0.81	0.74	39.4
11	T1	All MCs	998	6.1	998	6.1	*0.842	31.1	LOS C	24.4	179.1	0.93	0.86	0.99	44.0
12	R2	All MCs	202	1.5	202	1.5	0.806	62.1	LOS E	11.5	81.7	1.00	0.92	1.19	29.2
Appro	ach		1594	4.2	1594	4.2	0.842	34.4	LOS C	24.4	179.1	0.89	0.85	0.96	40.2
All Ve	hicles		3646	3.9	3646	3.9	0.864	39.7	LOS C	24.4	179.1	0.91	0.85	1.00	37.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance													
Mov	Input	Dem.	Aver.	Level of	AVERAGI	E BACK OF	Prop.	Eff.	Travel	Travel	Aver.		
ID Crossing	Vol.	Flow	Delay	Service	QL I Ped	Que	Stop Rate	Time	Dist.	Speed			
	ped/h	ped/h	sec		ped	m		Trato	sec	m	m/sec		
SouthEast: Brookhollow Ave													

P1 Full	50	53	49.3	LOS E	0.2	0.2	0.95	0.95	64.7	20.0	0.31
NorthEast: Norwest Blvd (East)											
P2 Full	50	53	49.3	LOS E	0.2	0.2	0.95	0.95	64.7	20.0	0.31
NorthWest: Ce	ntury Cct										
P3 Full	50	53	49.3	LOS E	0.2	0.2	0.95	0.95	64.7	20.0	0.31
All Pedestrians	150	158	49.3	LOS E	0.2	0.2	0.95	0.95	64.7	20.0	0.31

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.

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PHASING SUMMARY

Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave AM Fu Opt 5 (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 04 Norwest Blvd/Century Cct/Brookhollow Ave AM Fu Opt 5 Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Site Practical Cycle Time) Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog Phase Times determined by the program Phase Sequence: Variable Phasing Input Phase Sequence: A*, B1*, B2*, C, D*, E1*, E2*, F Output Phase Sequence: A*, C, D*, F Reference Phase: Phase C (* Variable Phase)

Phase Timing Summary

Phase	Α	С	D	F
Phase Change Time (sec)	89	0	38	57
Green Time (sec)	15	32	13	26
Phase Time (sec)	21	38	19	32
Phase Split	19%	35%	17%	29%
Phase Frequency (%)	100.0	100.0	100.0	100.0

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase VAR: Variable Phase



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Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave PM Fu Opt 5 (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

04 Norwest Blvd/Century Cct/Brookhollow Ave PM Fu Opt 5

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 130 seconds (Site Practical Cycle Time) Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Dem Fl [Total	nand lows HV]	Ar Fl [Total]	rival ows HV]	Deg. Satn	Aver. Delay	Level of Service	95% B Qu [Veh.	lack Of eue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
South	East:	Brookholl	ow Ave	70	ven/n	70	V/C	Sec		ven		_	_	_	K[1]/[]
1	L2	All MCs	213	0.9	213	0.9	0.313	38.4	LOS C	9.5	67.3	0.76	0.77	0.76	35.8
2	T1	All MCs	36	0.0	36	0.0	0.089	44.5	LOS D	1.8	12.8	0.84	0.63	0.84	31.3
3	R2	All MCs	20	0.0	20	0.0	0.054	49.4	LOS D	1.0	7.1	0.84	0.68	0.84	31.9
Appro	ach		269	0.8	269	0.8	0.313	40.0	LOS C	9.5	67.3	0.77	0.74	0.77	34.8
North	East:	Norwest	Blvd (E	ast)											
4	L2	All MCs	26	0.0	26	0.0	0.050	27.5	LOS B	1.2	9.4	0.63	0.66	0.63	38.3
5	T1	All MCs	994	6.3	994	6.3	0.836	35.3	LOS C	28.0	206.1	0.93	0.85	0.97	41.9
6	R2	All MCs	359	0.0	359	0.0	*0.838	75.0	LOS F	12.3	85.9	1.00	0.93	1.22	26.5
Appro	ach		1379	4.5	1379	4.5	0.838	45.5	LOS D	28.0	206.1	0.94	0.87	1.03	36.3
North	West:	Century (Cct												
7	L2	All MCs	95	0.0	95	0.0	0.392	53.8	LOS D	8.5	59.3	0.91	0.77	0.91	31.3
8	T1	All MCs	59	0.0	59	0.0	*0.392	48.1	LOS D	8.5	59.3	0.91	0.77	0.91	29.6
9	R2	All MCs	628	1.0	628	1.0	*0.852	66.2	LOS E	21.1	149.3	1.00	0.97	1.17	27.8
Appro	ach		782	0.8	782	0.8	0.852	63.4	LOS E	21.1	149.3	0.98	0.93	1.12	28.3
South	West:	Norwest	Blvd (\	(Vest											
10	L2	All MCs	487	0.8	487	0.8	0.517	27.9	LOS B	20.0	141.9	0.70	0.81	0.70	39.8
11	T1	All MCs	1030	4.4	1030	4.4	*0.900	42.7	LOS D	32.9	238.4	0.96	0.92	1.06	39.6
12	R2	All MCs	81	1.2	81	1.2	0.381	69.2	LOS E	4.9	34.5	0.97	0.77	0.97	28.4
Appro	ach		1598	3.2	1598	3.2	0.900	39.5	LOS C	32.9	238.4	0.88	0.88	0.95	38.8
All Ve	hicles		4028	3.0	4028	3.0	0.900	46.2	LOS D	32.9	238.4	0.91	0.88	1.00	35.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance													
Mov	Input	Dem.	Aver.	Level of	AVERAGI	E BACK OF	Prop.	Eff.	Travel	Travel	Aver.		
ID Crossing	Vol.	Flow	Delay	Service	QL I Ped	Que	Stop Rate	Time	Dist.	Speed			
	ped/h	ped/h	sec		ped	m		Trate	sec	m	m/sec		
SouthEast: Brookhollow Ave													

P1 Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	74.7	20.0	0.27
NorthEast: No	rwest Blvo	d (East)									
P2 Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	74.7	20.0	0.27
NorthWest: Ce	ntury Cct										
P3 Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	74.7	20.0	0.27
All Pedestrians	150	158	59.3	LOS E	0.2	0.2	0.96	0.96	74.7	20.0	0.27

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.

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PHASING SUMMARY

Site: 4698 [04 Norwest Blvd/Century Cct/Brookhollow Ave PM Fu Opt 5 (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 04 Norwest Blvd/Century Cct/Brookhollow Ave PM Fu Opt 5 Site Category: (None) Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 130 seconds (Site Practical Cycle Time) Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog Phase Times determined by the program Phase Sequence: Variable Phasing Input Phase Sequence: A*, B1*, B2*, C, D*, E1*, E2*, F Output Phase Sequence: A*, C, D*, F Reference Phase: Phase C (* Variable Phase)

Phase Timing Summary

Phase	Α	С	D	F
Phase Change Time (sec)	109	0	44	76
Green Time (sec)	15	38	26	27
Phase Time (sec)	21	44	32	33
Phase Split	16%	34%	25%	25%
Phase Frequency (%)	100.0	100.0	100.0	100.0

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase VAR: Variable Phase



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W Site: 02 [05 Norwest Blvd/Solent Cct/ Reston Grange AM Fu (Site Folder: General)]

22033 02 Norwest Blvd/Columbia Ct/Brookhollow Ave AM Fu Site Category: (None) Roundabout

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



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V Site: 02 [05 Norwest Blvd/Solent Cct/ Reston Grange AM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

02 Norwest Blvd/Columbia Ct/Brookhollow Ave AM Fu Site Category: (None) Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Dem Fl [Total	nand lows HV]	Ar Fl [Total]	rival ows HV]	Deg. Satn	Aver. Delay	Level of Service	95% B Que [Veh.	ack Of eue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
Coutbl	- a a tr	Deeten C	veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South	East:	Reston G	range												
1	L2	All MCs	277	1.1	277	1.1	0.563	10.9	LOS A	3.4	24.3	0.86	0.98	1.13	48.2
2	T1	All MCs	249	0.4	249	0.4	0.797	13.6	LOS A	7.7	55.1	0.95	1.19	1.62	41.0
3	R2	All MCs	297	3.2	297	3.2	0.797	19.3	LOS B	7.7	55.1	0.95	1.19	1.62	40.1
3u	U	All MCs	1	0.0	1	0.0	0.797	21.2	LOS B	7.7	55.1	0.95	1.19	1.62	40.5
Appro	ach		824	1.6	824	1.6	0.797	14.8	LOS B	7.7	55.1	0.92	1.12	1.45	43.0
NorthE	East: I	Norwest E	Blvd (Ea	ast)											
4	L2	All MCs	137	9.7	137	9.7	0.651	7.0	LOS A	5.5	40.7	0.68	0.65	0.75	47.1
5	T1	All MCs	1138	4.9	1138	4.9	0.651	7.3	LOS A	5.5	40.7	0.69	0.67	0.76	55.0
6	R2	All MCs	185	4.1	185	4.1	0.651	13.6	LOS A	5.5	39.9	0.70	0.71	0.79	45.7
6u	U	All MCs	2	0.0	2	0.0	0.651	16.1	LOS B	5.5	39.9	0.70	0.71	0.79	48.1
Appro	ach		1462	5.3	1462	5.3	0.651	8.1	LOS A	5.5	40.7	0.69	0.68	0.77	52.8
North	Vest:	Solent Co	ct												
7	L2	All MCs	105	5.7	105	5.7	0.459	11.4	LOS A	3.3	24.0	0.97	0.93	1.13	43.5
8	T1	All MCs	112	1.8	112	1.8	0.459	10.7	LOS A	3.3	24.0	0.97	0.93	1.13	43.4
9	R2	All MCs	161	4.5	161	4.5	0.487	19.8	LOS B	3.1	22.4	0.93	1.00	1.14	42.6
9u	U	All MCs	3	0.0	3	0.0	0.487	21.5	LOS B	3.1	22.4	0.93	1.00	1.14	39.4
Appro	ach		381	4.0	381	4.0	0.487	14.8	LOS B	3.3	24.0	0.95	0.96	1.14	43.0
South	West:	Norwest	Blvd (V	Vest)											
10	L2	All MCs	366	1.9	366	1.9	0.980	48.7	LOS D	33.1	237.8	1.00	1.84	3.30	33.1
11	T1	All MCs	1219	4.2	1219	4.2	0.980	49.0	LOS D	37.8	273.9	1.00	1.88	3.33	31.2
12	R2	All MCs	69	4.5	69	4.5	0.980	54.6	LOS D	37.8	273.9	1.00	1.90	3.34	32.8
12u	U	All MCs	4	0.0	4	0.0	0.980	57.1	LOS E	37.8	273.9	1.00	1.90	3.34	35.6
Appro	ach		1658	3.7	1658	3.7	0.980	49.2	LOS D	37.8	273.9	1.00	1.87	3.32	31.8
All Vel	nicles		4325	3.9	4325	3.9	0.980	25.7	LOS B	37.8	273.9	0.88	1.24	1.91	40.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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V Site: 02 [05 Norwest Blvd/Solent Cct/ Reston Grange PM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033

02 Norwest Blvd/Columbia Ct/Brookhollow Ave PM Fu Site Category: (None) Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Dem Fl [Total	nand lows HV]	Ar Fl [Total]	rival ows HV]	Deg. Satn	Aver. Delay	Level of Service	95% B Que [Veh.	ack Of eue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
South	-ast:	Reston G	range	%	ven/n	%	V/C	sec	_	ven	m	_	_	_	Km/n
1	12	All MCs	180	1.7	180	1.7	0.518	13.9	LOSA	32	22.9	0.92	1.00	1.15	46.4
2		All MCs	79	0.0	79	0.0	0.497	10.5	LOSA	3.5	25.7	0.96	0.97	1.15	42.0
3	R2	All MCs	159	7.3	159	7.3	0.497	16.4	LOS B	3.5	25.7	0.96	0.97	1.15	41.1
30	<u> </u>	All MCs	1	0.0	1	0.0	0 497	18.1	LOSB	3.5	25.7	0.96	0.97	1 15	41.6
Approa	ach	7 11 11 10 0	419	3.5	419	3.5	0.518	14.2	LOSA	3.5	25.7	0.94	0.98	1.15	43.6
NorthF	ast I	Norwest F	Rivd (Es	net)											
4	12	All MCs	384	26	384	26	0.915	14 6	LOSB	15.4	111 0	0.98	1 14	1 71	42.9
5	T1	All MCs	1339	4.5	1339	4.5	0.915	16.2	LOSB	15.4	111.0	0.99	1 16	1 78	48.8
6	R2	All MCs	62	6.9	62	6.9	0.915	23.3	LOS B	14.7	107.1	1.00	1.18	1.84	41.1
6u	U	All MCs	.3	33.3	3	33.3	0.915	27.6	LOSB	14 7	107.1	1.00	1 18	1.84	37.4
Approa	ach	74111100	1788	4.2	1788	4.2	0.915	16.1	LOS B	15.4	111.0	0.99	1.16	1.77	47.1
North\	Vest [.]	Solent Co	~ t												
7	12	All MCs	120	26	120	26	0 469	86	LOSA	31	21.9	0.88	0.90	1 04	45.8
8	T1	All MCs	189	0.0	189	0.0	0 469	7.9	LOSA	3.1	21.9	0.88	0.90	1.01	44.9
9	R2	All MCs	278	1 1	278	1 1	0.589	17.7	LOSB	3.8	26.9	0.88	1.05	1 20	44 1
90	U	All MCs	1	0.0	1	0.0	0.589	19.6	LOSB	3.8	26.9	0.88	1.00	1 20	40.2
Approa	ach	74111100	588	1.0	588	1.0	0.589	12.7	LOSA	3.8	26.9	0.88	0.97	1.12	44.6
South	Noct	Nonwest	Blvd (M	(act)											
10	12	All MCs	171	24	171	24	0 545	62	LOSA	49	34.9	0.66	0.55	0.66	51.1
11	T1		1207	2.4	1207	2.4	0.545	6.2		4.0	35.1	0.00	0.56	0.00	55.3
12	R2		113	0.0	113	0.0	0.545	12.5		4.5	35.1	0.00	0.50	0.00	50.3
12	11		113	0.9	1	0.9	0.545	15.0		4.5	35.1	0.00	0.57	0.00	57.0
Approa	ach		1582	2.5	1582	2.5	0.545	6.6	LOSA	4.9	35.1	0.66	0.56	0.66	54.3
						1.0	0.0.0	0.0				0.00	0.00	0.00	00
All Veh	nicles		4377	3.1	4377	3.1	0.915	12.0	LOS A	15.4	111.0	0.85	0.90	1.22	48.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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W Site: 06 [06 Solent Cct/Fairway Dr/Hillsong Church AM Fu

(Site Folder: General)]

22033 06 Solent Cct/Fairway Dr/Hillsong Church AM Fu Site Category: (None) Roundabout

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



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MOVEMENT SUMMARY

V Site: 06 [06 Solent Cct/Fairway Dr/Hillsong Church AM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 06 Solent Cct/Fairway Dr/Hillsong Church AM Fu Site Category: (None) Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Derr F [Total veh/h	nand Iows HV] %	Ar Fl [Total veh/h	rival lows HV] %_	Deg. Satn _v/c	Aver. Delay sec	Level of Service	95% B Que [Veh. veh	ack Of eue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South	ong Chur	ch													
1	L2	All MCs	1	0.0	1	0.0	0.025	6.9	LOS A	0.1	1.0	0.70	0.63	0.70	44.6
2	T1	All MCs	13	0.0	13	0.0	0.025	6.8	LOS A	0.1	1.0	0.70	0.63	0.70	44.8
3	R2	All MCs	3	0.0	3	0.0	0.025	11.1	LOS A	0.1	1.0	0.70	0.63	0.70	44.2
3u	U	All MCs	1	0.0	1	0.0	0.025	12.9	LOS A	0.1	1.0	0.70	0.63	0.70	44.2
Appro	ach		18	0.0	18	0.0	0.025	7.9	LOS A	0.1	1.0	0.70	0.63	0.70	44.6
East: Solent Cct (East)															
4	L2	All MCs	7	0.0	7	0.0	0.346	6.3	LOS A	2.4	17.1	0.76	0.70	0.76	43.5
5	T1	All MCs	74	1.5	74	1.5	0.346	6.3	LOS A	2.4	17.1	0.76	0.70	0.76	43.7
6	R2	All MCs	123	0.0	123	0.0	0.346	10.6	LOS A	2.4	17.1	0.76	0.70	0.76	43.2
6u	U	All MCs	78	1.3	78	1.3	0.346	12.4	LOS A	2.4	17.1	0.76	0.70	0.76	43.2
Appro	ach		282	0.8	282	0.8	0.346	9.9	LOS A	2.4	17.1	0.76	0.70	0.76	43.4
North: Fairway Dr															
7	L2	All MCs	353	0.3	353	0.3	0.764	8.2	LOS A	10.6	74.5	0.85	0.76	1.01	43.3
8	T1	All MCs	81	0.0	81	0.0	0.764	8.2	LOS A	10.6	74.5	0.85	0.76	1.01	43.5
9	R2	All MCs	412	0.0	412	0.0	0.764	12.5	LOS A	10.6	74.5	0.85	0.76	1.01	43.0
9u	U	All MCs	8	0.0	8	0.0	0.764	14.2	LOS A	10.6	74.5	0.85	0.76	1.01	43.0
Appro	ach		854	0.1	854	0.1	0.764	10.3	LOS A	10.6	74.5	0.85	0.76	1.01	43.2
West: Solent Cct (West)															
10	L2	All MCs	169	4.6	169	4.6	0.340	4.5	LOS A	2.3	16.8	0.52	0.50	0.52	45.7
11	T1	All MCs	179	2.9	179	2.9	0.340	4.4	LOS A	2.3	16.8	0.52	0.50	0.52	46.0
12	R2	All MCs	11	0.0	11	0.0	0.340	8.6	LOS A	2.3	16.8	0.52	0.50	0.52	45.4
12u	U	All MCs	12	9.1	12	9.1	0.340	10.6	LOS A	2.3	16.8	0.52	0.50	0.52	45.3
Approach		371	3.8	371	3.8	0.340	4.7	LOS A	2.3	16.8	0.52	0.50	0.52	45.8	
All Vehicles			1525	1.1	1525	1.1	0.764	8.8	LOS A	10.6	74.5	0.75	0.68	0.84	43.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

V Site: 06 [06 Solent Cct/Fairway Dr/Hillsong Church PM Fu (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

22033 06 Solent Cct/Fairway Dr/Hillsong Church PM Fu Site Category: (None) Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Dem Fl [Total	nand Iows HV]	Ar Fl [Total	rival ows HV]	Deg. Satn	Aver. Delay	Level of Service	95% I Qu [Veh.	Back Of ieue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
South			veh/h	%	veh/h	%	v/c	sec	-	veh	m		-	-	km/h
South: Hillsong Churc			n	0.0	0		0.400	0.4	100.4	0.0		0.00	0.70	0.00	40.7
1	L2	All MCs	6	0.0	6	0.0	0.126	9.1	LUSA	0.8	5.7	0.82	0.72	0.82	43.7
2	11	All MCs	60	0.0	60	0.0	0.126	9.0	LOSA	0.8	5.7	0.82	0.72	0.82	43.9
3	R2	All MCs	8	0.0	8	0.0	0.126	13.3	LOS A	0.8	5.7	0.82	0.72	0.82	43.4
3u	U	All MCs	1	0.0	1	0.0	0.126	15.1	LOS B	0.8	5.7	0.82	0.72	0.82	43.4
Appro	ach		75	0.0	75	0.0	0.126	9.6	LOSA	0.8	5.7	0.82	0.72	0.82	43.8
East: Solent Cct (East)															
4	L2	All MCs	10	0.0	10	0.0	0.579	6.3	LOS A	5.1	36.0	0.73	0.69	0.78	43.7
5	T1	All MCs	159	0.6	159	0.6	0.579	6.3	LOS A	5.1	36.0	0.73	0.69	0.78	43.9
6	R2	All MCs	339	0.0	339	0.0	0.579	10.5	LOS A	5.1	36.0	0.73	0.69	0.78	43.4
6u	U	All MCs	83	1.2	83	1.2	0.579	12.3	LOS A	5.1	36.0	0.73	0.69	0.78	43.3
Appro	ach		591	0.3	591	0.3	0.579	9.6	LOS A	5.1	36.0	0.73	0.69	0.78	43.5
North: Fairway Dr															
7	L2	All MCs	155	0.0	155	0.0	0.405	5.1	LOS A	2.9	20.3	0.63	0.62	0.63	44.8
8	T1	All MCs	43	0.0	43	0.0	0.405	5.1	LOS A	2.9	20.3	0.63	0.62	0.63	45.0
9	R2	All MCs	204	3.4	204	3.4	0.405	9.5	LOS A	2.9	20.3	0.63	0.62	0.63	44.4
9u	U	All MCs	4	0.0	4	0.0	0.405	11.1	LOS A	2.9	20.3	0.63	0.62	0.63	44.4
Appro	ach		406	1.7	406	1.7	0.405	7.4	LOS A	2.9	20.3	0.63	0.62	0.63	44.6
West: Solent Cct (West)															
10	L2	All MCs	317	1.3	317	1.3	0.638	9.3	LOS A	6.6	47.2	0.87	0.82	1.07	43.3
11	T1	All MCs	138	0.7	138	0.7	0.638	9.3	LOS A	6.6	47.2	0.87	0.82	1.07	43.5
12	R2	All MCs	4	33.3	4	33.3	0.638	15.2	LOS B	6.6	47.2	0.87	0.82	1.07	42.6
12u	U	All MCs	86	2.4	86	2.4	0.638	15.4	LOS B	6.6	47.2	0.87	0.82	1.07	43.0
Appro	ach		545	1.6	545	1.6	0.638	10.3	LOS A	6.6	47.2	0.87	0.82	1.07	43.3
All Vehicles			1617	1.1	1617	1.1	0.638	9.3	LOS A	6.6	47.2	0.76	0.72	0.84	43.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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