



AMENDMENT NO. 26

TO THE

BUTLER-RIDGEWOOD

AGREED STRUCTURE PLAN NO. 27

August 2021

RECORD OF AMENDMENTS MADE TO THE BUTLER-RIDGEWOOD

AGREED STRUCTURE PLAN NO. 27

Amendment No.	Summary of the Amendment	Date approved by the WAPC
	<p>1. Modifying the 'Plan 1 – Approved Local Structure Plan No. 27 to remove the 'Mixed Use' zone on Lot 9001 Kilrush Turn, Ridgewood and replace with the 'Business' zone.</p>	

**AMENDMENT NO.26 TO THE
BUTLER-RIDGEWOOD AGREED STRUCTURE PLAN NO. 27**

The City of Wanneroo, pursuant to its District Planning Scheme No. 2, hereby amends the above Agreed Structure Plan by:

Modifying the zoning as shown on the Butler-Ridgewood Agreed Structure Plan No. 27 Map as follows:

1. Modifying the 'Plan 1 – Approved Local Structure Plan No. 27 to remove the 'Mixed Use' zone on Lot 9001 Kilrush Turn, Ridgewood and replace with the 'Business' zone.

This structure plan is prepared under the provisions of the City of Wanneroo District Planning Scheme No. 2.

IT IS CERTIFIED THAT THIS STRUCTURE PLAN AMENDMENT NO.26 TO THE BUTLER-RIDGEWOOD AGREED
STRUCTURE PLAN NO. 27

WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

.....

Signed for and on behalf of the Western Australian Planning Commission

.....

An Officer of the Commission duly authorised by the Commission pursuant to Section 24 of the Planning and
Development Act 2005 for that purpose, in the presence of:

.....Witness

.....Date

.....Date of Expiry

PART TWO – EXPLANATORY SECTION

AMENDMENT NO. 26 TO BUTLER-RIDGEWOOD AGREED STRUCTURE PLAN NO. 27

1.0 INTRODUCTION & PURPOSE

The proposed amendment to the Agreed Structure Plan No. 27 ('ASP 27') seeks to modify the zoning plan in order to rationalise a consistent zoning over the site and facilitate land uses consistent with the Business zone.

1.1 Legal Description and Land Ownership

The subject area contains a single land parcel held in private ownership with an approximate area of 8,292m². The subject site can be legally referred to as follows:

Lot 9001 on Deposited Plan 406980 Volume 2895 & Folio 692

The proposed amendment to ASP 27 is sought on behalf of Silverspark Pty Ltd ATF for the Silverspark Unit Trust, the registered proprietor of Lot 9001.

Lot 9001 is from here on referred to as the 'subject site'.

2.0 PLANNING FRAMEWORK

2.1 Metropolitan Region Scheme

The subject site is zoned 'Urban' under the provisions of the Metropolitan Region Scheme ('MRS'). The Urban zone under the MRS is defined as:

"Areas in which a range of activities are undertaken, including residential, commercial, recreational and light industrial."

This Structure Plan amendment facilitates development consistent with the MRS Urban zoning.

2.2 City of Wanneroo District Structure Plan No. 2 ('DSP 2')

The subject site is zoned 'Urban Development' under the City of Wanneroo Districting Planning Scheme No. 2 ('DPS 2'), which requires a comprehensive structure planning process to occur prior to subdivision or development occurring.

ASP 27 satisfies this requirement.

2.3 Planning and Development Regulations (Local Planning Scheme) Regulations 2015

Part 4, Clause 29 under the Deemed Provisions (Schedule 2) prescribes that:

"A structure plan may be amended by the Commission at the request of the local government or a person who owns land in the area covered by the plan."

In accordance with Part 4 of the Deemed Provisions of the Regulations the amendment to ASP 27 the subject of this request can be adopted.

2.4 Agreed Structure Plan No. 27 ('ASP 27')

The subject site forms part of ASP 27 and is currently zoned either as the 'Business' zone or the 'Mixed Use' zone. The City of Wanneroo and Western Australian Planning Commission approved ASP 27 in 2002.

Current Zoning

Under ASP 27 approximately the western two thirds of Lot 9001 is zoned 'Mixed Use', with the balance of Lot 9001 being zoned 'Business'. An R60 density applies to the whole of the subject site.



Extract from Butler Ridgewood Plan 2 – Consolidated Zoning Plan

Clause 3.6.1 under DPS No. 2 prescribes the following objectives for the 'Business' zone:

"3.6.1 The Business Zone is intended to accommodate warehouses, showrooms, trade and professional services and small scale complementary and incidental retailing uses, as well as providing for retail and commercial businesses which require large areas such as bulky goods and category/theme-based retail outlets that provide for the needs of the community but which due to their nature are generally not appropriate to or cannot be accommodated in a commercial area.

3.6.2 The objectives of the Business Zone are to:

- (a) provide for retail and commercial businesses which require large areas such as bulky goods and category/theme based retail outlets as well as complementary business services;*
- (b) ensure that development within this zone creates an attractive façade to the street for the visual amenity of surrounding areas."*

Clause 3.4.3 under DPS No. 2 prescribes the following objectives for the 'Mixed Use' zone:

3.5.1

The objectives of the Mixed-Use Zone are:

- "(a) To provide for a wide variety of active uses on street level which are compatible with residential and other non-active uses on upper levels.*
- (b) To allow for the development of a mix of varied but compatible land uses such as housing, offices, showrooms, amusement centres, eating establishments and appropriate industrial activities which do not generate nuisances detrimental to the amenity of the district or to the health, welfare and safety of its residents. 3.5.2 The zoning will provide an intermediate stage between Residential and Commercial or Business Zone areas.*

The zoning changes proposed under Amendment 26 will facilitate land uses consistent with the Business zone across the whole of the subject site. The Business zone will also be more compatible with the land to the north of Lukin Drive (lot 1061 Captiva App) which is zoned Commercial and the land to the northwest, bound by Lukin Drive, Connolly Drive and Headingly Cr which is zoned Business.

2.5 Liveable Neighbourhoods

Liveable Neighbourhoods ('LN') is the Western Australian Planning Commissions operational policy for the design and assessment of structure plans and subdivision applications for Greenfield and urban infill sites.

The Structure Plan amendment has due regard to Liveable Neighbourhoods with each of the relevant elements addressed below.

Element 2 – Movement Network

The Structure Plan facilitates access via Kilrush Turn, however, the City of Wanneroo is currently in the process of lifting a portion of the access restriction from Lukin Drive. Access from Lukin Drive further supports the 'Business' zone across the subject site.

Element 6 – Utilities

The subject site is serviced by power, water, sewer and telecommunications in accordance with the requirements of the service providers.

Element 7 – Activity centres and employment

The structure plan amendment will facilitate employment opportunities and assist in the creation of a business commercial precinct, given the 'Commercial' and 'Business' zones north of Lukin Drive adjacent to the subject site.

3.0 PROPOSED AMENDMENT

The entirety of the subject site was previously zoned 'Business' with an R60 density. Approximately two thirds of the western portion of the subject site was amended to the 'Mixed Use' zone under Amendment No. 21 to the Butler-Ridgewood Agreed Local Structure Plan No. 27. Amendment 21 was endorsed by the City of Wanneroo on 7 July 2015 and by the Western Australian Planning Commission on 13 January 2016. Amendment No. 21 sought to facilitate residential development over the western portion of the subject site backing onto Lukin Drive.

Proposed Amendment No. 27 seeks to facilitate a consistent land use classification over the subject site and to change the portion of the subject site zoned 'Mixed Use' to the 'Business' zone. The proposed amendment will facilitate the single landholding comprising of a single 'Business' zoning, which will facilitate more compatible land uses over the subject site and greater land use compatibility with the land to the north of Lukin Drive which is zoned 'Commercial' and 'Business'.

The portion of the subject site zoned 'Business' has received approval for a 24 hour Service Station (DAP Reference: DAP/21/01940) and access via Lukin Drive. As part of this Approval the access restriction from Lukin Drive will be lifted and as a result will make land uses of a commercial nature more appropriate.

In terms of the land use analysis between the 'Mixed Use' zone and the 'Business zone', there are currently 17 additional land uses that may be approved under the 'Business' zone. Of these 17 land uses, there is only one land use which is a Permitted use, being the Veterinary land use (refer to Table 1 below). On this basis development approval will still be required for the additional land uses that can be contemplated under a Business zoning and proper consideration of all relevant planning considerations prior to any of these land uses being applied.

Residential land use previously intended under Amendment 21 is considered less appropriate given the upgrades planned for the Mitchell Freeway Extension including Lukin Drive being planned to connect to the eastern end future Mitchell Freeway extension.

Table 1 – comparison of land use permissibility under the 'Mixed Use and 'Business' zones.

Land Use	Mixed Use Zone	Business Zone	Change
Abattoir	X	X	-
Aged or Dependent Persons' Dwelling	D	D	-
Amusement Facility/Parlour	D	D	-
Ancillary Accommodation	A	A	-
Animal Husbandry	X	X	-
Aquaculture	X	X	-
Art Gallery	D	P	
Auction Room	A	D	
Bakery	D	D	-
Bank	P	P	-
Beauty Parlour	P	P	-
Bed & Breakfast	P	D	
Camping Ground	X	X	-
Car Park	D	P	-
Car Wash	X	D	
Caravan Park	X	X	-
Caretakers' Dwelling	D	D	-
Cattery	X	X	-

Child Care Centre	D	D	-
Cinema	X	D	
Cinema Complex	X	X	-
Civic Building	D	D	-
Club (Non-Residential)	X	D	
Concrete Batching Plant	X	X	-
Consulting Room	P	P	-
Convenience Store	D	P	
Corner Store	P	P	-
Costume Hire	D	P	
Department Store	X	X	-
Display Home Centre	D	D	-
Drive In Theatre	X	D	
Drive-Through Food Outlet	X	D	
Dry Cleaning Premises	D	D	-
Education Establishment	D	D	-
Equestrian Activity	X	X	-
Factory Unit	X	X	-
Fuel Depot	X	X	-
Funeral Parlour	X	D	
Golf Course	X	X	-
Grouped Dwelling	D	D	-
Hairdresser	P	P	-
Hall	D	D	-
Hardware Store	X	X	-
Hire Service	X	X	-
Holiday Accommodation	D	D	-
Holiday House	D	D	-
Holiday Village/Resort	X	X	-
Home Business Cat 1 – 3	P	P	-
Hospital	X	D	
Hotel	X	D	
All Industry (Extractive, General, Hazardous, light)	X	X	-
Intensive Agriculture	X	X	-
Kennels	X	X	-
Kindergarten	D	D	-
Landscape Supplies	D	D	-
Laundromat	D	P	
Liquor Store	X	A	
Lunch Bar	P	P	-
Market Garden Sales	X	X	-
Market	X	X	-
Mast or Antenna	D	D	-
Medical Centre	P	P	-
Milk Depot	X	X	-
Motel	X	D	
Motor Vehicle Repairs	X	X	-
Multiple Dwelling	D	D	-
Night Club	X	D	
Nursing Home	D	D	-
Office	P	P	-
Open Air Display	X	X	-
Park	D	D	-
Park Home Park	X	X	-

Pharmacy	D	D	-
Piggery	X	X	-
Place of Assembly	D	D	-
Place of Worship	D	D	-
Plant Nursey	X	A	
Private Recreation	D	D	-
Public Exhibition Facility	D	D	-
Reception Centre	D	D	-
Recreation Centre	D	D	-
Residential Building	D	D	-
Restaurant	D	P	
Restricted Premises	X	X	-
Retirement Village	D	D	-
Road House	X	D	
Roadside Stall	X	X	-
Rural Use	X	X	-
Salvage Yard	X	X	-
Service Station	X	D	
Shop	D	X	
Showroom	D	P	
Single House	D	D	-
Smash Repair Station	X	X	-
Special Place of Assembly	X	X	-
Sports Ground	X	X	-
Stables	X	X	-
Stall – General	D	D	-
Storage Yard	X	X	-
Supermarket	X	X	-
Take-Away Food Outlet	D	D	-
Tavern	X	A	
Telecommunications Infrastructure	D	D	-
Theatre	D	D	-
Trade Display	X	X	-
Transport Depot	X	X	-
Vehicle Sales/Hire Premises	X	D	
Vehicle Wrecking	X	X	-
Veterinary Hospital	X	P	
Video Hire	X	D	
Warehouse	X	D	
Winery	X	X	-
Woodyard	X	X	-

Traffic

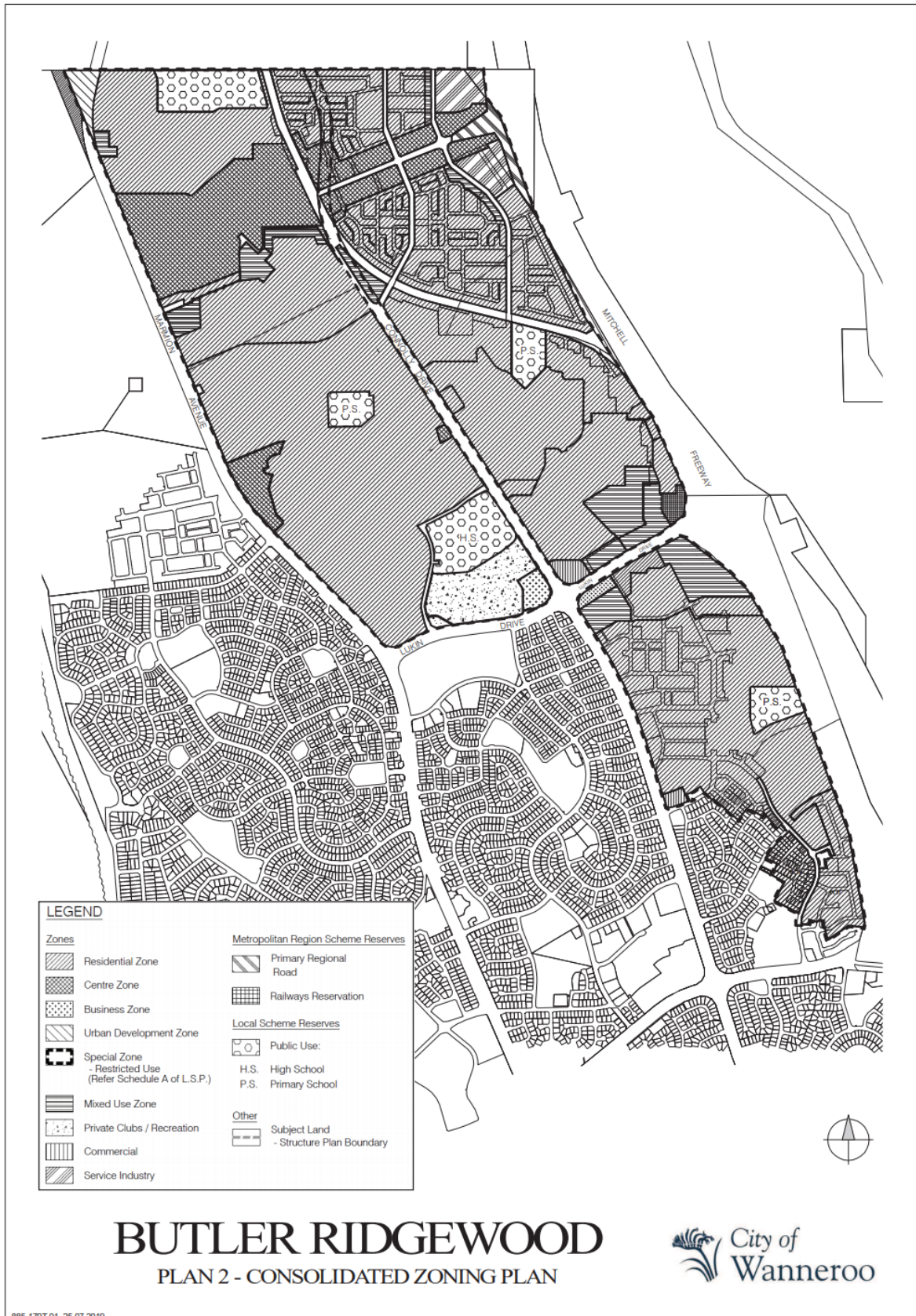
A Traffic Impact Assessment (refer Attachment 3) has been prepared for the subject site as part of the service station Development Application. The Traffic Impact Assessment was modelled on the basis of the subject site being improved with a service station within the portion of land zoned 'Business' and the balance of the site zoned 'Mixed Use' being improved with two drive through fast food outlets. The Traffic Impact Assessment supports a shared single access point via Lukin Drive and the traffic generation from the subject site being improved with a service station and two drive through fast food outlets.

Conclusion

The proposed modification to the Butler Ridgewood Agreed Local Structure Plan will facilitate more compatible land uses with the planned Service Station located within the north-eastern corner of the subject site and the Commercial and Business zones located along the northern side of Lukin Drive.

Attachment 1

Proposed Zoning Plan



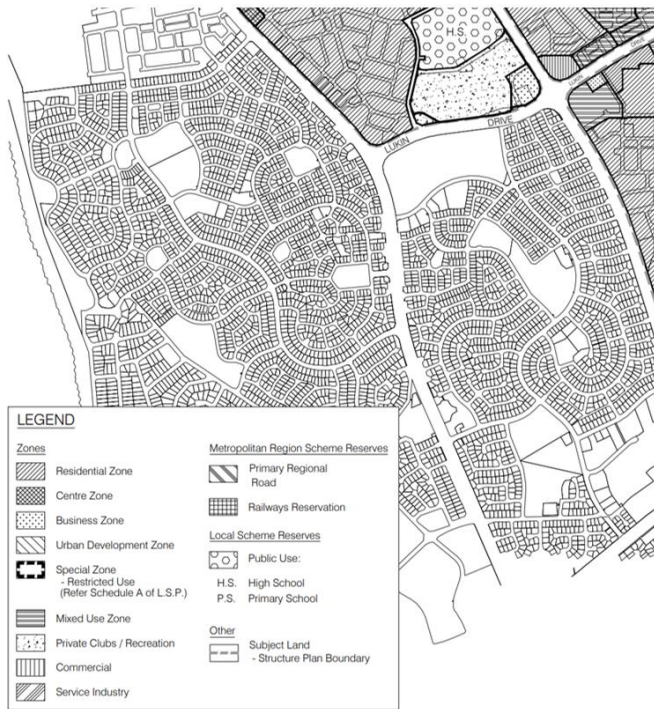
BUTLER RIDGEWOOD

PLAN 2 - CONSOLIDATED ZONING PLAN

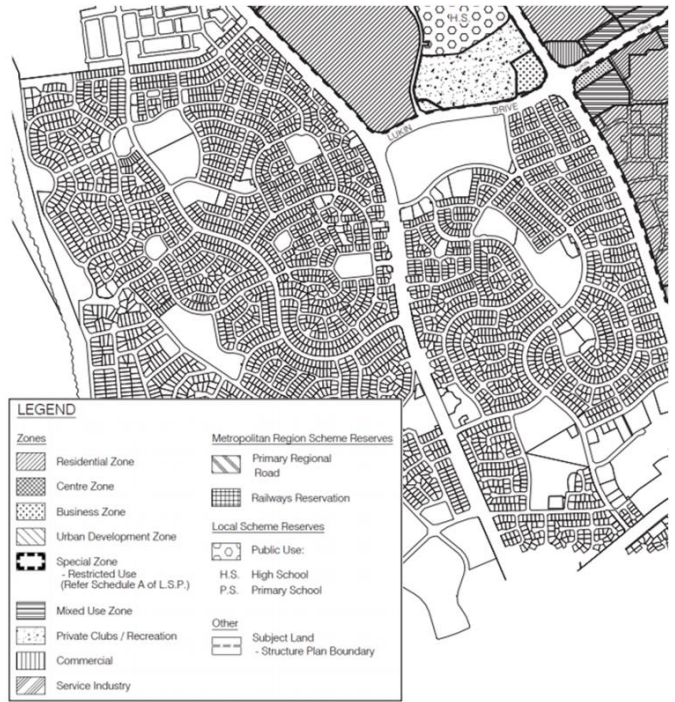


Attachment 2

Existing and Proposed Zoning Plan



BUTLER RIDGEWOOD
PLAN 2 - CONSOLIDATED ZONING PLAN



BUTLER RIDGEWOOD
PLAN 2 - CONSOLIDATED ZONING PLAN

Attachment 3

Traffic Impact Assessment



Proposed Service Station

Lot 9001 Lukin Drive, Ridgewood

Transport Impact Assessment - Update

**PREPARED FOR:
Vend Property**

April 2021

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Project: Lot 9001 Lukin Drive, Ridgewood

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1.0 Summary

Transcore prepared a Transport Impact Assessment in February 2020 for the proposed retail/commercial centre to be developed on Lot 9001 Lukin Drive in Ridgewood, City of Wanneroo. The then proposed retail/commercial centre development comprised a service station with two fast-food restaurants co-located at the subject site.

Since the submission of the original Development Application the City has provided several comments with respect to the originally proposed access system and the requirement for provision of a left-turn deceleration lane for the proposed site's crossover on Lukin Drive.

Additionally, the Development Application is now focusing only on the service station component of the original retail/commercial centre with the intention to ultimately develop the balance of the site to include the two fast-food restaurants with associated drive-through facilities.

Accordingly, this Transport Impact Assessment Update (hereafter TIAU) sets out to provide new and up-to-date information with respect to the revised development proposal.

As a result of the City's comments the proponent has prepared a modified site plan which now includes several key modifications including:

- ✚ Provision of a left-turn deceleration lane for Lukin Drive crossover;
- ✚ Positioning the proposed Lukin Drive crossover more centrally to the site;
- ✚ Internal site re-design to interface with the new crossover location;
- ✚ Removal of two of the previously proposed crossovers on the east-west laneway; and,
- ✚ Lukin Drive crossover design adjustment to accommodate access and egress of a 19.0m semi-trailer;

The development proposal contemplates a new service station and associated convenience store at the eastern half of the site. The two fast-food restaurants with drive-through facilities will be developed at subsequent stage of the project at the western portion of the site.

As part of the development proposal a two-point access system is proposed to serve the development. In order to reduce the impact of the proposed development traffic on the existing residential dwellings to the east and south of the subject site, the proposal entails a left-in/left-out crossover on Lukin Drive.

In accordance with the WAPC document "*Transport Impact Assessment Guidelines for Developments, Volume 4 – Individual Developments (2016)*" a Transport Impact Assessment is required for developments that are likely to generate high volumes of

traffic and, therefore, would have a high overall impact on the surrounding land uses and transport networks.

The aim of this TIAU is to estimate the traffic which will be generated by the development and establish the resultant traffic pattern on the surrounding road network. This assessment will include the capacity analysis of the intersection of Connolly Drive/Lukin Drive and Lukin Drive/Ashbourne Avenue including the proposed development's crossovers on the frontage roads.

2.0 Introduction

This TIA has been prepared by Transcore on behalf of Vend Property with regards to the proposed service station with a convenience store at Lot 9001 Lukin Drive in Ridgewood, City of Wanneroo.

The subject site (approximately 8,660m² in size) is bound by Connolly Drive to the west, Lukin Drive to the north, Ashbourne Avenue to the east and residential properties to the south and east as shown in **Figure 1**. The subject site is presently vacant. The proposed service station will occupy the eastern portion of the site with the balance of the site to be developed at some point in the future.

The key issues that will be addressed in this report include the traffic generation of the proposed development, capacity analysis of the existing Connolly Drive/Lukin Drive and Lukin Drive/Ashbourne Avenue intersections, capacity analysis of the site crossovers and assessment of the internal site circulation system for service vehicles.



Figure 1: Location of the subject site

The location of the subject site within the *Metropolitan Region Scheme* context is illustrated in **Figure 2**. Review of the *Metropolitan Regional Scheme* also confirms that Connolly Drive and Lukin Drive are classified as *Other Regional Roads* (Blue Roads), as shown in **Figure 2**.

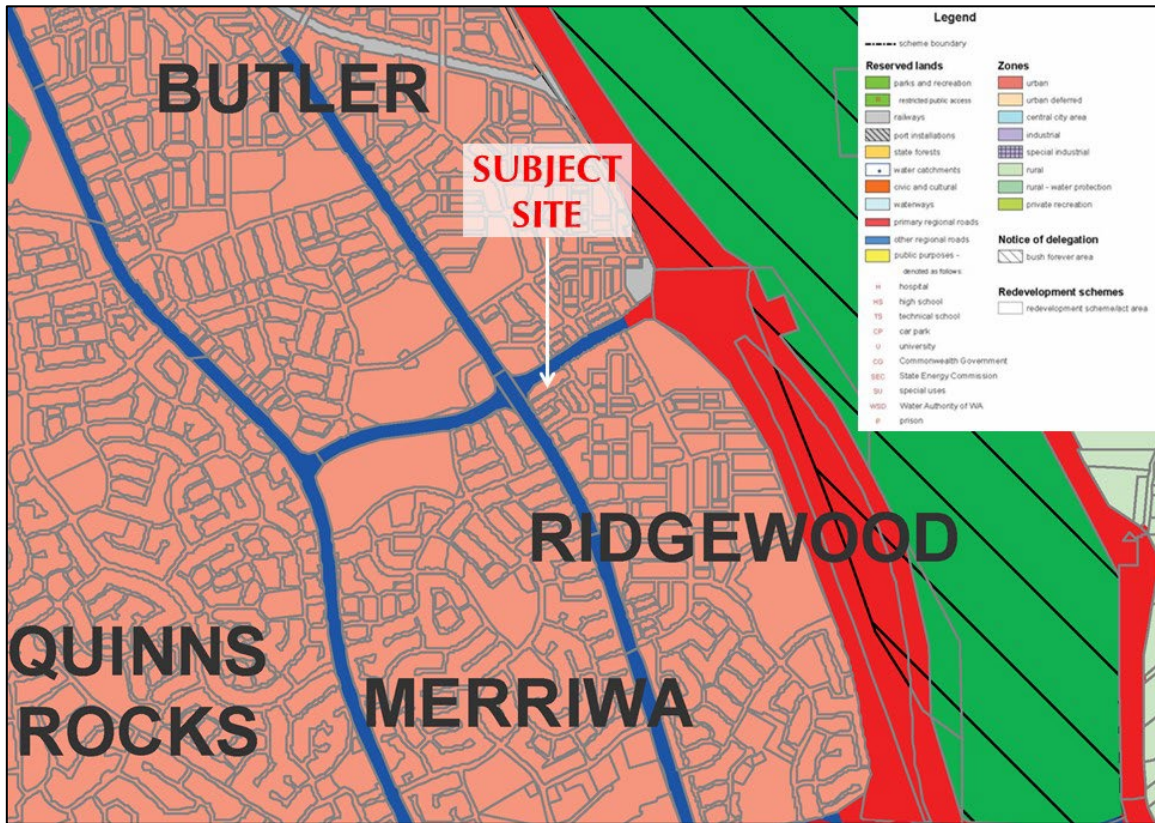


Figure 2. Site location within Metropolitan Region Scheme

3.0 Development Proposal

The development proposal comprises a service station with eight bowsers and associated convenience store of approximately NLA 160m². The proposed service station occupies the eastern portion of the Lot 9001.

It should also be noted that the balance of the site (i.e., western portion) is intended to be developed in the future so to integrate seamlessly with the proposed service station. According to the advice provided by the proponent the western portion of the site is contemplated for two fast-food restaurants with associated drive-through facilities and adequate parking.

A total of 10 parking bays (inclusive of one ACROD bay) are proposed to serve the service station. The parking provision This does not include eight parking spaces at the fuel bowsers. Refer **Appendix A** for more details.

A separate service yard (loading bay) is also proposed at the southern side of the store. It has been advised that large size rigid vehicle of up to 12.5m in length would be used for deliveries/pick-ups. Turn path assessments confirming the suitability of the internal site layout and service yard designs has been undertaken for large size rigid trucks and are presented in **Appendix B**.

The proposed access system for the development comprises the following elements:

- ✚ A left-in/left-out only crossover on Lukin Drive located approximately 65m west of Ashbourne Avenue intersection; and,
- ✚ A full-movement crossover on Kilrush Turn.

The delivery of fuel will be undertaken using a typical 19m fuel tanker which will enter the site via Lukin Drive crossover, access the fill points west of the canopy and exits the site via Lukin Drive crossover. The location of the fill point has been selected so that a tanker undertaking the filling operation will not impact on the operation of either of the crossovers and will also have a minimal impact on traffic circulation within the site. Appropriate turn path assessment for the tankers is also presented in **Appendix B**.

For the purpose of traffic assessment, it is assumed that the proposed development would be completed and fully operational by the end of 2021.

4.0 Existing Situation

The Lot 9001 entails three road frontages: Lukin Drive to the north, Ashbourne Avenue to the east and Kilrush Turn/Laneway to the south. Currently, the subject site is vacant.

4.1 Existing Road Network

Connolly Drive is a dual-carriageway, four-lane road with a wide landscaped median and on-road cycle lanes. It entails shared paths along both sides of the road in this vicinity. Connolly Drive operates under 70km/h speed limit south of Lukin Drive reducing to 60km/h to the north of it. A 40km/h speed school zone is in place immediately north of Lukin Drive.

In the Main Roads WA *Perth Metropolitan Area – Functional Road Hierarchy* document, Connolly Drive is classified as a *Distributor A* road. According to the *Metropolitan Region Scheme (MRS)* at this location Connolly Drive is covered by *Other Regional Road (ORR)*.

Lukin Drive entails a two-lane, dual divided carriageway cross-section with a 16m wide landscaped median and on-road cycling lanes. In this vicinity, Lukin Drive entails paths along both sides of the road. At this location Lukin Drive operates under a 60km/h speed limit regime. West of Connolly Drive Lukin Drive entails a 40km/h speed school zone. Refer **Figure 3** for more details.

In the Main Roads WA *Perth Metropolitan Area – Functional Road Hierarchy* document, Lukin Drive is classified as a *Local Distributor* road. According to the *Metropolitan Region Scheme (MRS)* at this location Lukin Drive is covered by *Other Regional Road (ORR)* reservation.

Ashbourne Avenue, is presented as a two-lane boulevard-style road with a 4m wide landscaped median, on-street cycling lanes and pedestrian paths on both sides. It operates under a default built-up area speed limit regime of 50km/h (refer **Figure 4**).

In the Main Roads WA *Perth Metropolitan Area – Functional Road Hierarchy* document, Ashbourne Avenue is classified as a *Local Distributor*.



Figure 3. Westbound view along Lukin Drive



Figure 4. Northbound view along Ashbourne Avenue from Kilrush Turn intersection

Kilrush Turn, is an L-shaped, 6m wide single-carriageway road with embayed on-street parking and wide paths on both sides and pedestrian paths on one or both sides. It operates under a default built-up area speed limit of 50km/h (refer **Figure 5**).

In the *Main Roads WA Perth Metropolitan Area – Functional Road Hierarchy* document, Redwood Avenue is classified as an *Access Road*.



Figure 5. Westbound view along Kilrush Turn from Ashbourne Avenue

Lukin Drive forms a four-way signalised intersection with Connolly Drive, immediately adjacent to the subject site. On its approaches to the intersection Connolly Drive entails two through lanes, a right-turn pocket and a left-turn slip lane. Lukin Drive entails one through lane, one right-turn lane and one left-turn slip-lane on both approaches. Pedestrian crossings are in place on all legs of the intersection.

Immediately northwest of the site, Lukin Drive forms a priority-controlled T-intersection with Ashbourne Avenue terminating on its southern approach. Lukin Drive entails a left-turn slip lane and a right-turn pocket at this intersection while Ashbourne Avenue entails a separate left and right-turn lane on its approach. Sheltered pedestrian crossings are in place on all sides of the intersection.

Ashbourne Avenue and Kilrush Turn form a priority-controlled T-intersection at the southeast corner of the site with Kilrush Turn terminating on western approach to the intersection.

4.2 Existing Traffic Volumes on Roads

According to the latest available SCATS data sourced from Main Roads WA, Connolly Drive (north of Lukin Drive) carried approximately 19,020vpd on a regular weekday in 2017/18. The classified counts for this road indicate approximately 4% participation of heavy vehicles in the total daily traffic mix.

According to the latest available SCATS data sourced from Main Roads WA, Lukin Drive (east of Connolly Drive) carried approximately 4,360vpd on a regular weekday in August 2019. The classified counts for this road indicate approximately 2% participation of heavy vehicles in the total daily traffic mix.

Based on the latest available traffic count survey undertaken by Transcore in December 2019, it is estimated that Ashbourne Avenue carried around 700vpd on a regular weekday.

It is estimated that Kilrush Turn presently carries up to 150vpd during the typical weekday, based on Transcore’s survey data.

4.3 Heavy Vehicles

Restricted Access Vehicle (RAV) Network routes are designated for access by large heavy vehicle combinations, which is managed by Main Roads WA. All roads surrounding the subject site including: Connolly Drive, Lukin Drive, Ashbourne Avenue and Kilrush Turn are classified as RAV Network 1 as shown **Figure 6**.

The RAV 1 Network classification permits operation of semi-trailers of up to 19m and short B-Doubles of up to 20m on these roads.

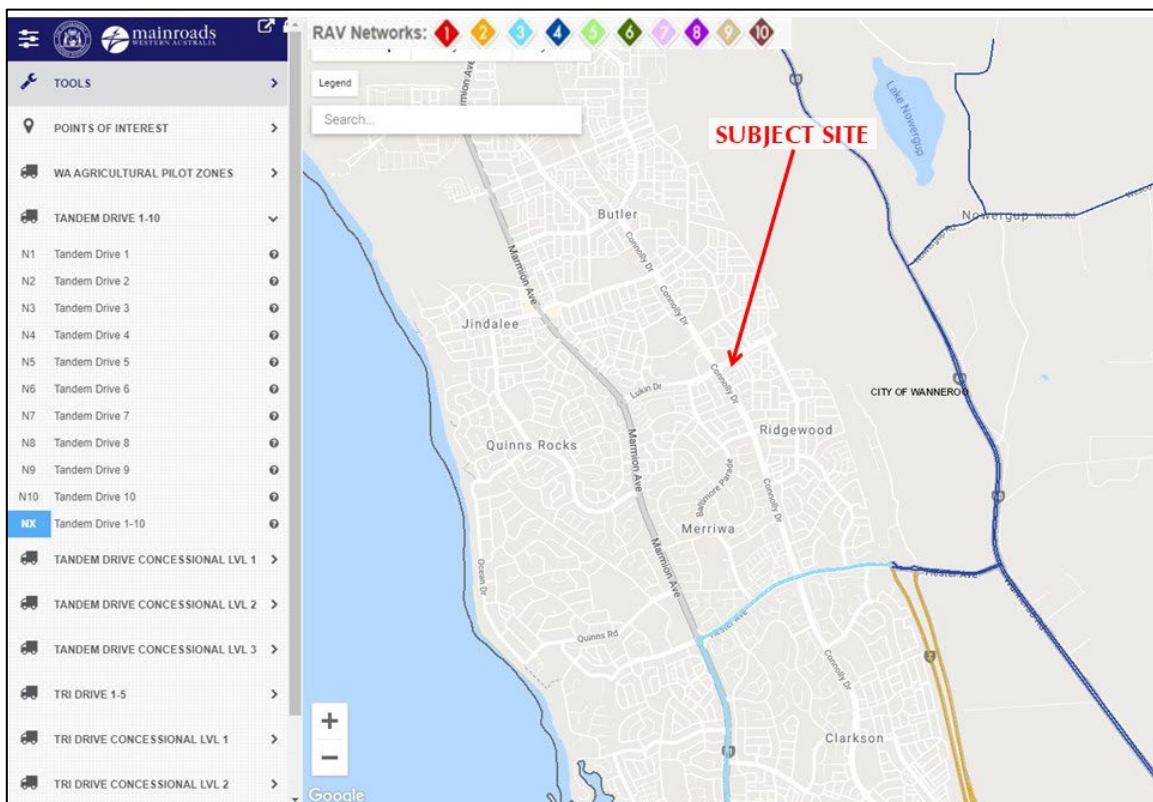


Figure 6. Existing heavy vehicle road network classification (RAV)

4.4 Public Transport Access

The closest existing bus route to the development area is bus service No. 484 operating along Hinchinbrook Avenue/Lukin Drive/Shepperton Drive corridor with bus stops on Shepperton Drive approximately 350m walking distance of the subject site. Bus stops are accessible directly via existing path system at this locality. This bus

service links Clarkson Station with Butler Station providing opportunities to transfer to Joondalup train line.

The Transperth map of existing public transport services available in the vicinity of the subject site is provided in **Figure 7**.

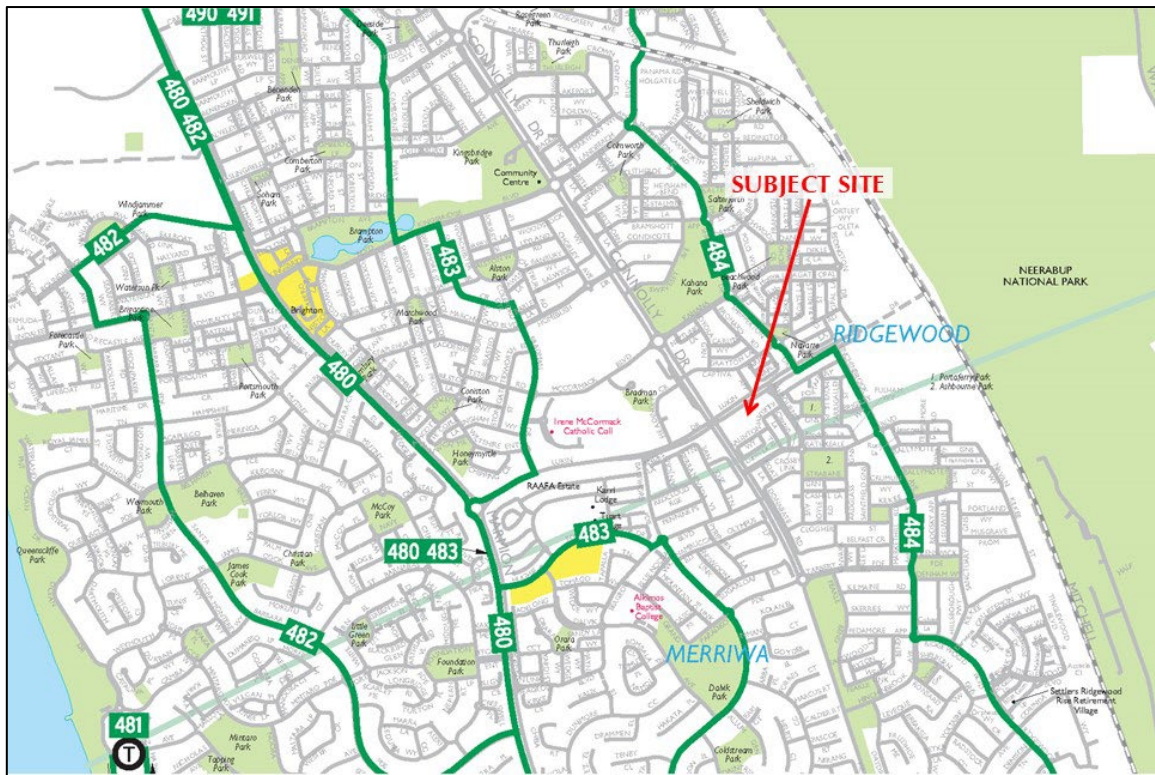


Figure 7: Existing bus routes (source: Transperth)

4.5 Pedestrian and Cyclist Facilities

The subject site enjoys very good level of access by pedestrian and cyclist paths with a network of on-road cycle lanes, shared paths and “good road riding environment” roads which provide links to major local attractors. The Department of Transport’s *Perth Bike Map* series shows a good cyclist connectivity for the subject site as shown **Figure 8**.



Figure 8: Bike map (source: Transperth)

4.6 Crash Data

Information available on Main Roads WA website provides crash statistics for Connolly Drive/Lukin Drive intersection during the five-year period ending in December 2020. No crashes were recorded at the Ashbourne Avenue/Lukin Drive or Ashbourne Avenue/Kilrush Turn intersections over this period.

The crash records indicate that Connolly Drive/Lukin Drive intersection recorded a total of 34 road crashes with seven casualties and no fatalities in the last five-year period. Most of the recorded crash were rear ends and right-turn/through types. More details on the crash records are provided in **Table 1**.

Table 1. Crash history for the Connolly Drive/Lukin Drive intersection

Intersection				Total Crashes	Casualty
Connolly Drive/Lukin Drive				34	7
Right turn thru	Rear End	Pedestrian	Cycle	Wet	Night
13	17	0	N/A	4	12

5.0 Changes to Surrounding Transport Networks

Mitchell Freeway presently terminates at Hester Avenue; however, planning and design works are currently underway for a planned extension further north by about 5.6km. The Mitchell Freeway Extension Project will see the freeway extending from Hester Avenue in Clarkson to Romeo Road in Alkimos. As part of this project Lukin Drive is planned to connect at the eastern end to the future freeway extension in form of an interchange.

According to the latest available information the timing for completion of this project is late 2022/late 2023.

6.0 Integration with Surrounding Area

The proposed development is consistent with the current zoning for the subject site. It is of a commercial/retail character and is expected to address the existing and future demand for this type of service along Connolly Drive, Lukin Drive and specifically within this locality.

Considering the zoning of the site, it is important to reduce any impact on the existing residential dwelling to the south and east of the subject site. Accordingly, and to achieve this objective, the proposal entails a left-in/left-out crossover on Lukin Drive.

7.0 Traffic Assessment

7.1 Assessment Period

Due to the nature of the development, it is expected that distinct peak activity periods will be experienced during weekday morning and afternoon peak road network periods.

A review of the existing traffic counts for the surrounding road network and other available information, suggests that the combination of the traffic expected to be generated by the subject development and the peak road network traffic periods is likely to result in the greatest demand on the road network during the typical weekday morning and afternoon peak hours between 8:00-9:00AM and 3:00 - 4:00PM. As such, trip generation is estimated and traffic analysis is undertaken for these periods.

It is assumed that the proposed development would be fully constructed and activated by the end of 2022. As such, 2022 assessment is undertaken for the post-development scenario.

In line with the requirements of the document *“Transport Impact Assessment Guidelines for Developments, Volume 4 - Individual Developments (2016)”* additional assessment is undertaken for a 10-year post development time horizon (i.e., 2032 in this case).

7.2 Trip Generation and Distribution

At this stage only the eastern portion of the site is proposed to be developed. However, the western portion of the site is also contemplated for further development in the subsequent stages of the project to ultimately form a retail/commercial centre over the entire Lot 9001. The development of the western portion of the site is also anticipated to take place in the very near future.

Accordingly, for the purpose of this report and in order to provide for a robust assessment, modelling and assessment will be undertaken for the ultimate retail/commercial centre development comprising one service station with convenience store and two fast-food restaurants with associated drive-through facilities.

Traffic generation rates for the service station were sourced from the *Institute of Transportation Engineers - Trip Generation Manual 10th Edition* (ITE), while the rates for the fast-food components were based on the actual transaction (sales data) records for the likely similar future restaurants.

Due to the proposed land use mix within the retail/commercial centre, incidences of multi-purpose trips¹ (i.e., cross-trade) are anticipated between the proposed uses. A moderate cross-trade discount of 10% was applied only for the fast-food outlets while no cross-trade discount applied for the service station.

Accordingly, it is estimated that the future retail/commercial centre would generate approximately **3,600** total daily trips (both inbound and outbound) with approximately **147** and **244** trips (inbound and outbound) during a weekday road network AM and PM peak hours, respectively.

Trips associated with the proposed elements of the future retail/commercial centre also comprise a significant portion of passing-trade trips (and diverted trips) which are trips already present on the road network. Arguably in some cases the constituent land uses may draw up to 90% or more of passing trade subject to location, accessibility and type of fronting roads. In this case a moderate passing trade discount of around 30% of total trips generated was assumed for the entire development during peak AM and PM periods.



It is therefore estimated that the proposed development would generate approximately **2,520** additional daily trips with additional **103** and **170** AM and PM peak hour trips on the road network, respectively.

The directional split of inbound and outbound trips for the retail/commercial centre is assumed to be approximately 50/50 during both weekday peak periods, except for one of the fast-food restaurants in the AM peak as it is expected to commence operation in late morning. In this instance only inbound employee trips are anticipated (employees arriving to work in the morning).

With respect to the assumed distribution and assignment of the development-generated traffic consideration was given to the location of the site (adjacent to a major district-level route), the overwhelmingly passing trade nature of the constituent land uses and the access and egress routes to and from the site (distribution is based on current road network and its layout). The assumed directional distribution was confirmed by the existing site observations during both peak periods.

It is anticipated that most of the future site patrons will be accessing the site primarily via Connolly Drive with a smaller proportion arriving via Lukin Drive and Ashbourne Avenue. Consequently, the assumed directional traffic distribution is as follows:

Inbound traffic:

-  50% of all site-generated traffic from Connolly Drive (north);
-  20% of all site-generated traffic from Connolly Drive/Ashbourne Avenue (south);

¹ Multi-purpose trips are incidences where more than one shop/outlet are visited within the development (also referred to as "cross-trade")

- 20% of all site-generated traffic from Lukin Drive (west); and,
- 10% of all site-generated traffic from Lukin Drive (east).

Outbound traffic:

- 20% of all site-generated traffic towards Connolly Drive (north);
- 50% of all site-generated traffic towards Connolly Drive (south);
- 20% of all site-generated traffic towards Lukin Drive (west); and,
- 10% of all site-generated traffic towards Lukin Drive (east).

7.3 Traffic Flows

The traffic movements generated by the future retail/commercial centre have been manually assigned on the adjacent road network in line with the directional distribution assumptions outlined in the previous section. The resulting traffic movements generated by this development during typical AM and PM weekday peak hour traffic volumes are shown in **Figure 9**.



Figure 9: Estimated traffic flows from the future retail/commercial centre – Weekday AM & PM peak traffic

For the purpose of this assessment the existing AM and PM weekday peak hour traffic movements at the relevant intersections including the adjacent Connolly Drive/Lukin Drive signalised intersection were derived from the on-site traffic surveys (conducted on Tuesday 3rd December 2019) combined with the actual

SCATS data (sourced from Main Roads WA) during the AM and PM peaks on Tuesday 20th August 2019. The resultant traffic movements at these intersections are illustrated in **Figure 10**.



Figure 10. Existing traffic flows at the local intersections including Connolly Drive/Lukin Drive signalised intersection (AM & PM peak hours)

7.4 Analysis of Local Intersections & Development's Crossovers

The assessment of the Connolly Drive/Lukin Drive, Lukin Drive/Ashbourne Avenue and Ashbourne Avenue/Kilrush Turn intersections was undertaken for the existing and post-development (year 2022) scenarios.

The site's crossover on Kilrush Turn, including the future crossovers on the east-west service road, are not expected to experience any capacity issues.

Similarly, the site's crossover on Lukin Drive is intended to operate as left-in/left-out only crossover and as such is not expected to experience any capacity issues either. Accordingly, detailed capacity assessment of site's crossovers is not deemed necessary.

For the purpose of this assessment background traffic growth of 2% p.a. was allowed for all surrounding roads (i.e., cumulative 4% growth for 2022 scenario).

Lukin Drive is planned to connect to the future Mitchell Freeway northbound extension at the eastern end and form a new interchange. The completion of this

project and opening of a new section of Mitchell Freeway as well as construction of a new interchange at Butler Boulevard and creation of a new east-west connection between Marmion Avenue and Wanneroo Road (Romeo Road) is expected to have a significant influence on the current traffic flows and patterns on Lukin Drive and other local roads.

Accordingly, the road network modelling to include the freeway extension and associated assessment of the 2032 development scenario for the proposal is considered to be beyond the scope of the Transport Impact Assessment and will therefore not be undertaken in this case. This is particularly the case as Main Roads WA ROM traffic projections are not available for consultants working on projects in private sector.

It is however expected that road network planning and modelling for the locality accounted for the land zoning and future developments so that the road network has been constructed to a standard to has adequate capacity to accommodate traffic from development of this site. Lukin Drive itself is planned to be upgraded to a four-lane standard which would secure additional capacity for the expected traffic growth post freeway extension.

In order to establish the existing and future traffic operations at the Connolly Drive/Lukin Drive, Lukin Drive/Ashbourne Avenue and Ashbourne Avenue/Kilrush Turn intersections during the critical weekday morning and afternoon peak periods a capacity analysis using SIDRA NETWORK computer package was undertaken. This package is a commonly used intersection-modelling tool by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These items are defined as following:

- ✚ **Degree of Saturation:** is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.
- ✚ **Level of Service:** is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of services, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- ✚ **Average Delay:** is the average of all travel time delays for vehicles through the intersection.
- ✚ **95% Queue:** is the queue length below which 95% of all observed queue lengths fall.

For the purpose of this assessment the Connolly Drive/Lukin Drive, Lukin Drive/Ashbourne Avenue and Ashbourne Avenue/Kilrush Turn intersections were modelled as one interconnected network so to allow for potential mutual impacts and reduced upstream/downstream capacity. The participation (i.e. percentage) of heavy vehicles in the total traffic mix on relevant roads was derived for each vehicle class from the latest available SCATS data for the constituent roads.

The results of the SIDRA analysis for the existing and 2022 scenarios are illustrated in **Table 2** through to **Table 13** in **Appendix C** and discussed in the following paragraphs. The network layout modelled in SIDRA is also illustrated in **Figure 11** in **Appendix C** of this report.

Connolly Drive/Lukin Drive intersection

The results of the SIDRA analysis for the existing situation show that this intersection presently operates with an overall intersection Level of Service B (LoS B) and at 57% and 56% capacity for morning and afternoon peak periods, respectively. The most pronounced queues are recorded on the Connolly Drive north and south approached during the AM and PM peaks.

The SIDRA analysis of the post-development stage (i.e., 2022 scenario) which includes the addition of the development-generated traffic combined with the 4% growth of background traffic on constituent roads shows that the intersection would retain its current overall LoS B and record moderate increases in capacity levels which are now at 57% and 58% during AM and PM peak periods. Moderate and proportional increases in delays and queues are also recorded on all intersection approaches.

It can therefore be concluded that the Connolly Drive/Lukin Drive intersection has sufficient capacity to accommodate the anticipated additional traffic from the proposed development combined with estimated background traffic growth on constituent roads and would continue to operate under similar conditions as at present after the development.

Lukin Drive/Ashbourne Avenue intersection

The results of the SIDRA analysis confirm that this intersection currently operates satisfactorily and with overall LoS A during both peak periods, with ample spare capacity and with no significant queueing or delays. This outcome is generally consistent with the site observations.

The addition of the development-generated traffic will not have a detrimental impact on the operation of the intersection, which will continue to enjoy the same LoS A in the post-development stage including a significant amount of spare capacity.

Ashbourne Avenue/Kilrush Turn intersection

The results of the SIDRA analysis confirm that this intersection currently also operates with an overall LoS A during both peak periods and with ample spare capacity and no significant queueing or delays.

The addition of the development-generated traffic will not have a detrimental impact on the operation of the intersection, which will continue to enjoy the same LoS A in the post-development stage including a significant amount of spare capacity.

7.5 Impact on Surrounding Roads

The significant portion of the developments' traffic will already be present on the road network as it relies on passing trade for its successful operation. It is conservatively assumed that about 30% of total daily traffic will be passing trade and/or diverted trips. The future retail/commercial centre is therefore conservatively estimated to generate about 2,520 new (non-passing trade) daily trips on the local road network.

This level of traffic increase represents around 4.6% and 1.2% of additional traffic on Connolly Drive and about 7.4% on Lukin Drive (west) section.

The most pronounced increases in traffic are nominally recorded on Lukin Drive (between Connolly Drive and Ashbourne Avenue) at 38%, and Ashbourne Avenue (south of site) at about 36%. However, this additional traffic is still well within the intended total daily traffic thresholds of respective roads.

Similarly, the total post-development daily traffic level of about 1,700vpd on Ashbourne Avenue, section between Lukin Drive and Kilrush Turn can be accommodated by this road.

7.6 Impact on Neighbouring Areas

Considering the location of the subject site, its accessibility via major regional road, significant passing trade component and limited number of residential dwellings within the immediate vicinity, the traffic impact from the proposed development in the area will be limited.

The proposed left-in/left-out crossover on Lukin Drive form an important initiative to reduce the impact of the proposed development on the existing surrounding residential areas.

7.7 Traffic Noise and Vibration

Due to the location of the proposed development and with respect to the surrounding land uses traffic noise and vibration are relevant only to the residential areas directly fronting major local and regional roads including the residential cell immediately south of the subject development which in this case is limited.

It generally requires a doubling of traffic volumes on a road to produce a perceptible 3dB(A) increase in road noise. The proposed development will not increase traffic volumes or noise on surrounding roads anywhere near this level.

8.0 Parking

Total car parking provision for the proposed service station comprises 10 parking bays exclusive of eight parking spots at fuel-filling positions. The parking provision includes one ACROD bay which is located immediately adjacent to the entry into the service station store for patron's convenience.

The design of the car park area and bays would need to be in accordance with provisions of AS 2890.1.

9.0 Public Transport Access

At present, Transperth service No. 484 operates in the relative proximity of the site with bus stops within comfortable walking distance and accessible directly via existing path system at this locality. This bus service links Clarkson Station with Butler Station providing opportunities to transfer to Joondalup train line.

10.0 Pedestrian and Cyclist Access

Pedestrian and cyclist patronage to the proposed development is expected to be limited due to the nature of the proposed development. However, the existing path system in the vicinity provides adequate access to the subject site.

11.0 Conclusions

This TIAU has been prepared with respect to the proposed service station and convenience store at Lot (Pt) 9001 Lukin Drive in Ridgewood, City of Wanneroo. The subject site is located on the southern side of Lukin Drive between Connolly Drive and Ashbourne Avenue intersections.

The access system proposed to service station and convenience store comprises one full-movement crossover on Kilrush Turn and a left-in/left-out only crossover on Lukin Drive. The intention of the proposed left-in/left-out crossover on Lukin Drive is to reduce the impact of the proposed development on the existing adjacent residential areas to the south and east.

The proposed development forms part of the future fully integrated retail/commercial centre over the entire Lot 9001 which was modelled in this case in order to ensure a robust assessment. The fully-developed retail/commercial centre is expected to generate approximately **3,600** total daily trips (both inbound and outbound) with approximately **147** and **244** trips (inbound and outbound) during a weekday road network AM and PM peak hours, respectively. However, due to the nature of the proposed land uses, a significant portion of development-generated traffic will be from the passing trade (i.e., traffic already present on the road network).

The assessment undertaken in this report indicates that the traffic from the fully-developed retail/commercial centre on Lot 9001 (including the proposed service station and convenience store) will not have an adverse impact on the surrounding road network which has the capacity to accommodate this additional traffic.

The traffic assessment undertaken in this report indicates that Connolly Drive/Lukin Drive, Lukin Drive/Ashbourne Avenue and Ashbourne Avenue/Kilrush Turn intersections have sufficient capacity to accommodate the anticipated traffic from the future development on Lot 9001 in the post-development stage.

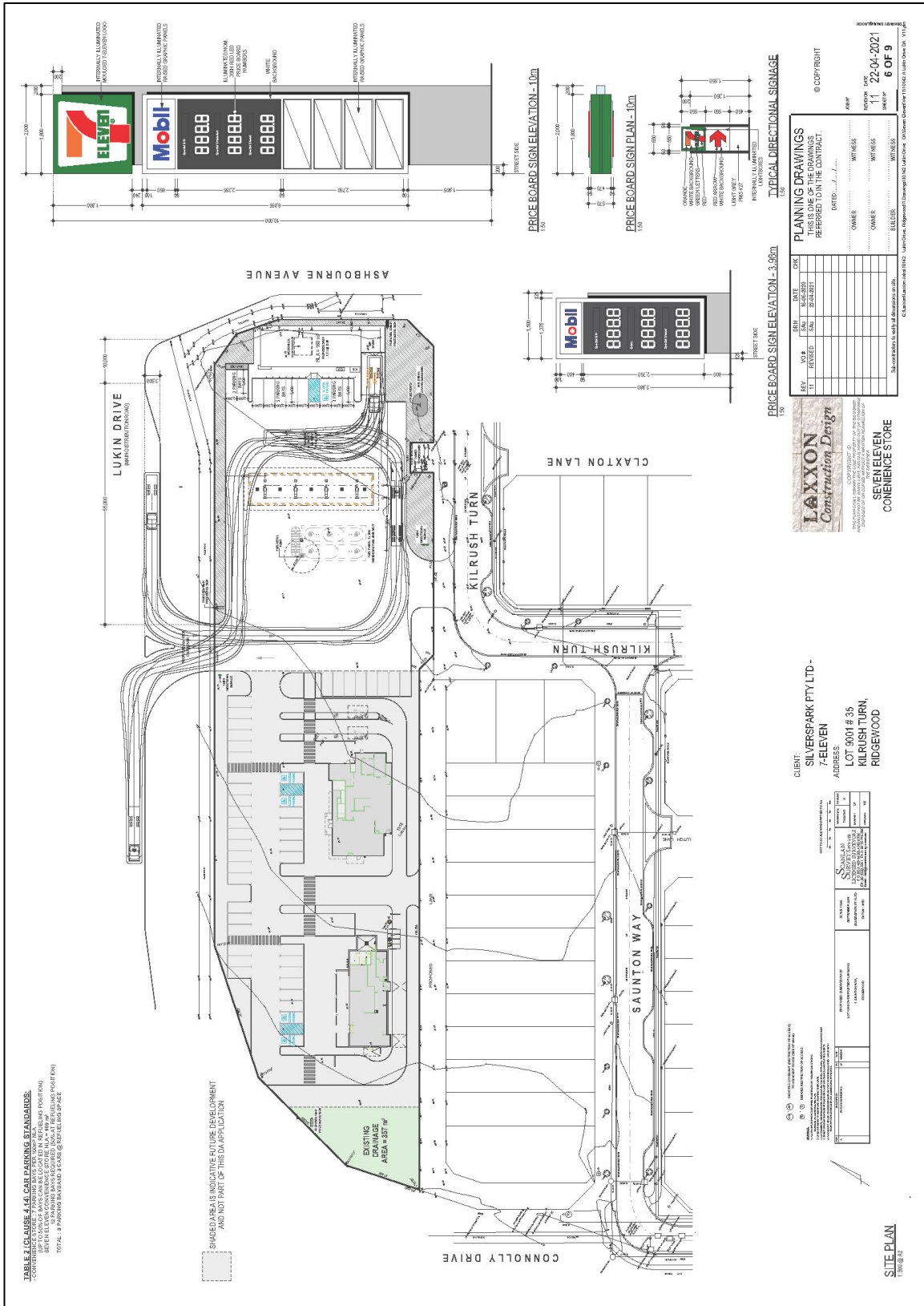
Therefore, the traffic-related issue should not form an impediment to the approval of the proposed development.

Appendix A

SITE PLAN

Appendix B

TURN PATH PLANS



Appendix C

SIDRA NETWORK LAYOUT & RESULTS FOR EXISTING & 2021 SCENARIOS

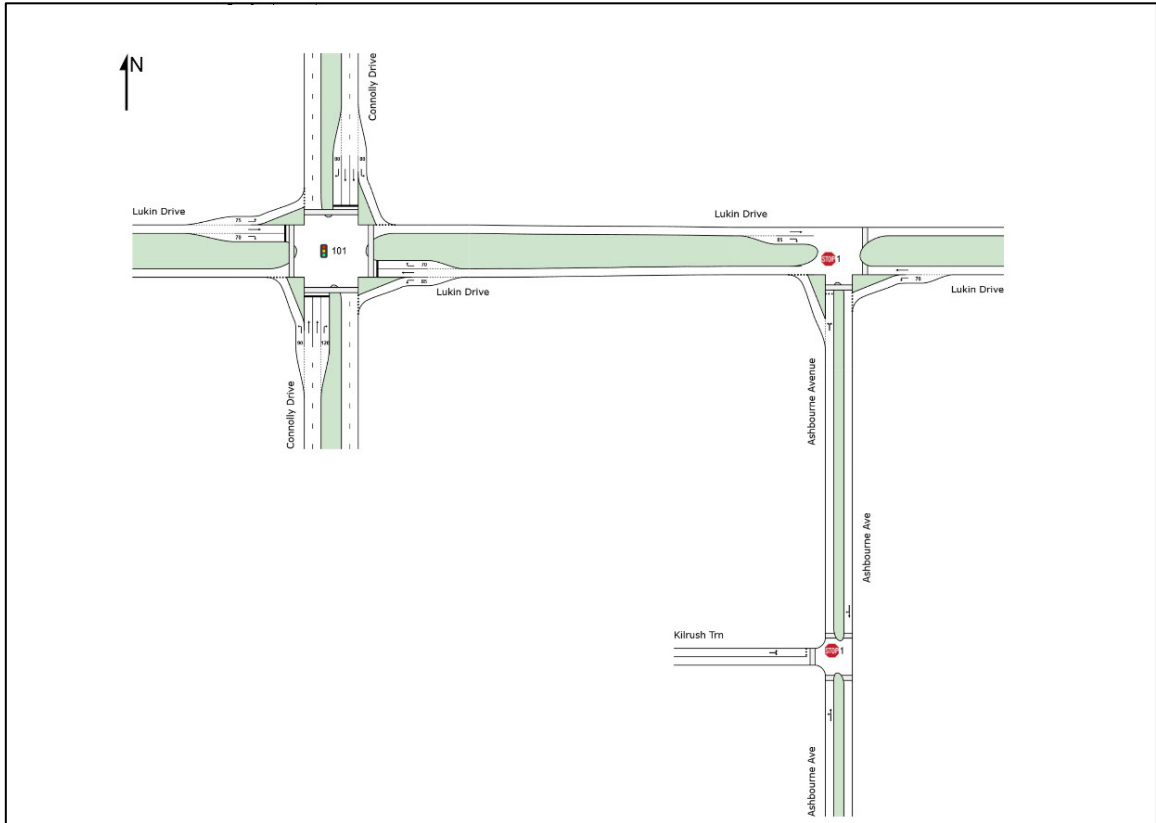


Figure 11. local road network layout modelled in SIDRA

Table 2. SIDRA results for the Connolly Drive/Lukin Drive intersection – Weekday AM peak period (Existing)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	Total veh/h	HV %				Vehicles	Distance m				
South: Connolly Drive														
1	L2	187	0.3	187	0.3	0.146	7.9	LOS A	1.2	9.0	0.29	0.66	0.29	55.9
2	T1	448	0.3	448	0.3	0.327	18.2	LOS B	5.5	43.1	0.76	0.68	0.76	48.9
3	R2	68	0.3	68	0.3	0.341	39.2	LOS D	2.3	17.8	0.96	0.75	0.96	28.3
Approach		704	0.3	704	0.3	0.341	17.5	LOS B	5.5	43.1	0.65	0.68	0.65	48.8
East: Lukin Drive														
4	L2	181	0.0	181	0.0	0.226	10.0	LOS A	1.9	14.4	0.53	0.70	0.53	51.2
5	T1	63	0.0	63	0.0	0.136	22.7	LOS C	1.7	12.9	0.82	0.63	0.82	39.4
6	R2	71	0.0	71	0.0	0.206	29.9	LOS C	2.0	15.1	0.85	0.74	0.85	34.8
Approach		315	0.0	315	0.0	0.226	17.0	LOS B	2.0	15.1	0.66	0.69	0.66	43.9
North: Connolly Drive														
7	L2	34	0.3	34	0.3	0.026	6.7	LOS A	0.2	1.3	0.24	0.60	0.24	49.3
8	T1	775	0.3	775	0.3	0.565	19.1	LOS B	10.7	83.1	0.85	0.73	0.85	48.7
9	R2	108	0.3	108	0.3	0.540	39.4	LOS D	3.8	29.2	0.99	0.78	1.00	36.0
Approach		917	0.3	917	0.3	0.565	21.1	LOS C	10.7	83.1	0.84	0.73	0.84	46.7
West: Lukin Drive														
10	L2	85	0.0	85	0.0	0.082	7.4	LOS A	0.6	4.2	0.32	0.63	0.32	52.9
11	T1	57	0.0	57	0.0	0.122	22.6	LOS C	1.5	11.6	0.81	0.62	0.81	34.9
12	R2	182	0.0	182	0.0	0.540	32.4	LOS C	5.7	43.0	0.93	0.81	0.93	40.1
Approach		324	0.0	324	0.0	0.540	24.1	LOS C	5.7	43.0	0.75	0.73	0.75	42.5
All Vehicles		2260	0.2	2260	0.2	0.565	19.8	LOS B	10.7	83.1	0.74	0.71	0.74	46.4

Table 3. SIDRA results for the Connolly Drive/Lukin Drive intersection – Weekday PM peak period (Existing)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	Total veh/h	HV %				Vehicles	Distance m				
South: Connolly Drive														
1	L2	215	0.3	215	0.3	0.161	7.8	LOS A	1.2	9.5	0.28	0.66	0.28	56.1
2	T1	889	0.3	889	0.3	0.562	17.5	LOS B	11.6	89.9	0.80	0.74	0.80	49.4
3	R2	118	0.3	118	0.3	0.522	39.1	LOS D	4.0	31.1	0.98	0.78	0.98	28.4
Approach		1222	0.3	1222	0.3	0.562	17.8	LOS B	11.6	89.9	0.73	0.73	0.73	48.6
East: Lukin Drive														
4	L2	91	0.0	91	0.0	0.097	7.8	LOS A	0.6	4.5	0.37	0.64	0.37	53.4
5	T1	33	0.0	33	0.0	0.100	27.0	LOS C	1.0	7.2	0.87	0.64	0.87	37.0
6	R2	58	0.0	58	0.0	0.255	35.9	LOS D	1.9	13.9	0.93	0.75	0.93	32.2
Approach		181	0.0	181	0.0	0.255	20.3	LOS C	1.9	13.9	0.64	0.67	0.64	41.4
North: Connolly Drive														
7	L2	46	0.3	46	0.3	0.037	7.2	LOS A	0.3	2.4	0.29	0.61	0.29	48.6
8	T1	522	0.3	522	0.3	0.330	14.4	LOS B	6.0	46.5	0.71	0.60	0.71	51.9
9	R2	88	0.3	88	0.3	0.391	37.5	LOS D	2.9	22.8	0.96	0.77	0.96	36.6
Approach		657	0.3	657	0.3	0.391	17.0	LOS B	6.0	46.5	0.71	0.62	0.71	49.0
West: Lukin Drive														
10	L2	101	0.0	101	0.0	0.117	9.1	LOS A	1.1	7.9	0.43	0.66	0.43	51.6
11	T1	83	0.0	83	0.0	0.254	28.0	LOS C	2.6	19.1	0.91	0.70	0.91	31.7
12	R2	138	0.0	138	0.0	0.523	36.4	LOS D	4.6	34.3	0.96	0.79	0.96	38.4
Approach		322	0.0	322	0.0	0.523	25.7	LOS C	4.6	34.3	0.78	0.73	0.78	40.9
All Vehicles		2382	0.2	2382	0.2	0.562	18.9	LOS B	11.6	89.9	0.72	0.69	0.72	47.1

Table 4. SIDRA results for the Connolly Drive/Lukin Drive intersection – Weekday AM peak period (2022)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	Total veh/h	HV %				Vehicles	Distance m				
South: Connolly Drive														
1	L2	195	0.3	195	0.3	0.153	8.2	LOS A	1.3	10.2	0.31	0.66	0.31	55.8
2	T1	37	0.3	37	0.3	0.027	16.0	LOS B	0.4	3.1	0.66	0.54	0.66	50.4
3	R2	72	0.3	72	0.3	0.356	39.3	LOS D	2.4	18.7	0.96	0.76	0.96	28.3
Approach		303	0.3	303	0.3	0.356	16.5	LOS B	2.4	18.7	0.50	0.67	0.50	48.7
East: Lukin Drive														
4	L2	227	0.0	227	0.0	0.281	10.2	LOS B	2.6	19.2	0.55	0.71	0.55	51.0
5	T1	74	0.0	74	0.0	0.159	22.9	LOS C	2.0	15.1	0.82	0.64	0.82	39.3
6	R2	88	0.0	88	0.0	0.259	30.3	LOS C	2.6	19.3	0.86	0.76	0.86	34.7
Approach		389	0.0	389	0.0	0.281	17.1	LOS B	2.6	19.3	0.67	0.71	0.67	43.8
North: Connolly Drive														
7	L2	74	0.3	74	0.3	0.057	6.7	LOS A	0.4	3.0	0.25	0.61	0.25	49.3
8	T1	782	0.3	782	0.3	0.570	19.2	LOS B	10.8	84.2	0.85	0.73	0.85	48.6
9	R2	113	0.3	113	0.3	0.561	39.6	LOS D	3.9	30.5	0.99	0.79	1.02	35.9
Approach		968	0.3	968	0.3	0.570	20.6	LOS C	10.8	84.2	0.82	0.73	0.82	46.7
West: Lukin Drive														
10	L2	85	0.0	85	0.0	0.068	6.6	LOS A	0.4	3.0	0.24	0.61	0.24	53.4
11	T1	57	0.0	57	0.0	0.122	22.6	LOS C	1.5	11.6	0.81	0.62	0.81	34.9
12	R2	182	0.0	182	0.0	0.553	33.2	LOS C	5.8	43.6	0.94	0.81	0.94	39.8
Approach		324	0.0	324	0.0	0.553	24.4	LOS C	5.8	43.6	0.73	0.72	0.73	42.3
All Vehicles		1985	0.2	1985	0.2	0.570	19.9	LOS B	10.8	84.2	0.73	0.72	0.73	45.7

Table 5. SIDRA results for the Connolly Drive/Lukin Drive intersection – Weekday PM peak period (2022)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	Total veh/h	HV %				Vehicles	Distance m				
South: Connolly Drive														
1	L2	223	0.3	223	0.3	0.169	7.8	LOS A	1.3	10.0	0.28	0.66	0.28	56.1
2	T1	911	0.3	911	0.3	0.575	17.6	LOS B	11.9	92.7	0.81	0.74	0.81	49.4
3	R2	122	0.3	122	0.3	0.540	39.2	LOS D	4.2	32.3	0.98	0.79	0.98	28.3
Approach		1256	0.3	1256	0.3	0.575	18.0	LOS B	11.9	92.7	0.73	0.73	0.73	48.6
East: Lukin Drive														
4	L2	159	0.0	159	0.0	0.171	8.0	LOS A	1.1	8.4	0.39	0.66	0.39	53.2
5	T1	49	0.0	49	0.0	0.151	27.4	LOS C	1.5	11.1	0.89	0.66	0.89	36.8
6	R2	75	0.0	75	0.0	0.344	37.4	LOS D	2.5	18.5	0.95	0.76	0.95	31.7
Approach		283	0.0	283	0.0	0.344	19.1	LOS B	2.5	18.5	0.63	0.69	0.63	42.3
North: Connolly Drive														
7	L2	113	0.3	113	0.3	0.091	7.3	LOS A	0.8	6.1	0.31	0.63	0.31	48.5
8	T1	504	0.3	504	0.3	0.319	14.3	LOS B	5.7	44.6	0.70	0.59	0.70	52.0
9	R2	92	0.3	92	0.3	0.405	37.6	LOS D	3.1	23.7	0.96	0.77	0.96	36.6
Approach		708	0.3	708	0.3	0.405	16.2	LOS B	5.7	44.6	0.67	0.62	0.67	48.8
West: Lukin Drive														
10	L2	105	0.0	105	0.0	0.124	9.4	LOS A	1.2	8.7	0.45	0.67	0.45	51.3
11	T1	97	0.0	97	0.0	0.295	28.3	LOS C	3.0	22.5	0.91	0.71	0.91	31.6
12	R2	143	0.0	143	0.0	0.569	36.9	LOS D	4.8	36.1	0.97	0.80	0.99	38.3
Approach		345	0.0	345	0.0	0.569	26.1	LOS C	4.8	36.1	0.80	0.74	0.80	40.5
All Vehicles		2593	0.2	2593	0.2	0.575	18.7	LOS B	11.9	92.7	0.71	0.70	0.71	46.8

Table 6. SIDRA results for the Lukin Drive/Ashbourne Avenue intersection – Weekday AM peak period (Existing)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	Total veh/h	HV %				Vehicles	Distance m				
South: Ashbourne Avenue														
1	L2	18	0.0	18	0.0	0.047	5.5	LOS A	0.2	1.3	0.43	0.60	0.43	24.5
3	R2	23	0.0	23	0.0	0.047	7.4	LOS A	0.2	1.3	0.43	0.60	0.43	47.1
Approach		41	0.0	41	0.0	0.047	6.5	LOS A	0.2	1.3	0.43	0.60	0.43	43.0
East: Lukin Drive														
4	L2	14	0.0	14	0.0	0.011	5.7	LOS A	0.0	0.3	0.10	0.52	0.10	50.3
5	T1	297	0.0	297	0.0	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		311	0.0	311	0.0	0.155	0.3	LOS A	0.0	0.3	0.00	0.02	0.00	59.5
West: Lukin Drive														
11	T1	99	0.0	99	0.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	35	0.0	35	0.0	0.026	6.4	LOS A	0.1	0.7	0.30	0.59	0.30	39.5
Approach		134	0.0	134	0.0	0.052	1.7	NA	0.1	0.7	0.08	0.15	0.08	57.2
All Vehicles		485	0.0	485	0.0	0.155	1.2	NA	0.2	1.3	0.06	0.11	0.06	57.4

Table 7. SIDRA results for the Lukin Drive/Ashbourne Avenue intersection – Weekday PM peak period (Existing)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	Total veh/h	HV %				Vehicles	Distance m				
South: Ashbourne Avenue														
1	L2	7	0.0	7	0.0	0.017	5.0	LOS A	0.1	0.5	0.34	0.53	0.34	25.6
3	R2	9	0.0	9	0.0	0.017	6.6	LOS A	0.1	0.5	0.34	0.53	0.34	47.7
Approach		17	0.0	17	0.0	0.017	5.9	LOS A	0.1	0.5	0.34	0.53	0.34	43.8
East: Lukin Drive														
4	L2	6	0.0	6	0.0	0.005	5.7	LOS A	0.0	0.1	0.10	0.52	0.10	50.3
5	T1	174	0.0	174	0.0	0.091	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		180	0.0	180	0.0	0.091	0.2	LOS A	0.0	0.1	0.00	0.02	0.00	59.6
West: Lukin Drive														
11	T1	162	0.0	162	0.0	0.086	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	35	0.0	35	0.0	0.023	6.0	LOS A	0.1	0.6	0.22	0.57	0.22	40.1
Approach		197	0.0	197	0.0	0.086	1.1	NA	0.1	0.6	0.04	0.10	0.04	58.3
All Vehicles		394	0.0	394	0.0	0.091	0.9	NA	0.1	0.6	0.04	0.08	0.04	58.3

Table 8. SIDRA results for the Lukin Drive/Ashbourne Avenue intersection – Weekday AM peak period (2022)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV % veh/h	Total veh/h	HV %				Vehicles	Distance m				
South: Ashbourne Avenue														
1	L2	18	0.0	18	0.0	0.061	5.6	LOS A	0.2	1.7	0.47	0.63	0.47	23.5
3	R2	31	0.0	31	0.0	0.061	7.9	LOS A	0.2	1.7	0.47	0.63	0.47	46.6
Approach		48	0.0	48	0.0	0.061	7.0	LOS A	0.2	1.7	0.47	0.63	0.47	43.2
East: Lukin Drive														
4	L2	14	0.0	14	0.0	0.011	5.9	LOS A	0.0	0.3	0.18	0.51	0.18	49.8
5	T1	311	0.0	311	0.0	0.162	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		324	0.0	324	0.0	0.162	0.3	LOS A	0.0	0.3	0.01	0.02	0.01	59.4
West: Lukin Drive														
11	T1	97	0.0	97	0.0	0.051	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	89	0.0	89	0.0	0.068	6.5	LOS A	0.2	1.9	0.32	0.61	0.32	39.4
Approach		186	0.0	186	0.0	0.068	3.1	NA	0.2	1.9	0.15	0.29	0.15	53.9
All Vehicles		559	0.0	559	0.0	0.162	1.8	NA	0.2	1.9	0.10	0.17	0.10	56.1

Table 9. SIDRA results for the Lukin Drive/Ashbourne Avenue intersection – Weekday AM peak period (2022)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV % veh/h	Total veh/h	HV %				Vehicles	Distance m				
South: Ashbourne Avenue														
1	L2	7	0.0	7	0.0	0.036	5.1	LOS A	0.1	1.0	0.41	0.59	0.41	24.0
3	R2	22	0.0	22	0.0	0.036	7.2	LOS A	0.1	1.0	0.41	0.59	0.41	47.0
Approach		29	0.0	29	0.0	0.036	6.7	LOS A	0.1	1.0	0.41	0.59	0.41	45.0
East: Lukin Drive														
4	L2	6	0.0	6	0.0	0.005	6.0	LOS A	0.0	0.2	0.21	0.51	0.21	49.6
5	T1	183	0.0	183	0.0	0.096	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		189	0.0	189	0.0	0.096	0.2	LOS A	0.0	0.2	0.01	0.02	0.01	59.6
West: Lukin Drive														
11	T1	157	0.0	157	0.0	0.082	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	124	0.0	124	0.0	0.082	6.0	LOS A	0.3	2.4	0.24	0.58	0.24	40.0
Approach		281	0.0	281	0.0	0.082	2.7	NA	0.3	2.4	0.11	0.26	0.11	54.8
All Vehicles		500	0.0	500	0.0	0.096	2.0	NA	0.3	2.4	0.09	0.19	0.09	55.9

Table 10. SIDRA results for the Ashbourne Avenue/Kilrush Turn intersection – Weekday AM peak period (Existing)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
		Total veh/h	HV % veh/h	Total HV %	HV %				Vehicles veh	Distance m				
South: Ashbourne Ave														
4	L2	1	0.0	1	0.0	0.017	4.6	LOS A	0.0	0.0	0.00	0.02	0.00	49.0
5	T1	32	0.0	32	0.0	0.017	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	49.8
Approach		33	0.0	33	0.0	0.017	0.1	NA	0.0	0.0	0.00	0.02	0.00	49.8
North: Ashbourne Ave														
11	T1	45	0.0	45	0.0	0.026	0.0	LOS A	0.0	0.1	0.01	0.04	0.01	49.6
12	R2	3	0.0	3	0.0	0.026	4.7	LOS A	0.0	0.1	0.01	0.04	0.01	43.3
Approach		48	0.0	48	0.0	0.026	0.3	NA	0.0	0.1	0.01	0.04	0.01	49.4
West: Kilrush Tm														
1	L2	9	0.0	9	0.0	0.007	4.6	LOS A	0.0	0.2	0.09	0.50	0.09	29.1
3	R2	1	0.0	1	0.0	0.007	4.8	LOS A	0.0	0.2	0.09	0.50	0.09	43.5
Approach		11	0.0	11	0.0	0.007	4.7	LOS A	0.0	0.2	0.09	0.50	0.09	33.6
All Vehicles		92	0.0	92	0.0	0.026	0.8	NA	0.0	0.2	0.02	0.08	0.02	48.8

Table 11. SIDRA results for the Ashbourne Avenue/Kilrush Turn intersection – Weekday PM peak period (Existing)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
		Total veh/h	HV % veh/h	Total HV %	HV %				Vehicles veh	Distance m				
South: Ashbourne Ave														
4	L2	1	0.0	1	0.0	0.008	4.6	LOS A	0.0	0.0	0.00	0.04	0.00	48.8
5	T1	15	0.0	15	0.0	0.008	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	49.6
Approach		16	0.0	16	0.0	0.008	0.3	NA	0.0	0.0	0.00	0.04	0.00	49.5
North: Ashbourne Ave														
11	T1	37	0.0	37	0.0	0.022	0.0	LOS A	0.0	0.2	0.01	0.06	0.01	49.4
12	R2	4	0.0	4	0.0	0.022	4.6	LOS A	0.0	0.2	0.01	0.06	0.01	42.7
Approach		41	0.0	41	0.0	0.022	0.5	NA	0.0	0.2	0.01	0.06	0.01	49.2
West: Kilrush Tm														
1	L2	2	0.0	2	0.0	0.002	4.6	LOS A	0.0	0.1	0.06	0.52	0.06	29.3
3	R2	1	0.0	1	0.0	0.002	4.7	LOS A	0.0	0.1	0.06	0.52	0.06	43.6
Approach		3	0.0	3	0.0	0.002	4.6	LOS A	0.0	0.1	0.06	0.52	0.06	39.0
All Vehicles		60	0.0	60	0.0	0.022	0.7	NA	0.0	0.2	0.01	0.08	0.01	48.9

Table 12. SIDRA results for the Ashbourne Avenue/Kilrush Turn intersection – Weekday AM peak period (2022)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV % veh/h	Total HV %	v/c				sec	Vehicles veh				
South: Ashbourne Ave														
4	L2	17	0.0	17	0.0	0.026	4.6	LOS A	0.0	0.0	0.00	0.19	0.00	47.4
5	T1	32	0.0	32	0.0	0.026	0.0	LOS A	0.0	0.0	0.00	0.19	0.00	47.9
Approach		48	0.0	48	0.0	0.026	1.6	NA	0.0	0.0	0.00	0.19	0.00	47.7
North: Ashbourne Ave														
11	T1	45	0.0	45	0.0	0.058	0.1	LOS A	0.2	1.6	0.10	0.30	0.10	46.7
12	R2	58	0.0	58	0.0	0.058	4.7	LOS A	0.2	1.6	0.10	0.30	0.10	36.2
Approach		103	0.0	103	0.0	0.058	2.7	NA	0.2	1.6	0.10	0.30	0.10	43.4
West: Kilrush Tm														
1	L2	17	0.0	17	0.0	0.012	4.6	LOS A	0.0	0.3	0.09	0.50	0.09	29.1
3	R2	1	0.0	1	0.0	0.012	5.0	LOS A	0.0	0.3	0.09	0.50	0.09	43.5
Approach		18	0.0	18	0.0	0.012	4.7	LOS A	0.0	0.3	0.09	0.50	0.09	32.1
All Vehicles		169	0.0	169	0.0	0.058	2.6	NA	0.2	1.6	0.07	0.29	0.07	44.5

Table 13. SIDRA results for the Ashbourne Avenue/Kilrush Turn intersection – Weekday PM peak period (2022)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV % veh/h	Total HV %	v/c				sec	Vehicles veh				
South: Ashbourne Ave														
4	L2	26	0.0	26	0.0	0.022	4.6	LOS A	0.0	0.0	0.00	0.34	0.00	46.1
5	T1	15	0.0	15	0.0	0.022	0.0	LOS A	0.0	0.0	0.00	0.34	0.00	46.3
Approach		41	0.0	41	0.0	0.022	2.9	NA	0.0	0.0	0.00	0.34	0.00	46.2
North: Ashbourne Ave														
11	T1	37	0.0	37	0.0	0.074	0.1	LOS A	0.3	2.2	0.10	0.39	0.10	46.0
12	R2	94	0.0	94	0.0	0.074	4.7	LOS A	0.3	2.2	0.10	0.39	0.10	34.7
Approach		131	0.0	131	0.0	0.074	3.4	NA	0.3	2.2	0.10	0.39	0.10	40.6
West: Kilrush Tm														
1	L2	15	0.0	15	0.0	0.010	4.6	LOS A	0.0	0.3	0.05	0.51	0.05	29.5
3	R2	1	0.0	1	0.0	0.010	5.1	LOS A	0.0	0.3	0.05	0.51	0.05	43.7
Approach		16	0.0	16	0.0	0.010	4.6	LOS A	0.0	0.3	0.05	0.51	0.05	32.8
All Vehicles		187	0.0	187	0.0	0.074	3.4	NA	0.3	2.2	0.07	0.39	0.07	42.1