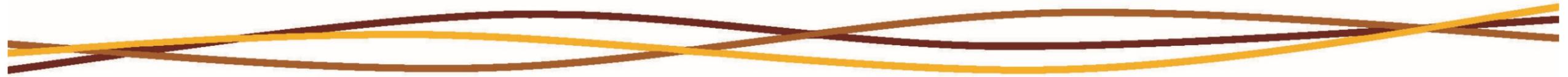




Kalamunda Road Functional Review

Summary

DRAFT



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Annexure A

1 INTRODUCTION

The purpose of this project is to identify the long-term function for Kalamunda Road between Abernethy Road and Roe Highway and produce a forward plan for the upgrade of this section of road. The scope of project included extensive, proactive community consultation to help determine the function of the road, undertaking relevant traffic modelling for the network, the preparation of proposed concept design and Forward Works Plan and estimated costs for the road upgrade.

1.1 Background and Objectives

1.1.1 Background

The section of Kalamunda Road under review is shown in **Figure 1-1** below.

Figure 1-1 Study Area



The functional environment of Kalamunda Road between Abernethy Road and Roe Highway can be divided into three distinctive sections as illustrated in **Figure 1**:

- > Section 1- The section between Abernethy Road and Wittenoom Road. Section 1A extends between Abernethy Rd and Stirling Crescent and Section 1B between Stirling Crescent and Wittenoom Road;
- > Section 2 - The section comprising the High Wycombe Shopping Centre between Wittenoom Road and Cyril Road. Section 2A extends between Wittenoom Road and Newburn Road/Chipping Drive and Section 2B between Newburn Road/Chipping Drive and Cyril Road; and
- > Section 3 - The section between Cyril Road and Roe Highway.

1.1.2 Vision, Planning Principles and Objectives

Our vision is:

"Connected Communities, Valuing Nature and Creating our Future Together"

The concept design has been developed taking cognisance of the Planning Principles on which the present Local Planning Strategy is based. These are as follows:

- > The primary aim of planning is to provide for the sustainable use and development of land;
- > To protect and enhance the key natural and cultural assets of the Shire and deliver to all residents a high quality of life which is based on environmentally sustainable principles;
- > To respond to social changes and facilitate the creation of vibrant, safe and self-reliant communities;
- > To actively assist in the creation of regional wealth, supports the development of new industries and encourage economic activity in accordance with sustainable development principles; and
- > To facilitate strategic development by making provision for efficient and equitable transport and public utilities.

The specific objectives of the proposed concept design are as follows:

- > Determine the most feasible and preferred function for Kalamunda Road, considering community consultation and traffic demands;
- > Ensure that Kalamunda Road provides an effective transport connection for the local community;
- > Significantly improve road safety for road users including pedestrians and cyclists;
- > Significantly increase active transport and public transport through the provision of supporting infrastructure;
- > Provide clarity for the City of Kalamunda and land owners in their future land ownership and development plans, associated with the function and design of Kalamunda Road; and
- > Ensure that the preferred design aligns with Council and State Government policies and strategies including the City's draft Traffic and Transport Policy.

2 COMMUNITY CONSULTATION

2.1 Consultation Process

The stakeholder engagement focused on disseminating information to affected stakeholders to raise their awareness of the project and collect their feedback which would be taken into consideration in the development of the design options.

The primary instrument of collecting feedback was through a survey form, which was available online at the City's Engage Kalamunda website and in hardcopy at various City-managed locations. In addition, the public and community consultation included two community workshops, inclusive of a business breakfast, public submissions and direct engagement with non-residential stakeholders including schools, businesses and public agencies.

2.1.1 Survey

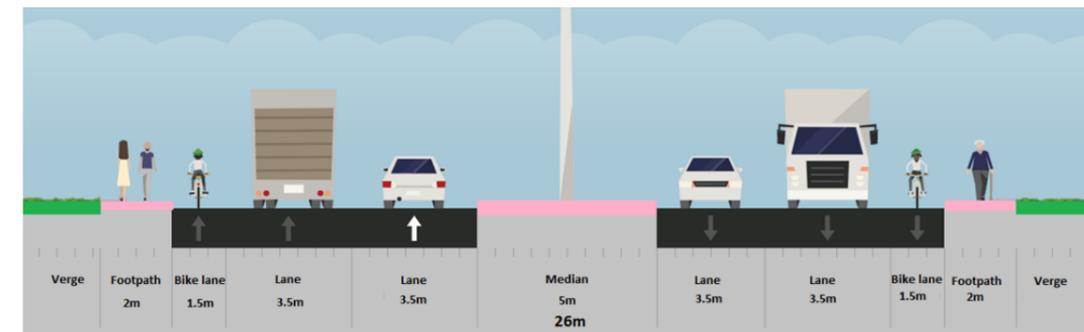
The survey focused on obtaining feedback regarding the following:

- > Existing conditions on Kalamunda Road – this was done by asking the respondents to rate their level of satisfaction (very dissatisfied, dissatisfied, neither, satisfied, and very satisfied) with several aspects of the road, which included road features, streetscape, bus facilities, bicycle facilities, and pedestrian facilities.
- > Preferred new layout for Kalamunda Road – the respondents were asked to select which of the two proposed layouts is more preferable as illustrated in **Figure 2-1** and **Figure 2-2** below.

Figure 2-1 Layout 1 – Lower Capacity Main Street



Figure 2-2 Layout 2 – Higher Capacity Distributor Road



2.1.2 Stakeholder Information Sessions

The community consultation pop-up information session was held at High Wycombe Library on 8 April 2019. A business consultation pop-up information session and breakfast was also held on 9 April 2019. Surveys were also completed in the sessions.

2.2 Survey Results

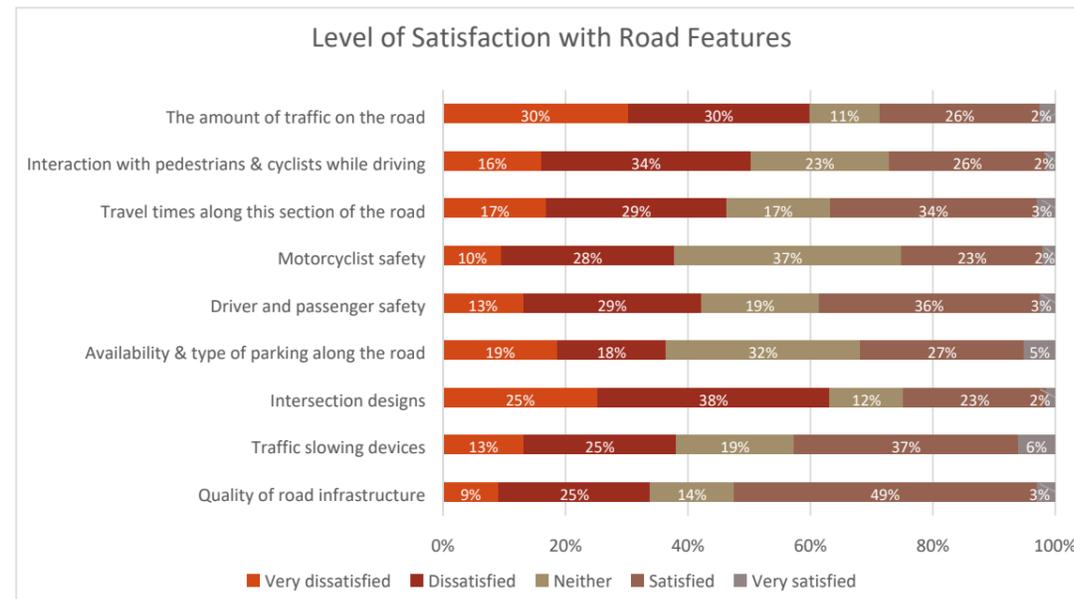
In total, 224 survey responses were received with good representation from local residents (91% of respondents) and businesses (9.8%). The majority of respondents reported living in High Wycombe (72.3%), Maida Vale (5.8%) or Kalamunda (4.9%) with the remainder living in suburbs outside the City of Kalamunda.

The main form of transport used on the road by respondents is the motor vehicle with 50.7% of all responses. Other forms of transport included - 37.3% walking, 16.9% public transport/bus, 9.5% cycling, 4.5% taxi/rideshare, 2.5% motorcycle/scooter and 0.5% heavy vehicles.

Destination responses indicated that many people in the area shop locally with High Wycombe Village Shopping Centre being the most common destination (48.5% of respondents). The next three most common destinations were Kalamunda (37.4%), Perth City (31.0%) and Midland (29.8%).

The following charts summarises other results of the survey.

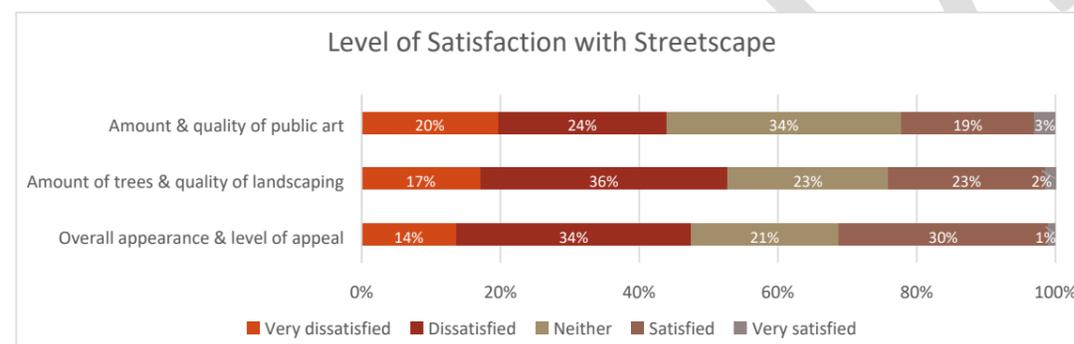
Figure 2-3 Level of Satisfaction with Road Features



The following significant concerns related to the road features were raised:

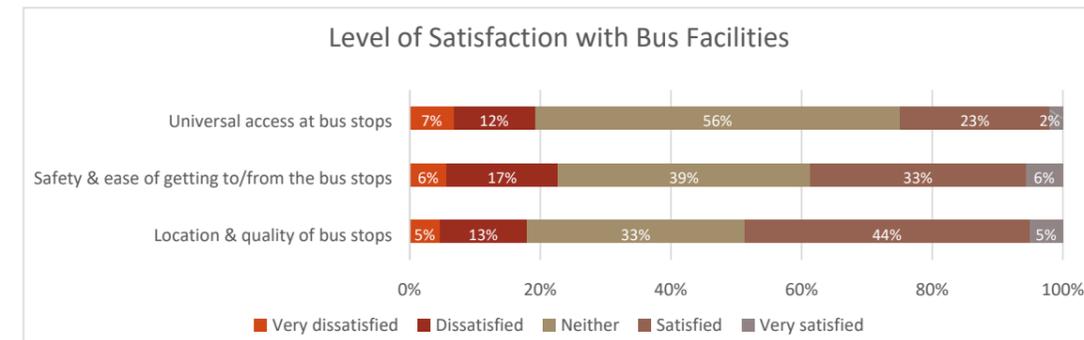
- > Intersection designs – 63.1% 'Dissatisfied' or 'Very dissatisfied'
- > The amount of traffic on the road - 59.9% 'Dissatisfied' or 'Very dissatisfied'
- > Interaction with pedestrians & cyclists while driving - 50.3% 'Dissatisfied' or 'Very dissatisfied'.

Figure 2-4 Level of Satisfaction with Streetscape



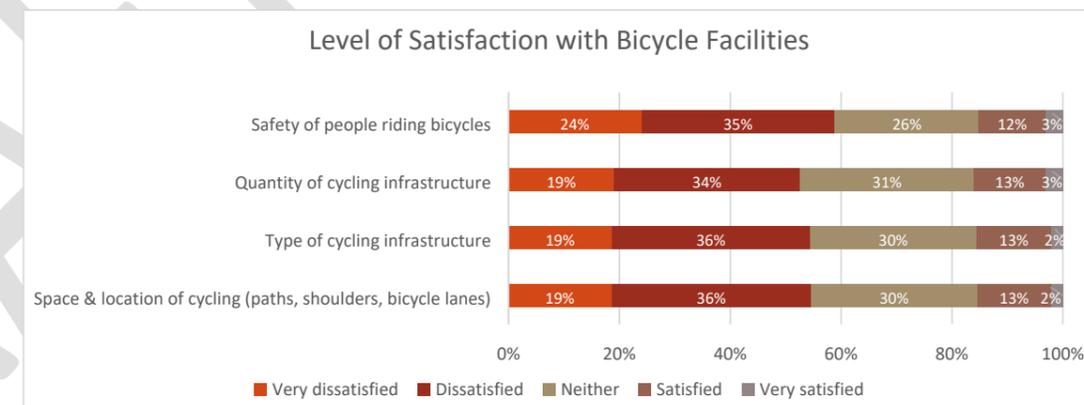
52.8% of respondents were either 'very dissatisfied' or 'dissatisfied' with the number of trees and quality of landscaping along the road. the majority of respondents indicated that they were unhappy with aspects of the current streetscape including quantity, quality and appeal of streetscapes.

Figure 2-5 Level of Satisfaction with Bus Facilities



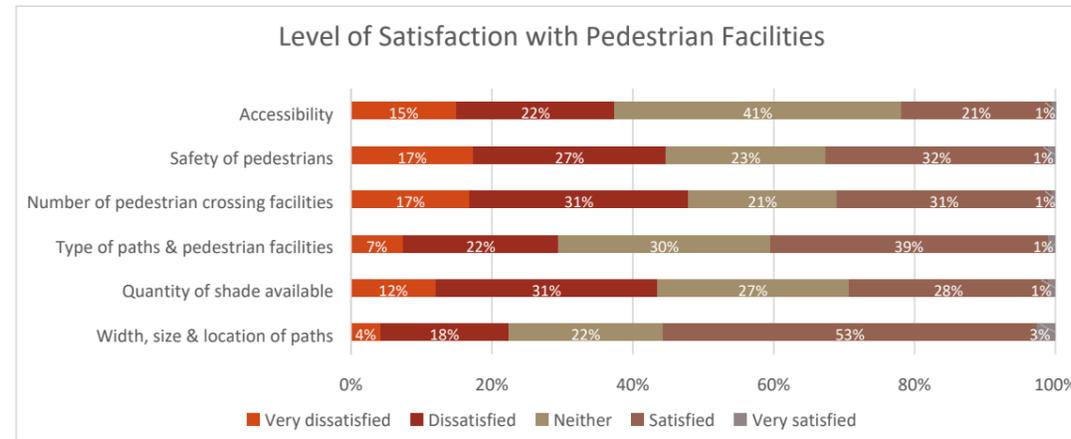
The majority of respondents were mainly satisfied or provided no indication in relation to both location and quality of bus stops and safety and ease of getting to and from bus stops.

Figure 2-6 Level of Satisfaction with Bicycle Facilities



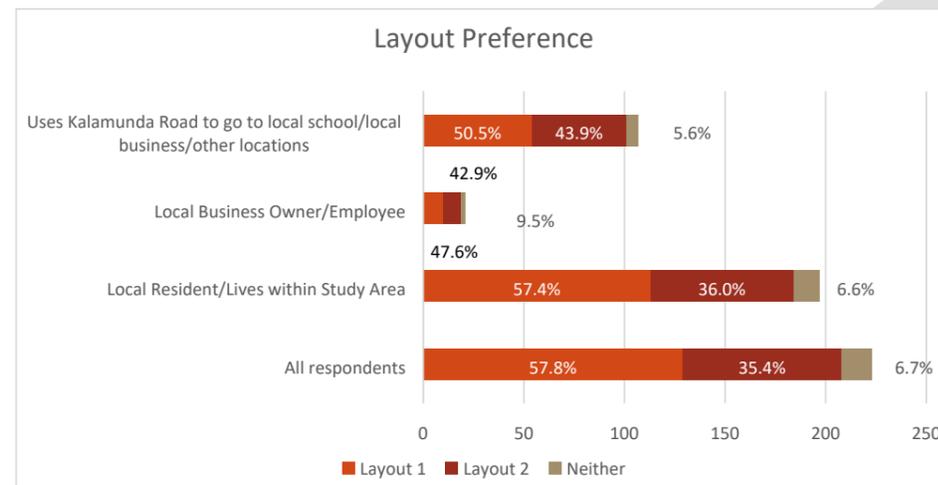
Majority of respondents were mostly dissatisfied or very dissatisfied or provided no indication with regard to cycling infrastructure.

Figure 2-7 Level of Satisfaction with Pedestrian Facilities



The majority of respondents were generally neutral towards the overall pedestrian experience however, expressed strong dissatisfaction with specific aspects of pedestrian facilities such as number of facilities (47.9%), safety of pedestrians (44.7%) and quantity of shade available (43.5%).

Figure 2-8 Layout Preference



Respondents were asked to rate different aspects of the two options (Lower Capacity vs Higher Capacity) with 58% of all respondents indicating a preference for the Lower Capacity option, 36% selecting the Higher Capacity option and about 6% indicating no preference for either.

Based on the community's response and feedback, the City of Kalamunda endorsed the vision of Kalamunda Road (between Roe Highway and Abernethy Road) becoming a Lower Capacity Local Road and proceeded with the development of the proposed concept design.

3 PROPOSED KALAMUNDA ROAD CONCEPT DESIGN

3.1 Concept Design

The cross section for the concept design for this section of Kalamunda Road was determined and supported through an extensive stakeholder consultation process as discussed in Section 2. The City of Kalamunda endorsed the design of a Low Capacity road with a typical cross section as illustrated in **Figure 3-1** below.

Figure 3-1 Typical Cross-section for a Low-Capacity Road



The proposed cross section and current traffic volumes are characteristic of an Integrator B road according to the *Draft Liveable Neighbourhoods 2015*. The road would generally comprise of a 3.5-metre-wide general traffic lane, a 2-metre-wide bike lane, a 2-metre-wide pedestrian foot path along both sides, and a 4-metre-wide median separator. The concept design was designed to constrain traffic flows at 15,000vpd for this section of Kalamunda Road.

The proposed concept design for this section of Kalamunda Road is shown in Drawings no. CW1063000-TR-001, CW1063000-TR-002 and CW1063000-TR-003 in **Annexure A**.

3.2 Traffic Analysis

Critical intersections were analysed using the Sidra traffic analysis software. This was undertaken in order to assess the impact and performance of the proposed concept design intersection treatments at these critical intersections.

Sidra results for each approach are presented in the form of Degree of Saturation (DOS), Average Delay, Level of Service (LOS) and 95th Percentile Queue. These characteristics are defined as follows:

- > **Degree of Saturation (DOS):** is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The theoretical intersection capacity is exceeded for an un-signalized intersection where $DOS > 0.80$;
- > **95% Queue:** is the statistical estimate of the queue length up to or below 95% of all observed queues that would be expected;
- > **Average Delay:** is the average of all travel time delays for vehicles through the intersection. An un-signalised intersection can be considered to be operating at capacity when the average delay exceeds 40 seconds for any movement; and
- > **Level of Service (LOS):** is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. The different levels of service can generally be defined as shown in the table below.

Table 3-1 Level of Service (LOS) Performance Criteria

| LOS | Description | Signalised Intersection | Unsignalised Intersection |
|-----|---|-------------------------|---------------------------|
| A | Free-flow operations (best condition) | ≤10 sec | ≤10 sec |
| B | Reasonable free-flow operations | 10-20 sec | 10-15 sec |
| C | At or near free-flow operations | 20-35 sec | 15-25 sec |
| D | Decreasing free-flow levels | 35-55 sec | 25-35 sec |
| E | Operations at capacity | 55-80 sec | 35-50 sec |
| F | A breakdown in vehicular flow (worst condition) | ≥80 sec | ≥50 sec |

For some intersections, intersection LOS may be displayed as "NA", since the average delay is not a good LOS measure due to zero delays associated with major road movements.

The analysis was undertaken for the AM and PM peaks of five different scenarios. Peak times selected are 7AM to 8 AM and 4 PM to 5 PM respectively for the morning and afternoon peak periods on weekdays. The following scenarios were analysed using the Sidra intersection analysis software:

- > **Scenario 1:** Year 2019 (Base Scenario);
- > **Scenario 2:** Year 2031 Traffic, without cul-de-sac treatment in Stirling Crescent;
- > **Scenario 3:** Year 2031 Traffic, with cul-de-sac treatment in Stirling Crescent;
- > **Scenario 4:** Year 2041 Traffic, without cul-de-sac treatment in Stirling Crescent; and
- > **Scenario 5:** Year 2041 Traffic, with cul-de-sac treatment in Stirling Crescent.

3.3 Section 1 (Abernethy Road to Wittenoom Road)

This section comprises the following intersections:

- > Kalamunda Road/Chullwyne Mews;
- > Kalamunda Road/Stirling Crescent; and
- > Kalamunda Road/Wittenoom Road.

a) Kalamunda Road/Stirling Crescent

A roundabout is proposed for this intersection which would encroach into vacant Lot 200- 584 Kalamunda Road, High Wycombe. The proposed roundabout has been designed to cater for a 19 m Prime Mover and Semi-Trailer right of way vehicle.

According to *Austrroads Guide to Road Design Part 4B - Roundabouts*, roundabouts may not be as safe for cyclists as for other road users. Considering this, the on-street bicycle lanes along the east and west legs were designed to terminate before the roundabout, joining with the footpath to become a shared path, as shown in **Figure 3-2** below.

Figure 3-2 Kalamunda Road/Stirling Crescent intersection treatment



The Sidra results is summarised in **Table 3-2**.

Table 3-2 Sidra Results for Kalamunda Road/Stirling Crescent intersection

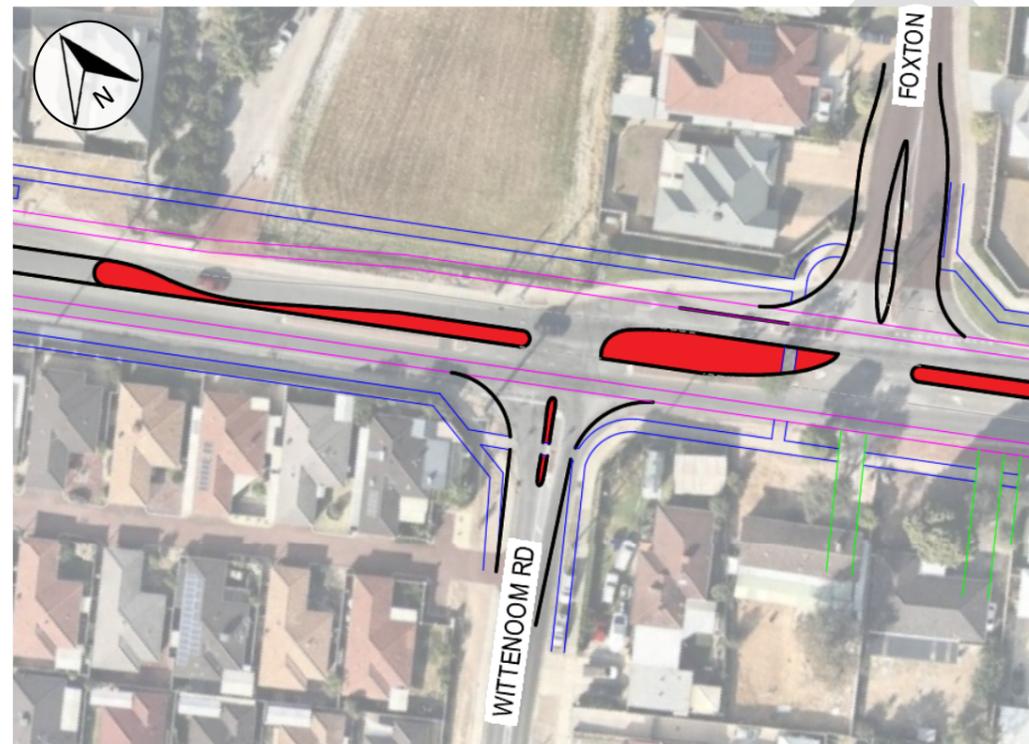
| Scenario | DOS | | Average Delay (s) | | LOS | | 95% Queue (m) | |
|--------------------------|-------|-------|-------------------|-----|-----|----|---------------|------|
| | AM | PM | AM | PM | AM | PM | AM | PM |
| 2019, Base Scenario | 0.478 | 0.327 | 2.7 | 3.5 | NA | NA | 14.4 | 8.7 |
| 2031, Without cul-de-sac | 0.669 | 0.595 | 6.6 | 6.7 | A | A | 57.1 | 48.8 |
| 2031, With cul-de-sac | 0.58 | 0.448 | 5.5 | 5.6 | A | A | 47.7 | 26.2 |
| 2041, Without cul-de-sac | 0.659 | 0.585 | 6.5 | 6.5 | A | A | 55.3 | 47.8 |
| 2041, With cul-de-sac | 0.576 | 0.433 | 5.5 | 5.5 | A | A | 46.8 | 25.1 |

Analysis results show that the intersection will have an excellent performance with LOS A under different scenarios.

b) Kalamunda Road/Wittenoom Road

It is proposed that a full movement T-junction be maintained at this intersection. A right turn pocket is proposed on the western approach of the Kalamunda Road/Wittenoom Road intersection as illustrated in Drawing no. CW1063000-TR-001 and **Figure 3.3** below.

Figure 3-3 Kalamunda Road/Wittenoom Road intersection treatment



The Sidra results is summarised in **Table3-3**.

Table 3-3 Sidra Results for Kalamunda Road/Wittenoom Road intersection

| Scenario | DOS | | Average Delay (s) | | LOS | | 95% Queue (m) | |
|--------------------------|-------|-------|-------------------|-----|-----|----|---------------|------|
| | AM | PM | AM | PM | AM | PM | AM | PM |
| 2019, Base Scenario | 0.426 | 0.386 | 2.8 | 3.5 | NA | NA | 6 | 12.2 |
| 2031, Without cul-de-sac | 0.466 | 0.341 | 0 | 2.1 | NA | NA | 3.7 | 2 |
| 2031, With cul-de-sac | 0.476 | 0.332 | 3.1 | 3.9 | NA | NA | 3.8 | 2 |
| 2041, Without cul-de-sac | 0.458 | 0.300 | 3.5 | 2.8 | NA | NA | 5.5 | 2.9 |
| 2041, With cul-de-sac | 0.467 | 0.300 | 3.5 | 4.3 | NA | NA | 4.6 | 2.4 |

Analysis results show that this intersection is expected to perform at acceptable level of service, degree of saturation and average delays for the 2041 design horizon.

3.4 Section 2 (Wittenoom Road to Cyril Road)

This commercial section comprises the following intersections:

- > Kalamunda Road/Foxton Boulevard;
- > Kalamunda Road/Fernan Road;
- > Kalamunda Road/High Wycombe Village shopping centre accesses;
- > Kalamunda Road/Newburn Road; and
- > Kalamunda Road/Kenneth Road.

a) Kalamunda Road/Foxton Boulevard

It is proposed that a full movement T-junction be maintained at this intersection. A right turn pocket is proposed on the eastern approach of the Kalamunda Road/Foxton Boulevard intersection as illustrated in **Figure 3-4** below

Figure 3-4 Kalamunda Road/Foxton Boulevard intersection treatment

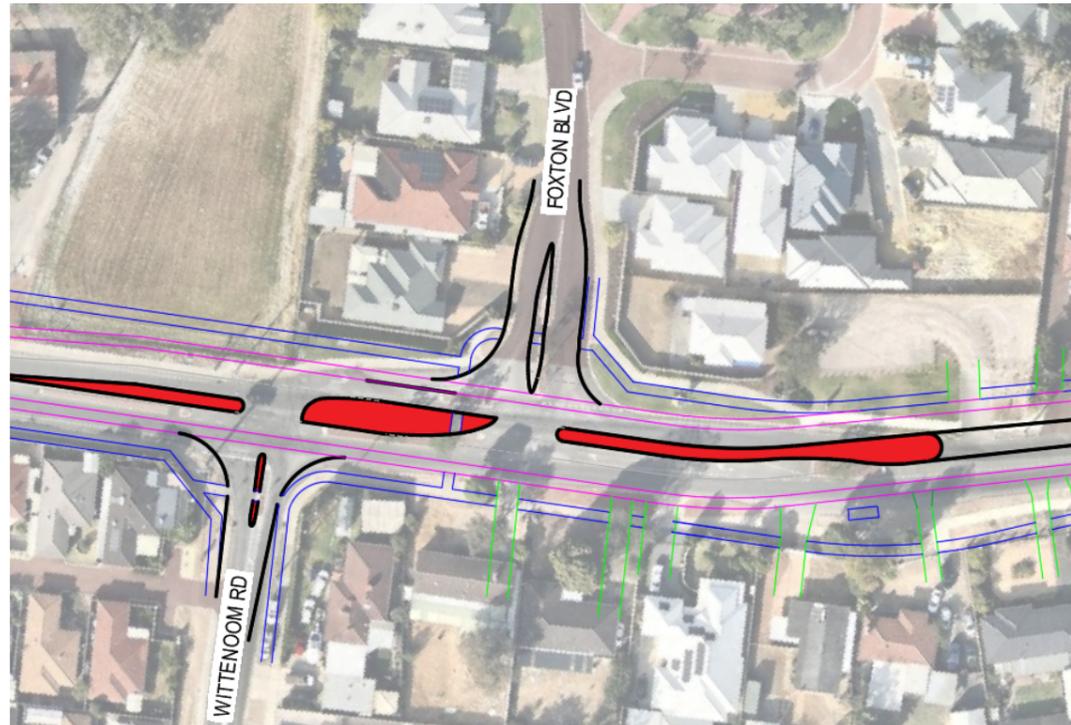
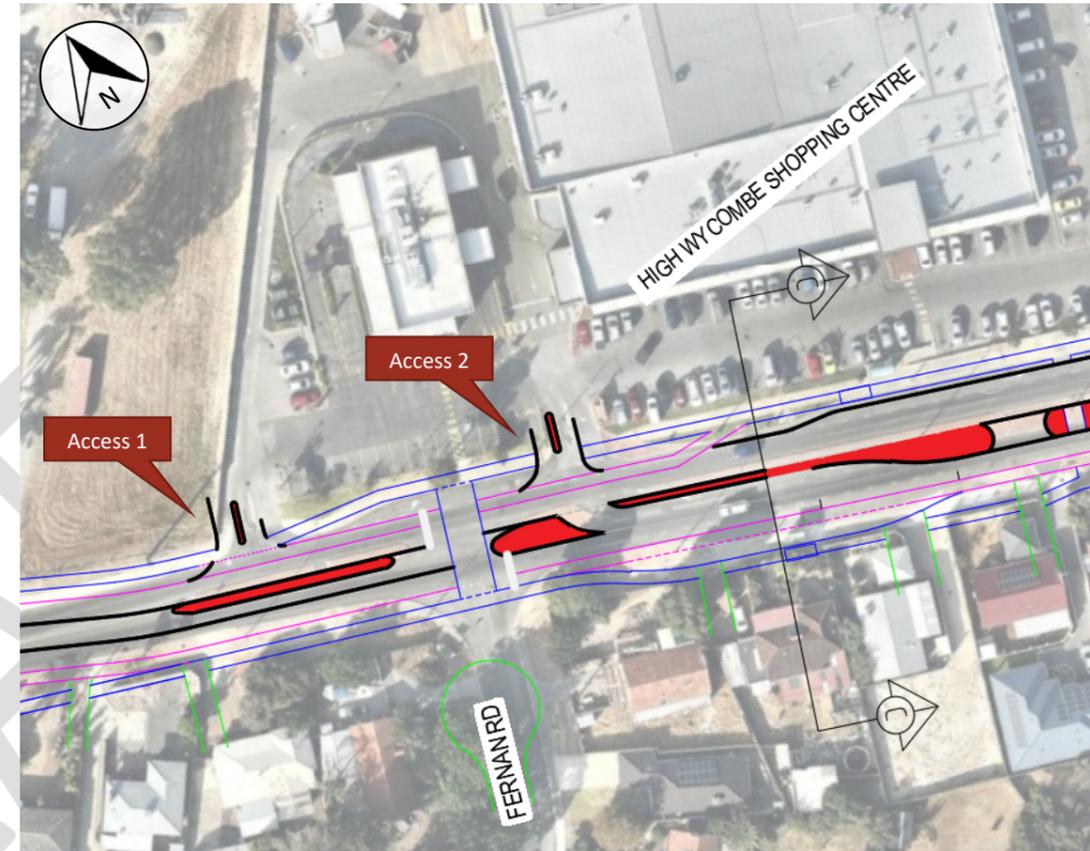


Figure 3-5 Kalamunda Road/High Wycombe SC Access 2



b) Kalamunda Road/Fernan Road intersection and Kalamunda Road/High Wycombe Village Shopping Centre accesses

It is proposed that Fernan Road be converted to a cul-de-sac at its intersection with Kalamunda Road and a new 6-metre-wide pedestrian crossing with traffic signals be installed in the proximity of this intersection as shown in Drawing no. CW1063000-TR-002.

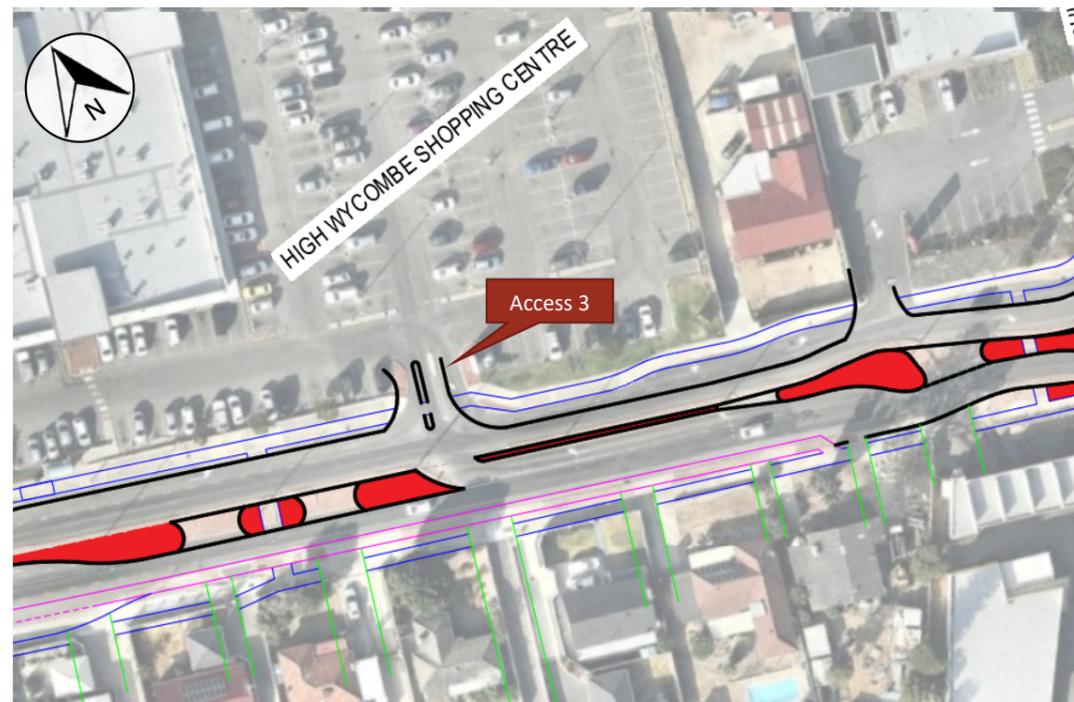
Currently four access points on Kalamunda Road exist to enter and exit the High Wycombe Village Shopping Centre. The configuration of the accesses located on Kalamunda Road on the eastern and western extremities of the shopping centre property boundary is expected to remain unchanged.

Minor changes have been proposed at Access 2 and Access 3 to the High Wycombe Shopping Centre as illustrated in **Figure 3-5** and **Figure 3-6**. The central island is proposed to be extended at both accesses to prevent right turning movements on exiting the shopping centre (as currently experienced at these locations). To accommodate the bicycle lane on the southern side of Kalamunda Road the central island located at Access 3 is also proposed to be relocated slightly northwards. Furthermore, the left turn pocket at Access 3 is to be reduced by about 4m.

The swept path analysis indicated that the right turn movement into the High Wycombe Shopping Centre can accommodate an 8.8m design vehicle at both Access 2 and Access 3.

It is proposed that a bus embayment be provided on the westbound carriageway opposite the High Wycombe Shopping Centre. In the eastbound direction the bus stop will be located adjacent to the left turn pocket as per the existing situation.

Figure 3-6 Kalamunda Road/High Wycombe SC Access 3



Intersection analysis for the three accesses was undertaken for the critical weekday PM peak hour period. The Sidra results is summarised in **Table 3-4**.

Table 3-4 Sidra Results for Kalamunda Road/Access to High Wycombe Shopping Centre

| Scenario | DOS | | | Average Delay (s) | | | LOS | | | 95% Queue (m) | | |
|---------------------------------|-------|-------|-------|-------------------|-----|-----|-----|----|----|---------------|-----|-----|
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 2019, Base Scenario | 0.353 | 0.304 | 0.301 | 0.2 | 0.9 | 2.2 | NA | NA | NA | 0.3 | 2.6 | 7.8 |
| 2031, Without cul-de-sac | 0.378 | 0.372 | 0.359 | 0.3 | 0.9 | 2.5 | NA | NA | NA | 0.3 | 2.5 | 6.4 |
| 2031, With cul-de-sac | 0.369 | 0.350 | 0.306 | 0.3 | 0.9 | 2.8 | NA | NA | NA | 0.3 | 2.3 | 8.5 |
| 2041, Without cul-de-sac | 0.356 | 0.338 | 0.338 | 0.3 | 0.9 | 2.5 | NA | NA | NA | 0.3 | 2.3 | 6.1 |
| 2041, With cul-de-sac | 0.346 | 0.329 | 0.284 | 0.3 | 0.9 | 2.8 | NA | NA | NA | 0.3 | 2.2 | 7.8 |

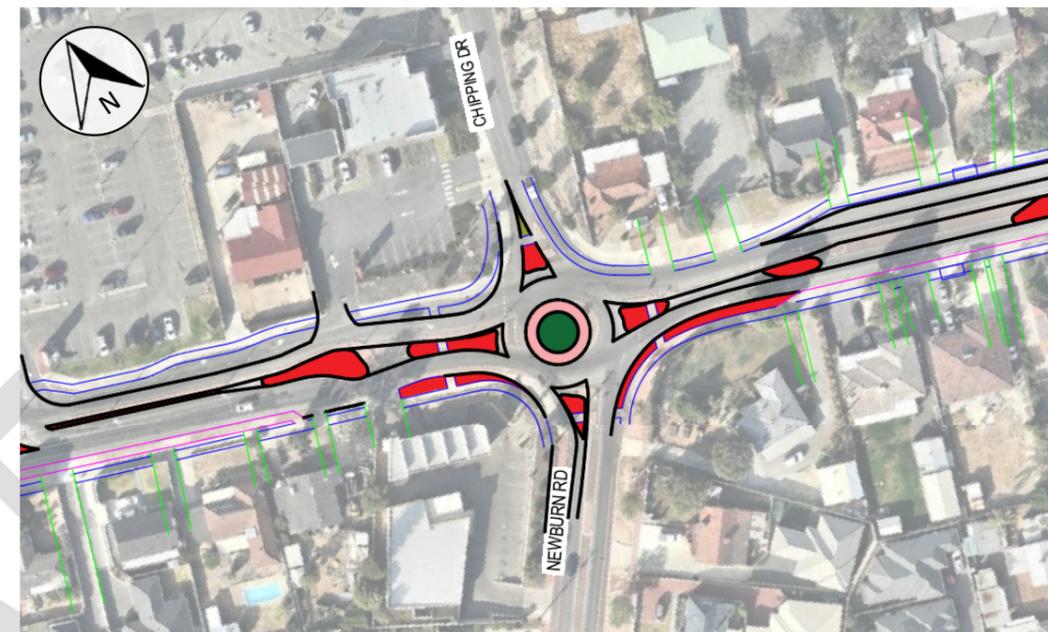
Analysis results show that these accesses are expected to perform at acceptable level of service, degree of saturation and average delays for the 2041 design horizon.

c) Kalamunda Road/Newburn Road/Chipping Drive

Upgrades to the Newburn Road/Chipping Drive intersection including the removal of the right turn lane on the western approach and converting the roundabout to a single circulating lane only were completed in 2019 as illustrated in **Figure 3-7**.

The concept design does not propose any further changes and the intersection is to remain unchanged.

Figure 3-7 Kalamunda Road/Newburn Road/Chipping Drive intersection treatment



The Sidra results is summarised in **Table 3-5**.

Table 3-5 Sidra Results for Kalamunda Road/Newburn Road/Chipping Drive intersection

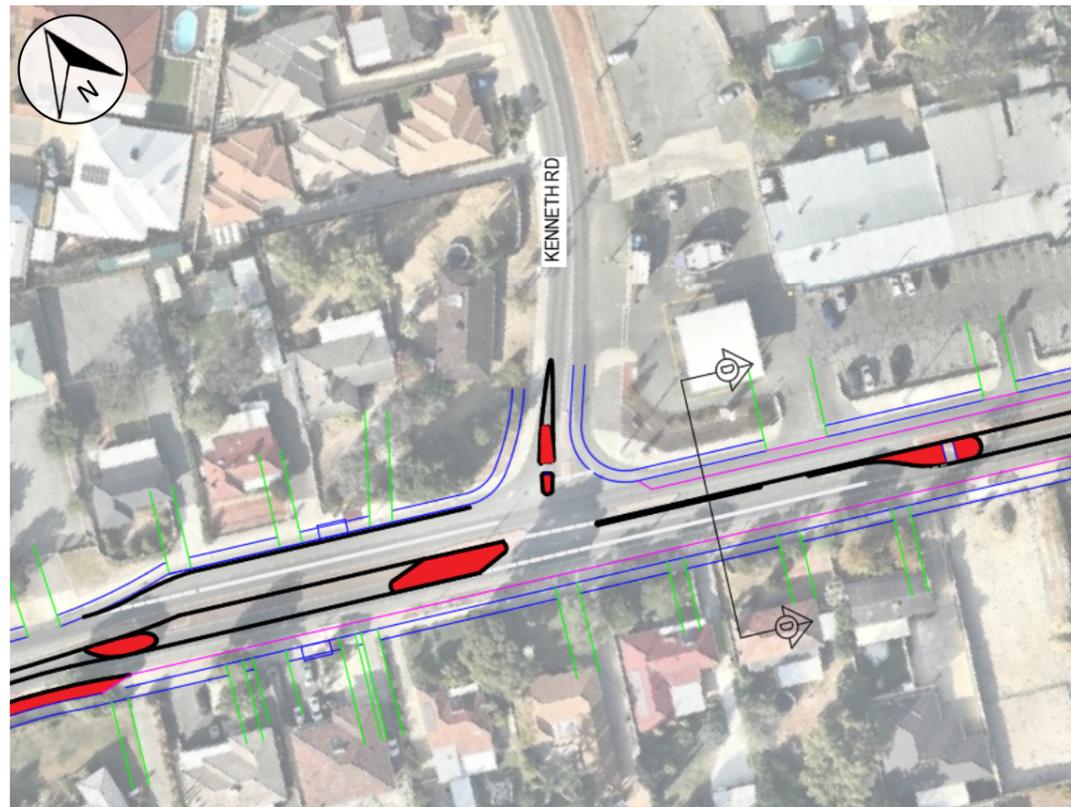
| Scenario | DOS | | Average Delay (s) | | LOS | | 95% Queue (m) | |
|---------------------------------|-------|-------|-------------------|-----|-----|----|---------------|------|
| | AM | PM | AM | PM | AM | PM | AM | PM |
| 2019, Base Scenario | 0.554 | 0.754 | 6.2 | 8.6 | A | A | 37.7 | 75.3 |
| 2031, Without cul-de-sac | 0.472 | 0.650 | 6.8 | 7.8 | A | A | 26.2 | 48.9 |
| 2031, With cul-de-sac | 0.480 | 0.634 | 6.8 | 7.7 | A | A | 27 | 45.9 |
| 2041, Without cul-de-sac | 0.488 | 0.662 | 7.3 | 8.6 | A | A | 27.1 | 52.2 |
| 2041, With cul-de-sac | 0.494 | 0.645 | 7.4 | 8.5 | A | A | 27.9 | 49 |

Analysis results show that this intersection is expected to perform at acceptable level of service, degree of saturation and average delays for the 2041 design horizon.

d) Kalamunda Road/Kenneth Road

It is proposed that a full movement T-junction be maintained at this intersection as illustrated in **Error! Reference source not found.** below.

Figure 3-8 Kalamunda Road/Kenneth Road intersection treatment



The Sidra results is summarised in **Table 3-6**.

Table 3-6 Sidra Results for Kalamunda Road/Kenneth Road intersection

| Scenario | DOS | | Average Delay (s) | | LOS | | 95% Queue (m) | |
|--------------------------|-------|-------|-------------------|-----|-----|----|---------------|------|
| | AM | PM | AM | PM | AM | PM | AM | PM |
| 2019, Base Scenario | 0.328 | 0.352 | 1.2 | 1.3 | NA | NA | 4.7 | 4.5 |
| 2031, Without cul-de-sac | 0.267 | 0.554 | 0.7 | 2.5 | NA | NA | 1.8 | 13.5 |
| 2031, With cul-de-sac | 0.272 | 0.424 | 0.7 | 1.8 | NA | NA | 1.5 | 9.2 |
| 2041, Without cul-de-sac | 0.256 | 0.545 | 1.2 | 2.7 | NA | NA | 3.5 | 13.3 |
| 2041, With cul-de-sac | 0.268 | 0.424 | 0.9 | 1.8 | NA | NA | 2.5 | 9.1 |

Analysis results show that this intersection is expected to perform at acceptable level of service, degree of saturation and average delays for the 2041 design horizon.

3.5 Section 3 (Cyril Road to Roe Highway)

This residential section comprises the following intersections:

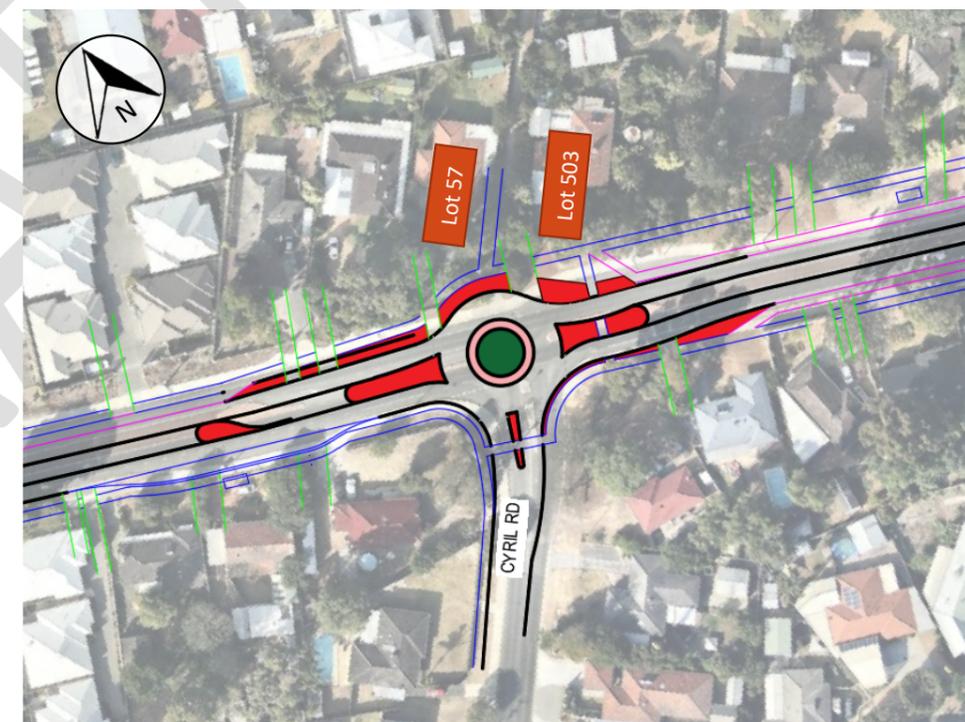
- > Kalamunda Road/Cyril Road;
- > Kalamunda Road/Hawkevale Road; and
- > Kalamunda Road/Range View Road.

a) Kalamunda Road/Cyril Road

The Kalamunda Road/Cyril Road intersection is proposed to be converted into a roundabout.

It should be noted that access to Lot 57 and Lot 503 is suggested to access directly into the new roundabout proposed at the Kalamunda Road/Cyril Road intersection as illustrated in **Figure 3-9**.

Figure 3-9 Kalamunda Road/Cyril Road intersection treatment



It is recommended that the proposed bus embayment to the west of Cyril Road (westbound direction) be retained in order to reduce the potential impact of this bus stop on traffic operations at the Kalamunda Rd/Cyril Road intersection.

Furthermore, the existing bus stops at Cyril Road (eastbound direction) would have to be relocated due to the new roundabout treatment proposed at this intersection.

The Sidra results is summarised in **Table 3-7**.

Table 3-7 Sidra Results for Kalamunda Road/Cyril Road intersection

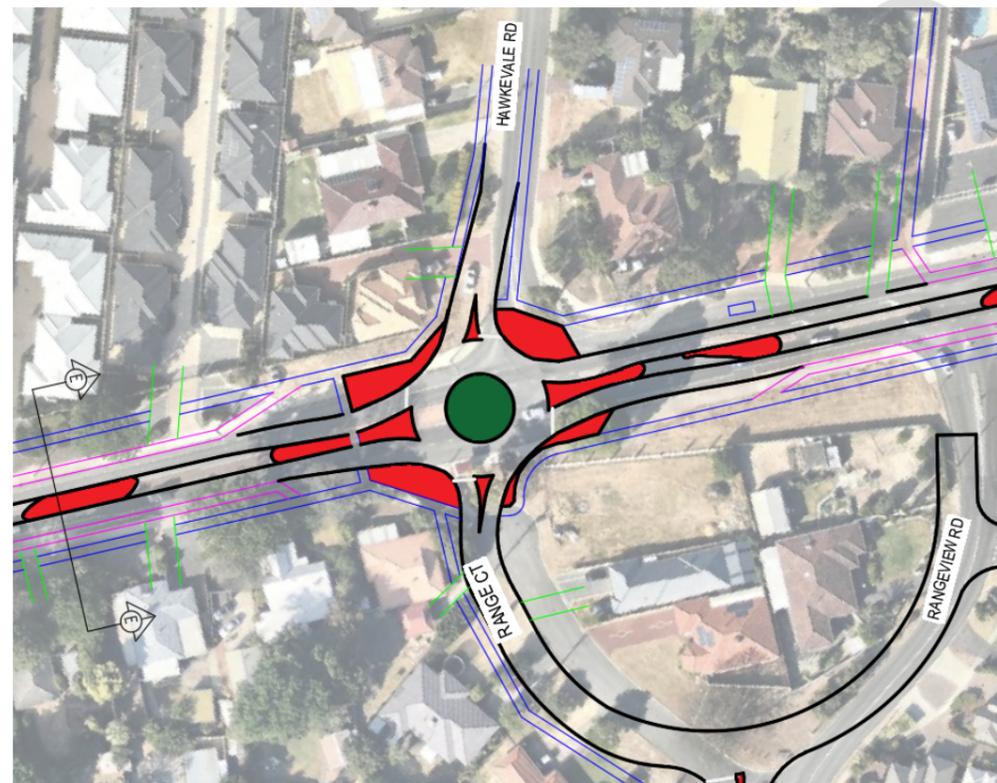
| Scenario | DOS | | Average Delay (s) | | LOS | | 95% Queue (m) | |
|--------------------------|-------|-------|-------------------|-----|-----|----|---------------|------|
| | AM | PM | AM | PM | AM | PM | AM | PM |
| 2019, Base Scenario | 0.334 | 0.356 | 0.5 | 0.9 | A | A | 1.2 | 3.1 |
| 2031, Without cul-de-sac | 0.382 | 0.479 | 5.2 | 5 | A | A | 25.1 | 36.3 |
| 2031, With cul-de-sac | 0.372 | 0.470 | 5.2 | 5 | A | A | 24.2 | 35.2 |
| 2041, Without cul-de-sac | 0.384 | 0.482 | 5.2 | 5.1 | A | A | 25.2 | 36.6 |
| 2041, With cul-de-sac | 0.376 | 0.473 | 5.2 | 5.1 | A | A | 24.4 | 35.5 |

Analysis results show that this intersection is expected to perform at acceptable level of service, degree of saturation and average delays for the 2041 design horizon.

b) Kalamunda Road/Hawkevale Road/Range Court

The existing three-leg intersection is proposed to be converted into a four-leg roundabout by connecting Range Court to Kalamunda Road. The existing intersection of Kalamunda Road and Range View Road will be closed by converting the north end of Range View Road into a cul-de-sac as detailed in **Error! Reference source not found.**

Figure 3-10 Kalamunda Road/Hawkevale Road/Range Court intersection treatment



The Sidra results is summarised in **Table 3-8.**

Table 3-8 Sidra Results for Kalamunda Road/Hawkevale Road/Range Court intersection treatment

| Scenario | DOS | | Average Delay (s) | | LOS | | 95% Queue (m) | |
|--------------------------|-------|-------|-------------------|-----|-----|----|---------------|------|
| | AM | PM | AM | PM | AM | PM | AM | PM |
| 2019, Base Scenario | 0.324 | 0.359 | 0.5 | 0.8 | A | A | 1.3 | 2.9 |
| 2031, Without cul-de-sac | 0.457 | 0.556 | 5.8 | 6.2 | A | A | 31.5 | 39.6 |
| 2031, With cul-de-sac | 0.464 | 0.552 | 5.8 | 6.2 | A | A | 32.4 | 38.8 |
| 2041, Without cul-de-sac | 0.464 | 0.564 | 5.9 | 6.3 | A | A | 32 | 40.4 |
| 2041, With cul-de-sac | 0.470 | 0.561 | 5.9 | 6.4 | A | A | 32.8 | 39.5 |

Analysis results show that this intersection is expected to perform at acceptable level of service, degree of saturation and average delays for the 2041 design horizon.

4 FORWARD WORKS PLAN

A Forward Works Plan (FWP) has been developed for various work packages that includes details on the broad-brush cost estimate for the proposed concept design. The following is concluded:

- > A review of the existing vehicle usage data has identified that Section 3 (between Cyril Road and Roe Highway) has already reached the restricted demand of 15,000 vpd to accomplish the proposed function of this section of Kalamunda Road. Furthermore, the Roe Highway and Kalamunda Road interchange is to be a grade separated interchange and is expected to be upgraded by early 2021. Hence, Section 3 (between Cyril Road and Roe Highway) of the proposed concept design will need to be implemented by the end of 2022.
- > Demand forecast for Section 2B (between Newburn Road/Chipping Drive and Cyril Road) has revealed that the traffic for this section is expected to increase to over 20,600 vpd beyond 2031. It is recommended that the City of Kalamunda consider upgrading Section 2B (between Newburn Road/Chipping Drive and Cyril Road) at approximately the same time as Section 3 (between Cyril Road and Roe Highway) for ease of constructability, traffic management and reducing inconvenience to the local communities.
- > Based on present and future demand forecasts there is no requirement to upgrade Section 2A (Wittenoom Road to Newburn Road/Chipping Drive) by 2041. However, pedestrian facilities to the existing shopping centre is limited and there is a desire from the local community for the provision of a new pedestrian crossing to improve connectivity and safety. The preferred option involves closing Fernan Road and installing a new signalised pedestrian crossing across Kalamunda Road. Fernan Road will need to be converted into a cul-de-sac to enable the construction of this signalised pedestrian crossing. It is envisaged that these works and minor improvements at the shopping centre access can be undertaken independently within the next few years even though the upgrade of Section 2A (Wittenoom Road to Newburn Road/Chipping Drive) is only required beyond 2041.

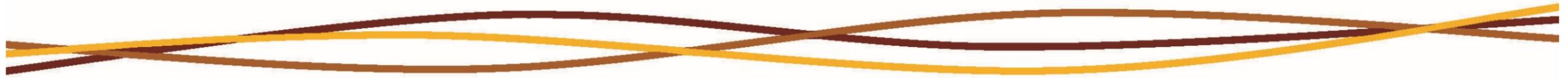


Table 4-9 Forward Works Programme (2021 – 2031)

| Works Description | Estimated Project Value | 2021 | | 2022 | | 2023 | | 2024 | | 2025 | | 2026 | | 2027 | | 2028 | | 2029 | | 2030 | | 2031 | |
|--|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | Q1/Q2 | Q3/Q4 |
| Kalamunda Road Traffic Upgrade | | | | | | | | | | | | | | | | | | | | | | | |
| Section 1A | | | | | | | | | | | | | | | | | | | | | | | |
| Abernethy Road to Stirling Crescent | | | | | | | | | | | | | | | | | | | | | | | |
| Design | \$277k | | | | | | | | | | | | | | | | | | | | | | |
| Land Acquisition | \$2.03m | | | | | | | | | | | | | | | | | | | | | | |
| Construction/Delivery | \$3.7m | | | | | | | | | | | | | | | | | | | | | | |
| Section 1B | | | | | | | | | | | | | | | | | | | | | | | |
| Stirling Crescent to Wittenoom Road | | | | | | | | | | | | | | | | | | | | | | | |
| Design | \$ | | | | | | | | | | | | | | | | | | | | | | |
| Land Acquisition | \$0.7m | | | | | | | | | | | | | | | | | | | | | | |
| Construction/Delivery | \$2.7m | | | | | | | | | | | | | | | | | | | | | | |
| Section 2A | | | | | | | | | | | | | | | | | | | | | | | |
| Wittenoom Road to Newburn Road/Chipping Drive | | | | | | | | | | | | | | | | | | | | | | | |
| Design | \$219k | | | | | | | | | | | | | | | | | | | | | | |
| Construction/Delivery (excl traffic lights) | \$3m | | | | | | | | | | | | | | | | | | | | | | |
| Section 2B | | | | | | | | | | | | | | | | | | | | | | | |
| Newburn Road/Chipping Drive to Cyril Road | | | | | | | | | | | | | | | | | | | | | | | |
| Design – | \$123k | | | | | | | | | | | | | | | | | | | | | | |
| Construction – | \$1.64m | | | | | | | | | | | | | | | | | | | | | | |

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5 COST ESTIMATE

The following assumptions were made in developing the preliminary cost estimate:

- > An allowance has been made for modification works to the 150mm diameter sewer, i.e. modifying line and level of the sewer.
- > An allowance has been made for modification works to the 250mm diameter cast iron watermain.
- > It is anticipated that modification to the 70Kpa low pressure gas main would be required but not for the high-pressure gas main. Allowance for the modification to the 70Kpa low pressure gas main has been included in the cost estimates.
- > Overhead cables run along Kalamunda Road in Section 1, a cost has been attributed to undergrounding the overhead cables. Allowance has also been made for relocating existing overhead power poles in Sections 2 and 3.
- > Allowances have also been made for relocating existing street lights in all three sections. This allowance includes upgrading the streetlights to compliant infrastructure.
- > Other power infrastructure within all three sections, such as property connections has not been allowed for in the cost estimates.
- > Modifications to the existing Telstra, NBN and Optus infrastructure have been assumed.
- > Underlying soil conditions are assumed to allow management of the nominated rainfall events and resulting flows within the catchment area, and as such no works have been allowed to facilitate connection to City drainage infrastructure.
- > An allowance has been made for upgrading Kalamunda Road between Abernethy Road and Roe Highway, please refer to Cardno's concept plans for further details.
- > A 40% contingency has been applied to account for uncertainties.

The total preliminary order magnitude of cost estimated for the road upgrades proposed in the concept design for Kalamunda Road is approximately **\$17,256,450.40 including GST** as shown in **Table 3-10**.

Table 5-10 Project Costs

| Item | Estimate Cost | | | | | |
|---|------------------------|----------------|----------------|----------------|--------------|----------------|
| | Section 1A | Section 1B | Section 2A | Section 2B | Section 2C | Section 3 |
| Preliminaries and Site Costs | \$1,049,993 | \$390,413 | \$256,460 | \$212,512 | \$63,096 | \$424,393 |
| Earthworks | \$126,706 | \$31,740 | \$26,258 | \$40,120 | \$17,662 | \$63,383 |
| Demolition | \$340,390 | \$169,390 | \$154,640 | \$68,200 | \$20,800 | \$75,900 |
| Roads | \$1,182,624 | \$379,270 | \$431,441 | \$284,528 | \$26,920 | \$224,144 |
| Road Drainage | \$- | \$- | \$20,000 | \$20,000 | \$10,000 | \$20,000 |
| Power Diversion | \$288,000 | \$105,000 | \$20,000 | \$188,000 | \$- | \$235,000 |
| Water Corp Water/Sewer/ Drainage | \$125,750 | \$77,750 | \$184,500 | \$82,200 | \$- | \$123,000 |
| Telstra | \$19,000 | \$27,000 | \$30,000 | \$18,000 | \$- | \$24,000 |
| Optus | \$- | \$24,000 | \$- | \$- | \$- | \$- |
| Driveway Construction | \$- | \$10,000 | \$130,000 | \$125,000 | \$- | \$105,000 |
| Land take (*Estimated expropriation cost where land cannot be ceded as part of the development application process) | \$2,030,000 | \$700,000 | | | \$- | \$- |
| NBN | \$14,000 | \$6,000 | \$21,000 | \$12,000 | \$27,000 | \$25,000 |
| ATCO Gas | \$73,500 | \$31,500 | \$8,000 | \$12,000 | \$- | \$21,000 |
| Pedestrian Traffic Lights | \$- | \$- | | | \$150,000 | \$- |
| Sub Total | \$5,249,963 | \$1,952,063 | \$1,282,298 | \$1,062,560 | \$315,478 | \$1,341,320 |
| 40% Contingency | \$2,100,000 | \$781,000 | \$513,000 | \$426,000 | \$127,000 | \$537,000 |
| Total (excl GST) | \$7,349,963.40 | \$2,733,062.50 | \$1,795,298.30 | \$1,488,560.00 | \$442,478.00 | \$1,878,320.00 |
| Total (incl GST) | \$8,084,959.80 | \$3,006,368.80 | \$1,974,828.10 | \$1,637,416.00 | \$486,725.80 | \$2,066,151.90 |
| Overall Total (incl GST) | \$17,256,450.40 | | | | | |

6 CONCLUSIONS AND RECOMMENDATIONS

- > The proposed cross section and current traffic volumes are characteristic of an Integrator B road according to the Draft Liveable Neighbourhoods 2015 and hence the concept design was designed to constrain traffic flows at 15000vpd for this section of Kalamunda Road;
- > The concept design proposes three new roundabout controlled intersections at the following intersections:
 - Kalamunda Road/Stirling Crescent;
 - Kalamunda Road/Cyril Road; and
 - Kalamunda Road/ Hawkevale Road/Range Court.
- > In addition, it is proposed that Fernan Road is converted to a cul-de-sac and Rangeview Road be closed at its intersection with Kalamunda Road. A signalised pedestrian crossing is proposed at Fernan Road to provide safe pedestrian access across Kalamunda Road;
- > All bus embayments within the study area, except for those located west of Cyril Road (westbound direction) and fronting the High Wycombe shopping centre, are proposed to be removed and buses are proposed to stop in the roadway;
- > Bus stops are proposed to be retained at existing locations along Kalamunda Road between Abernethy Road and Roe Highway, although the bus stops located at Cyril Road (eastbound direction) and Range Court (westbound direction) are required to be relocated due to the new roundabout treatments proposed at these locations;
- > A review of the existing vehicle usage data has identified that Section 3 (between Cyril Road and Roe Highway) has already reached the restricted demand of 15,000 vpd to accomplish the proposed function of this section of Kalamunda Road. Furthermore, the Roe Highway and Kalamunda Road interchange is to be a grade separated interchange and is expected to be upgraded by early 2021. Hence, Section 3 (between Cyril Road and Roe Highway) of the proposed concept design will need to be implemented by the end of 2022;
- > Demand forecast for Section 2B (between Newburn Road/Chipping Drive and Cyril Road) has revealed that the traffic for this section is expected to increase to over 20,600 vpd beyond 2031. It is recommended that the City of Kalamunda consider upgrading Section 2B (between Newburn Road/Chipping Drive and Cyril Road) at approximately the same time as Section 3 (between Cyril Road and Roe Highway) for ease of constructability, traffic management and reducing inconvenience to the local communities;
- > Based on present and future demand forecasts there is no requirement to upgrade Section 2A (Wittenoom Road to Newburn Road/Chipping Drive) by 2041. However, pedestrian facilities to the existing shopping centre is limited and there is a desire from the local community for the provision of a new pedestrian crossing to improve connectivity and safety. Cardno recommends closing off Fernan Road and installing a new signalised pedestrian crossing across Kalamunda Road. Fernan Road will need to be converted into a cul-de-sac to enable the construction of this signalised pedestrian crossing. It is envisaged that these works and minor improvements at the shopping centre access can be undertaken independently within the next few years even though the upgrade of Section 2A (Wittenoom Road to Newburn Road/Chipping Drive) is only required beyond 2041;
- > The total preliminary order of magnitude of cost estimated for the road upgrades proposed in the concept design for Kalamunda Road is approximately **\$17,256,450.40 including GST**.
- > Land acquisition may be required in the vicinity of Kalamunda Road/Stirling Crescent and Kalamunda Road/Wittenoom Road intersections. The City of Kalamunda should ensure that the necessary land and truncations required for the development of the proposed concept plan are ceded, where possible, through the planning and development application process; and
- > A key risk is the possibility of installing underground Western Power services between Abernethy Road and Wittenoom Road intersection with Kalamunda Road. It is recommended that the City of Kalamunda request for Western Power to undertake a feasibility study in this regard during the future planning and detail design stages.

ANNEXURE A – Proposed Concept Designs



DATE PLOTTED: 12 February 2020 9:46 AM BY: JOEY HUANG
 REF: City of Kalamunda, Kalamunda Rd Functional Traffic Upgrade Technical Traffic Concept Plan - Kalamunda Road - JH - v02.dwg
 CAD File: K:\Projects\2019\2020\City of Kalamunda, Kalamunda Rd Functional Traffic Upgrade\Technical Traffic Concept Plan - Kalamunda Road - JH - v02.dwg

LEGEND

- PROPOSED KERB AND MEDIAN
- CADASTRAL
- BIKE LANE
- FOOTPATH
- BUS EMBAYMENT
- PROPERTY DRIVEWAY
- SOLID MEDIAN
- ROUNDABOUT ISLAND

| Rev | Date | Description | Des. | Verif. | Appd. |
|-----|------|-------------|------|--------|-------|
| | | | | | |



CHECK PRINT ONLY

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| CONFIRMED | | | | |

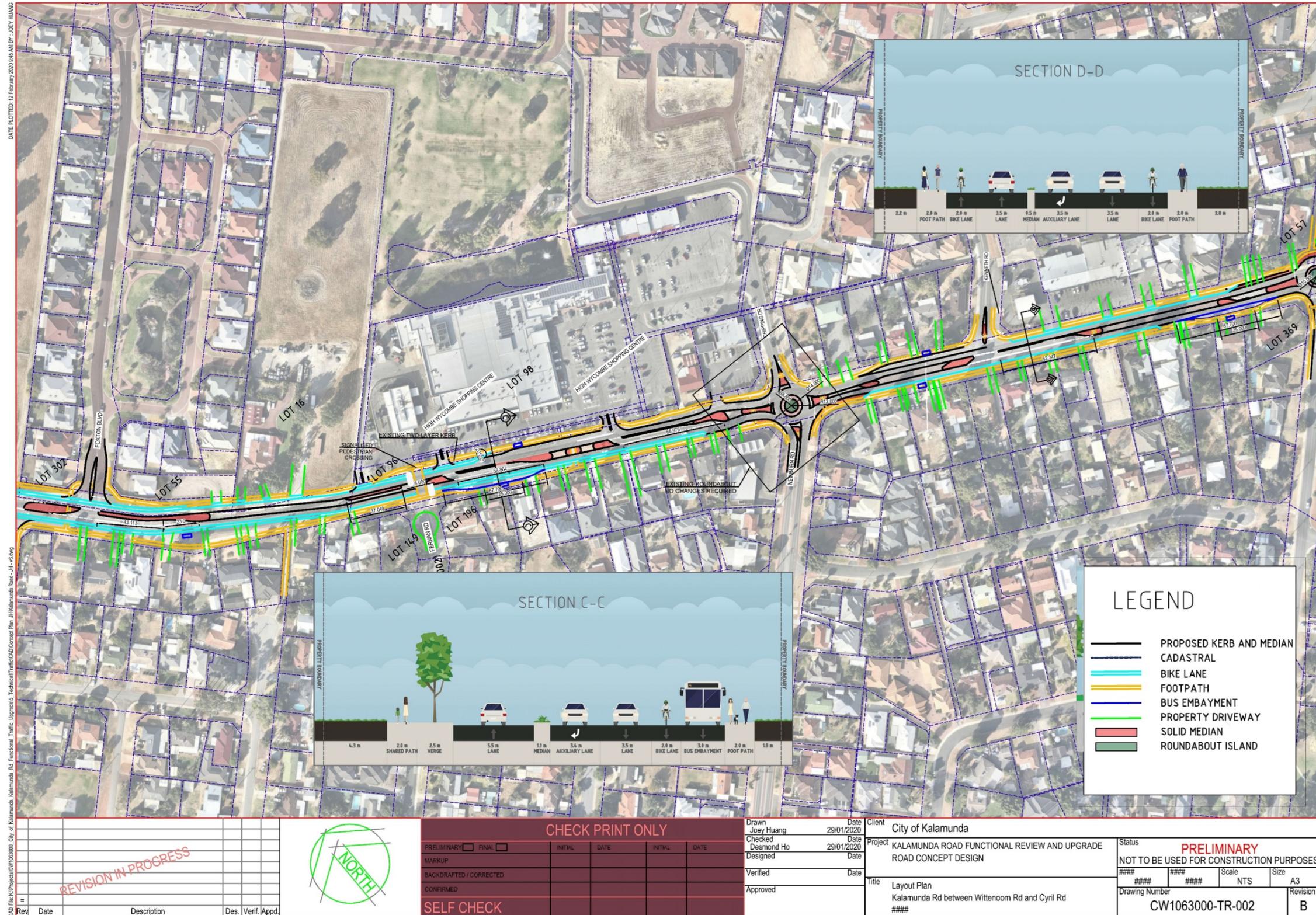
SELF CHECK

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|----------|------------|------|------------|
| Drawn | Joey Huang | Date | 29/01/2020 |
| Checked | Desmond Ho | Date | 29/01/2020 |
| Verified | | Date | |
| Approved | | Date | |

| | |
|---------|---|
| Client | City of Kalamunda |
| Project | KALAMUNDA ROAD FUNCTIONAL REVIEW AND UPGRADE ROAD CONCEPT DESIGN |
| Title | Layout Plan Kalamunda Rd between Abernethy Rd and Wittenoom Rd |

| | | | | | |
|--|--------------------|------|----|----------|---|
| Status | PRELIMINARY | | | | |
| NOT TO BE USED FOR CONSTRUCTION PURPOSES | | | | | |
| Scale | NTS | Size | A3 | | |
| Drawing Number | CW1063000-TR-001 | | | Revision | B |

REVISION IN PROGRESS





| REVISION IN PROGRESS | | | |
|----------------------|------|-------------|-------------------|
| Rev | Date | Description | Des. Verif. Appd. |
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| CHECK PRINT ONLY | | | | | |
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|-----------------------|--------------------|
| Drawn Joey Huang | Date 29/01/2020 |
| Checked Desmond Ho | Date 29/01/2020 |
| Designed | Date |
| Verified | Date |
| Approved | Date |

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|--|
| Client City of Kalamunda |
| Project KALAMUNDA ROAD FUNCTIONAL REVIEW AND UPGRADE ROAD CONCEPT DESIGN |
| Title Layout Plan Kalamunda Rd between Cyril Rd and Roe Hwy ### |

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| Status PRELIMINARY NOT TO BE USED FOR CONSTRUCTION PURPOSES |
| Scale NTS |
| Size A3 |
| Drawing Number CW1063000-TR-003 |
| Revision B |

