To: Bryan Hudson, Justine Kennedy

Copy:

From: Vinish Prakash, Alastair Black

Date: 10 August 2020

Job Number: 05_152

SUBJECT: C4 Structure Plan – Concept Layout for Internal Intersection

1. INTRODUCTION

The purpose of this memo is to develop an intersection arrangement for the C4 Structure Plan that provides certainty on the layout for Council and identifies property impacts for affected landowners.

We have:

- Identified options for the intersection arrangement based on a four leg roundabout on Cambridge Road. The roundabout has been centred on existing intersection.
- Evaluated the options and selected a preferred option;
- Completed a concept design for the preferred option; and
- Identified opportunities to provide appropriate pedestrian and cycling connections.

2. OPTION DESCRIPTION AND EVALUATION

The options are based on providing a minimum 90m separation from the proposed Kaipaki/Cambridge Road roundabout. We have assumed that Silverwood Lane will be upgraded to collector road standard as part of the development, with Lamb Street maintained as a minor arterial.

Options for the 'internal layout' include:

- Option 1: Priority along Silverwood Lane with right-turn bay into Lamb St as side road
- Option 2: Priority along Lamb St with Silverwood Lane as side road
- Option 3: 4-leg mini roundabout with access to northern part of the cell

For Option 2 we have used a 175m curve radius for the realignment which is appropriate for a 70km/h design speed. A smaller curve radius (e.g. 50km/h design speed = 60m) could be applied but may require additional speed management measures on the approaches and change to the speed limit.

Our option evaluation is summarised in the table below.

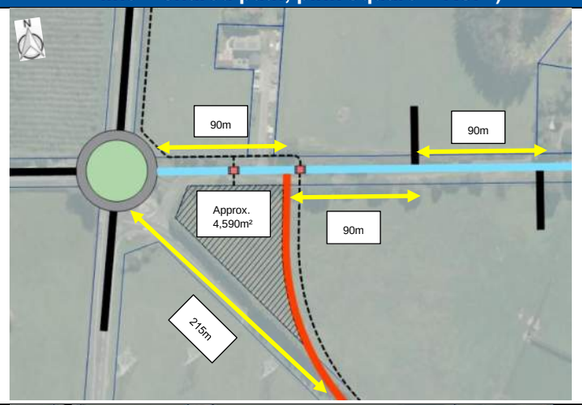
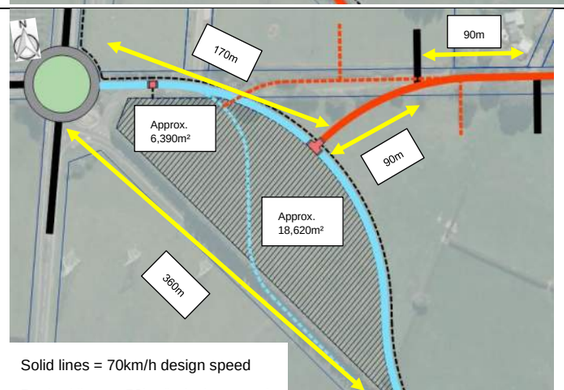
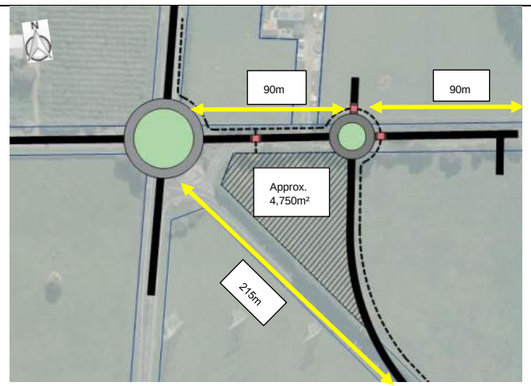
Option	Layout[1] (blue line = priority, red line = controlled, black dashed line = shared path, pink square = RSP[2])	Safety	Efficiency	Cost	Pedestrians	Summary
Option 1: Priority Silverwood Lane with right turn bay into Lamb St (side road).		**Low** • Priority controlled intersections are typically less safe than roundabouts. • Potential crash risk if high right turn demand into Lamb St. • The safety of the intersection could be improved with raised safety platforms/ raised intersection.	**Low** • Results in a lower hierarchy road having priority (Silverwood Lane as collector vs Lamb St as minor arterial) • Residents in the northern section of the subdivision will need to travel through multiple intersections before entering the arterial road network. • Potentially confusing to unfamiliar drivers wanting to travel along Lamb St.	**Medium** • Requires re-aligning Lamb St • Will require upgrading Silverwood Lane to collector road standard to accommodate increase in traffic • Lamb St tie-in approx. 215m from Cambridge Rd roundabout.	**Medium** • Will require at grade crossing at the Lamb St/ Silverwood Lane intersection. • Raised pedestrian platforms or raised intersection could be provided to improve safety.	**Undesirable** Results in a lower hierarchy road having priority (unless hierarchy is modified). Likely to be the least efficient option if flows along Lamb St dominate. Priority controlled intersections are typically less safe than roundabouts
Option 2: Priority Lamb Street	 Solid lines = 70km/h design speed Dashed lines = 50km/h design speed	**Medium** • Similar to Option 1. • Providing priority on Lamb St is likely to result in a safer layout compared to Option 1. • Need to ensure sight distance is available for vehicles turning right into and out of Silverwood Lane. This impacts on the curve radius.	**Medium** • Without speed management, may result in higher speeds along Lamb St • Residents in the northern section of the subdivision will need to travel through multiple intersections before entering the arterial road network. • Potential delays for right-turn out of Silverwood Lane.	**Medium** • Requires re-aligning Lamb St • Will require upgrading of Silverwood Lane to collector road standard. • Lamb St tie-in approx. 360m from Cambridge Rd roundabout. • Largest land severance. • 70km/h design speed requires 175m radius curve and results in 18,620m² land severance. • 50km/h design speed reduces the curve radius to 60m and results in 6,390m² land severance • Wider road reserve required to maintain SISD within road.	**Medium** • Similar to Option 1, although likely to be lower traffic volume on Silverwood Lane.	**Acceptable** A priority controlled intersection with priority on Lamb St is likely to be more legible and safer than Option 1. However, this option results in a large severance area due to the curve radius needed to maintain sight distance.
Option 3: Roundabout with access to the northern part of the cell.		**High** • Consolidates internal intersections into one. • A roundabout reduces the number of intersection conflict points and results in lower conflict speeds	**High** • Provides most direct access for residents on the north side of the subdivision compared to Options 1 and 2. • Requires all vehicles to use the roundabout which should result in lower speeds.	**High** • Requires re-aligning Lamb St • No realignment of Silverwood Lane • Will require upgrade of Silverwood Lane to collector road standard. • Lamb St tie-in approx. 215m from Cambridge Rd roundabout.	**Medium** • Will require at least two at grade pedestrian crossings at the roundabout. • Raised pedestrian platforms or raised intersection could be provided to improve safety.	**Preferred** This option results in a single intersection on Silverwood Lane improving legibility and access. A roundabout results in fewer conflict points and lower conflict speeds compared to priority intersections.

Table 1: Option Description and Evaluation

[1] Layout based on aerial photos. Further design required to confirm final layouts and severance areas

[2] RSP = Raised Safety Platform

Our preferred option is Option 3 as it results in a single intersection (roundabout) on Silverwood Lane. Roundabouts are also considered to be typically safer than priority controlled intersections.

Option 1 is undesirable given the likely road hierarchy of Lamb St (minor arterial) and Silverwood Lane (assumed as collector). Assuming that flows along Lamb St continue to dominate movements, this option is likely to be the least efficient/legible with high volumes of right-turns.

Option 2 would be acceptable, but results in a large severance area (18,620m² for 175m curve radius). The severance area reduces to 6,390m² with a smaller curve radius and implementation of speed management measures on the curve approaches.

3. INTERSECTION CONCEPT DESIGN

As agreed with Council (email dated 31st July 2020) our concept design is based on Option 3.

We outlined the design criteria for the Kaipaki Road/Cambridge Road roundabout in our ITA (dated 20 December 2019). While the design criteria are unchanged, the location of the roundabout has changed to optimise geometry for the Cambridge Road approach.

We have based the Lamb Street roundabout concept design on the following design criteria.

Criteria	Lamb Street Roundabout
Design Speed	70 km/h
Central Island Radius	10m
Circulating width (single Lane)	7.5m
Inscribed circle diameter (ICD)	35m
Criterion 2 visibility	70m (based on 50 km/h approach speed)
Design vehicle	Large Rigid Truck (refer swept right turn swept path below)

Table 2: Design Criteria

The concept design is based on the following road cross-sections:

- Lamb Street (minor arterial)
  - 26m road reserve
  - 3.5m lanes
  - 1.5m outside shoulders
  - 0.5m median/inside shoulder
  - 3m solid/flush median
- Collector Road (Silverwood Lane)
  - 3m lanes
  - 1.5m shoulder

The concept plan includes raised pedestrian platforms on the collector road approaches to the Lamb Street roundabout. A mid-block raised pedestrian platform is located between the Cambridge Road roundabout and Lamb Street roundabout to provide access to the severed land which could be used for recreation or stormwater.

Our concept layout is shown below and attached at Appendix A. The layout results in a land severance area of approximately 4,750m² plus 3,655m² of redundant road reserve.

Figure 1: Proposed Layout

Land acquisition will be required to comply with Criterion 2 visibility and to provide sufficient road reserve width. We have taken this into account in the proposed property boundaries. Criterion 3 visibility is not mandatory but could be achieved with additional land take. We note that providing visibility beyond Criterion 3 can result in higher roundabout approach speeds and higher impact speeds.

We have completed vehicle tracking analysis for a large rigid truck, an example right-turn vehicle path is provided below.

Figure 2: Swept Path - Large Rigid Truck Right Turn

4. CONCLUSION

The preferred roundabout layout results in a land severance area of approximately 4,750m² plus 3,655m² of redundant road reserve.

The final layout will need to be confirmed at detailed design stage and should include:

- Intersection design in accordance with the RITS and current design best practice.
- All marking and signs are in accordance with the Traffic Control Devices Rule and MOTSAM.
- Appropriate landscaping treatments.
- Providing appropriate street lighting at the intersections.

APPENDIX A – CONCEPT PLAN

0mm 100mm 200mm

CAMBRIDGE ROAD

FUTURE ROAD

SILVERWOOD LANE

FUTURE ROAD

N

PROPOSED BOUNDARY
LAND REQUIRED = 630m2

PROPOSED BOUNDARY
LAND REQUIRED = 4,170m2

PROPOSED BOUNDARY
LAND REQUIRED = 695m2

LAND SEVERENCE
APPROXIMATELY 4,750m2
(POSSIBLE PARK, STORMWATER
TREATMENT ETC)

SPEEDS (km/h)	Cambridge Rd	Kaipaki Rd	Lamb St
Current posted speed	100	100	100
Proposed speed limit	80	100	60
Design Speed	90	110	70

FEATURES KEY

- PROPOSED KERB
- PROPOSED ROADMARKING
- PROPOSED RAISED PLATFORM
- PROPOSED SHARED PATH
- PROPOSED BOUNDARY
- POSSIBLE LAND REQUIREMENTS

KAIPAKI ROAD

PROPOSED BOUNDARY
LAND REQUIRED = 621m2

EXISTING ROAD TO BE STOPPED
APPROXIMATELY 3,655m2

CAMBRIDGE ROAD

LAMB STREET

EXISTING POWER PYLONS

NOTES:

1. THIS PLAN IS A CONCEPT FOR PLANNING PURPOSES ONLY, BASED ON AERIAL PHOTOS AND LINZ BOUNDARY INFORMATION.
2. EXISTING SERVICES ARE NOT SHOWN AND THE SCOPE OF POSSIBLE SERVICE RELOCATIONS HAS NOT BEEN ASSESSED. THIS SHOULD BE CONFIRMED WITH DETAILED DESIGN.
3. FINAL INTERSECTION LAYOUT AND LAND REQUIREMENTS WILL BE SUBJECT TO TOPO SURVEY AND DETAILED DESIGN.
4. REFER TO SEPARATE TABLE FOR FUTURE SPEED ZONE CHANGES AND DESIGN SPEEDS.

PROPOSED ROUNDABOUT INTERSECTIONS CONCEPT PLAN

REF	AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN	D. MILLS	V. PRAKASH	08 / 20
DRAWN	D. MILLS	V. PRAKASH	08 / 20

RECOMMENDED: D. MILLS — 10 / 08 / 20 DATE

APPROVED: A. BLACK — 10 / 08 / 20 DATE

OFFICE: gray matter

CLIENT: Waipa DISTRICT COUNCIL

PROJECT: WAIPA DISTRICT COUNCIL - C4 STRUCTURE PLAN
LAMB ST / CAMBRIDGE RD / KAIPAKI RD

SHEET TITLE: PROPOSED ROUNDABOUT INTERSECTIONS
CONCEPT PLAN

STATUS: CONCEPT

GEODETIC & VERTICAL DATUM: NZGD2000

PLAN NUMBER: 05_152_100_O

SHEET: Sketch 1

SCALE: 1:1000 (@ A3)

REVISION: R0

CAD FILE: C4CBKRINTERSECTIONS.DWG

ORIGINAL SIZE A3