Request for Change to the Selwyn District Plan

prepared for

# ROLLESTON WEST RESIDENTIAL LIMITED

**Dunns Crossing Road, Rolleston**

**November 2020**

**Request for Change to the Selwyn District Plan**

**prepared for**

# ROLLESTON WEST RESIDENTIAL LIMITED

**Dunns Crossing Road, Rolleston**

Novo Group Ltd
Level 1, 279 Montreal Street
PO Box 365, Christchurch 8140
P: (03) 365 5570
E: info@novogroup.co.nz
W: www.novogroup.co.nz

| | |
|---|---|
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| Project Manager: | Jeremy Phillips, Director & Senior Planner |
| Prepared by: | Jeremy Phillips, Director & Senior Planner |
| Reviewed by | Kim Seaton, Senior Planner |

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# Request to Change the Selwyn District Plan under Clause 21 of the First Schedule of the Resource Management Act 1991

TO: The Selwyn District Council

**Rolleston West Residential Limited ('RWRL') requests** changes to the Selwyn District Plan as described below.

1. The location to which this request relates is:

   - The subject land is located generally on the western side of the Rolleston township, to the west of Dunns Crossing Road and south of Main South Road (State Highway 1).

   - The subject land is currently zoned Living 3 and is comprised of two separate blocks:

     - The Holmes Block, being the 87.5 hectare property situated on the southwest corner of Dunns Crossing Road and Main South Road, Lincoln; and

     - The Skellerup Block, being the 72.7 hectare property situated on the west side of Dunns Crossing Road, approximately midway between Selwyn Road and Brookside Road.

   - Total Area: 160 hectares (approximately).

   - Legal Descriptions: See **Attachment 1**.

   - A location plan indicating the location of the subject land is included as **Attachment 2**.

   - A plan indicating proposed amendments to the District Planning maps is included as **Attachment 3**.

   - An outline development plan proposed for the subject land is included as **Attachment 4 (Holmes Block)** and **Attachment 5 (Skellerup Block)**.

2. The Proposed Plan Change undertakes the following changes to the Selwyn District Plan (changes <u>underlined</u> or ~~struck through~~):

   1. To amend the Selwyn District Plan Planning Maps, by rezoning the site to Living Z and Business 1 (Local Centre) as detailed in **Attachment 3**.

   2. To amend Township Volume, Appendix 39 Outline Development Plan- Holmes Block, Rolleston by inserting the ODP attached in **Attachment 4**.

   3. To amend Township Volume, Appendix 40 Outline Development Plan- Skellerup Block, Rolleston by inserting the ODP attached in **Attachment 5**.

   4. To amend the following District Plan provisions:

## *C4 LZ Buildings*

*4.2.1 ~~Except for the Living 3 Zone at Rolleston identified in the Outline Development Plan in Appendix 39 and 40, any~~ Any principal building shall be a permitted activity if the area between the road boundary and the principal building is landscaped with shrubs and…*

- *Planted in lawn, and/or*
- *Paved or sealed, and/or*
- *Dressed with bark chips or similar material.*

*For the Living 3 Zone at~~ Rolleston and~~ Prebbleton identified on the Outline Development Plan in Appendix 19~~, Appendix 39 and Appendix 40~~ the following shall apply:*

*4.2.2 Any principal building shall be a permitted activity if: …*

*Note: ~~Rule 4.2.2 shall not apply to allotments of 4ha or greater in the Living 3 Zone identified on the Outline Development Plan in Appendix 39 and Appendix 40.~~*

*4.9.3 Except for ~~the Living 3 Zone at Rolleston identified on the Outline Development Plan in Appendix 39 and Appendix 40, and~~ ODP Area 3 and ODP Area 8 in Rolleston, and the Living 2A Zone in Darfield, as identified in the Outline Development Plan in Appendix 47, any dwelling, family flat, and any rooms within accessory buildings used for sleeping or living purposes shall be located no closer than 40m from the edge of the sealed carriageway of State Highways with a posted speed limit of 70 Km/hr or greater.*

*4.9.4 Except for ~~the Living 3 Zone at Rolleston identified on the Outline Development Plan in Appendix 39 and Appendix 40, and~~ ODP Area 3 and ODP Area 8 in Rolleston, and the Living 2A Zone in Darfield, as identified in the Outline Development Plan in Appendix 47, any dwelling, family flat, and any rooms within accessory buildings used for sleeping or living purposes within 100m from the edge of the sealed carriageway of State Highways with a posted speed limit of 70 Km/hr or greater shall have internal noise levels from road traffic that do not exceed the limits set out below with all windows and doors closed.*

*~~4.9.37 Any building in the Living 3 Zone at Rolleston (as shown on the Outline Development Plan in Appendix 39 and Appendix 40) shall be set back at least:~~*

> *~~i) 15 metres from any road boundary except that on corner lots a minimum setback of 10m applies to one road boundary;~~*
>
> *~~ii) 5 metres from any other boundary~~*

*~~4.9.38 Any dwelling, family flat, and any rooms within accessory buildings used for sleeping or living purposes, and any internal areas associated with noise sensitive activities in the Living 3 Zone at Rolleston (as shown on the Outline Development in Appendix 39) shall be setback at least 80m from State Highway 1.~~*

~~*For the purposes of this rule, noise sensitive activities means any residential activity, travellers accommodation, educational facility, medical facility or hospital, or other land use activity, where the occupants or persons using such facilities may be likely to be susceptible to adverse environmental effects or annoyances as a result of traffic noise from State Highway 1 over its location.*~~

*4.9.39 Any dwelling, family flat, and any rooms within accessory buildings used for sleeping or living purposes in the Living ~~3~~Z Zone at Rolleston (as shown on the Outline Development Plan in Appendix 39 (Holmes Block) or Appendix 40 (Skellerup Block) shall be located outside the 'Odour Constrained Area' ~~as shown in Appendix 40 (Skellerup Block))~~.*

~~*4.9.49.4 In the Living 3 Zone at Rolleston as shown in Appendix 39, whether the building development meets the internal sound levels in the table listed below:*~~

| ~~*Type of Occupancy/activity*~~ | ~~*Recommended Internal Design Sound Level (dBa Leq (24hr))*~~ |
|---|---|
| ~~*Dwelling/Family Flat/accessory buildings – bedroom*~~<br><br>~~*Within Bedrooms*~~ | ~~*35*~~ |
| ~~*all other habitable spaces*~~ | ~~*40*~~ |
| ~~*Noise Sensitive activities*~~ | ~~*35*~~ |

*4.9.58 Erecting any new dwelling in the ~~Countryside Area or~~ ~~the~~ 'Odour Constrained Area' identified on the Outline Development Plan in Appendix 39 and Appendix 40.*

***Reasons for Rules…***

***Building Position…***

*Controls on side and front yard spaces apply to sites in the Living 3 Zone at Rolleston identified on the Outline Development Plan in Appendix ~~39, 40 or~~ 46 in order to retain views between residences and to assist in retaining elements of rural character and provide visual integration and visual attractiveness.*

~~*Building within the Countryside Area identified on the Outline Development Plan in Appendix 39 and Appendix 40 is a non-complying activity. The purpose of the Countryside Areas is to provide open space and a visual link to the surrounding rural landscape. These corridors bisect the residential activity and are to be managed in productive rural use.*~~

## *C5 LZ Roading*

*5.1.1.6 For the Living 3 Zone at Rolleston identified on the Outline Development Plan in Appendix ~~39 40 or~~ 46, the road shall include the relevant cross sectional treatment as shown in Appendix ~~39 40 or~~ 46.*

*5.2.1.6 The vehicle accessway is formed to the relevant standards in Appendix E13.2.1 ~~and in addition for the Living 3 Zone at Rolleston identified on the Outline Development Plan in Appendix 39 and 40, private vehicular accessways serving less than three sites shall have a maximum formed width of 3.5m at the road boundary and within 10m of the road boundary;~~ and*

***Reasons for Rules…***

*~~A maximum width applies to accessways within the front 10m of sites in the Living 3 Zone at Rolleston identified on the Outline Development Plan in Appendix 39 and 40 in order to avoid dominance of landscaped front yard areas by wide paved accessway surfaces, which could compromise the rural character the zone is expected to create.~~*

## *C10 LZ Activities*

*10.3.2 The keeping of animals other than domestic pets except as provided under Rules 10.3.3 to Rules 10.3.5 shall be a discretionary activity~~, except~~*

*~~(a) within the Living 3 Zone Countryside Areas identified on the Outline Development Plan at Appendix 39 and 40 provided that such activities are identified by and undertaken consistent with the Countryside Area Management Plan required by Rule 12.1.3.35; and~~*

*~~(b) within the Living 3 Zone Lower Density Area identified on Outline Development Plan at Appendix 39 and 40 provided that this shall not include intensive livestock production or the keeping of roosters, peacocks, pigs or donkeys.~~*

***~~10.14 COUNTRYSIDE AREAS – LIVING 3 ZONE, ROLLESTON~~***

***~~Permitted Activities – Countryside Areas – Living 3 Zone, Rolleston~~***

*~~10.14.1 Rural activities (excluding forestry, intensive livestock production and dwellings) within the Living 3 Zone Countryside Areas identified on the Outline Development Plan at Appendix 39 and 40 shall be a permitted activity provided that such rural activities are identified by and undertaken consistent with the Countryside Area Management Plan required by Rule 12.1.3.35.~~*

***~~Restricted Discretionary Activities – Countryside Areas – Living 3 Zone, Rolleston~~***

*~~10.14.2 Rural activities (excluding forestry, intensive livestock production and dwellings) within the Living 3 Zone Countryside Areas identified on the Outline Development Plan at Appendix 39 and 40 shall be a restricted discretionary activity except where such rural activities are identified by and undertaken consistent with the Countryside Area Management Plan required by Rule 12.1.3.35.~~*

*~~10.14.3 Under Rule 10.14.2, the Council shall restrict the exercise of its discretion to:~~*

~~*10.14.3.1 the degree to which the proposed rural activities maintain open space and/or rural character and rural amenity of the Countryside Area(s);*~~

~~*10.14.3.2 the extent to which potential adverse nuisance effects on occupiers of adjacent rural residential allotments will be internalised within the Countryside Area(s).*~~

***Reasons for Rules…***

***Keeping of Animals***

*…Resource consent for a discretionary activity is required for: commercial rearing of animals for sale of progeny, meat, skins, wool or other products; the keeping of animals other than domestic pets* ~~*(except within the Living 3 Zone Countryside Areas identified on the Outline Development Plan at Appendix 39 and 40)*~~*. Those activities may be granted resource consent, depending on whether adverse effects can be adequately mitigated, and if there is consistency with the relevant objectives and policies of the plan.* ~~*The exception provided for the Living 3 Zone Countryside Areas regarding keeping of animals recognises that rural activities (subject to some specific exceptions) are anticipated and intended to occur within the designated Countryside Areas, and also within the large lot Lower Density Areas. The potential adverse effects associated with the keeping of animals other than domestic pets (e.g. horse grazing) within the Countryside Areas is managed through the requirement for a management plan to be in place prior to such activities occurring, and as such, are deemed appropriate for the Zone. A further exception is provided to enable limited grazing of the Lower Density Areas within the Living 3 Zone.*~~

~~***…Countryside Areas – Living 3 Zone***~~

~~*Rule 10.14 provides for rural activities (subject to some specific exceptions) to occur within the designated Countryside Areas within the Living 3 Zone identified on the Outline Development Plans at Appendices 39 and 40 as a means of achieving and maintaining rural character within the Living 3 Zone While such activities have the potential to create adverse environmental effects, the requirement for those activities to be identified by and undertaken consistent with the Countryside Area Management Plan required by Rule 12.1.3.35 will ensure that any adverse effects are appropriately managed over time*~~

## *C12 LZ Subdivision*

***Rolleston***

~~*12.1.3.49 Any subdivision of land within the area shown in Appendix 39 and 40 (Living 3 Zone at Rolleston) complies with:*~~

~~*(a) the Countryside Area layout of the Outline Development Plan at Appendix 39 and 40;*~~

~~*(b) the location of the Lower Density Area as shown on the Outline Development Plan at Appendix 39 and 40;*~~

~~*(c) the establishment of shelterbelt planting comprising three rows of Leyland Cypress along the common boundary with Lot 3 DP 20007 in accordance with the Outline Development Plan at Appendix 40*~~

~~*(d) the roading layout of the Outline Development Plan at Appendix 39 and 40;*~~

~~*(e) where any conflict occurs with Rule E13.3.1 the cross sections in Appendix 39 and 40 shall take precedence; and*~~

~~*(f) full public access is maintained to internal roads so that the area shown on the Outline Development Plan in Appendix 39 and 40 does not become a gated community.*~~

*12.1.3.50 (a) In respect of the land identified at Appendix 39 (Holmes Block), no more than* ~~*97 rural*~~ *1150 residential allotments may be created;*

*(b) In respect of the land identified at Appendix 40 (Skellerup Block), no more than* ~~*51 rural*~~ *950 residential allotments may be created.* ~~*and no subdivision shall take place to densities less than what are provided for under the Rural (Outer Plains) Zone until:*~~

~~*(i) a publicly owned sewerage reticulation system has been extended to the site.*~~

~~*12.1.3.51 Any subdivision application within the Living 3 Zone west of Dunns Crossing Road that includes any part of the Countryside Areas as identified on the Outline Development Plan included at Appendix 39 and 40 shall be accompanied by a Countryside Area Management Plan which addresses the following matters:*~~

~~*(a) The ownership and management structure for the Countryside Area(s);*~~

~~*(b) Mechanisms to ensure that the management plan applies to and binds future owners;*~~

~~*(c) The objectives of the proposed rural use of the Countryside Area(s);*~~

~~*(d) Identification of the rural activity or activities proposed for the Countryside Area(s), which meet the above objectives*~~

~~*(e) Measures to maintain and manage open space and/or rural character;*~~

~~*(f) Measures to manage plant pests and risk of fire hazard;*~~

~~*(g) Measures to internalise adverse effects including measures to avoid nuisance effects on occupiers of adjacent rural residential allotments;*~~

~~*(h) Measures to provide for public access within the Countryside Area(s) along Dunns Crossing Road; and*~~

~~*(i) Whether there is sufficient irrigation water available to provide surety of crop within the Countryside Area(s).*~~

***Table C12.1 –Allotment Sizes***

| *Township* | *Zone* | *Average Allotment Size Not Less Than* |
|---|---|---|
| … | | |
| *Rolleston* | ~~*Living 3 (Appendix 39 & 40)*~~ | ~~*At least 20ha of the land within the area defined by the Outline Development Plan at Appendix 39 and 40 shall be developed as a Lower Density Area in the location shown on the Outline Development Plan with a minimum and an average allotment size of no less than 4ha.*~~<br><br>~~*The balance of the land on the Outline Development Plans at Appendix 39 and 40 outside the above area shall be developed with an average allotment size of no less than 5000m2 with a minimum allotment size of 4000m2.*~~<br><br>~~*The maximum number of allotments within the area defined by the Outline Development Plan at Appendix 39 shall be 97.*~~<br><br>~~*The maximum number of allotments within the area defined by the Outline Development Plan at Appendix 40 shall be 51.*~~ |

*12.1.4.76 In relation to the Living ~~3~~ Z Zone (Holmes and Skellerup) at Rolleston as shown in Appendix 39 and 40:*

*(a) Whether the pattern of development and subdivision is consistent with the Outline Development Plan in Appendix 39 and 40;*

*(b) In relation to the Living Z zone shown in Appendix 39 only, whether the pattern and staging of development takes into account the potential upgrade of the Dunns Crossing Road / Main South Road (SH1) / Walkers Road intersection by Council and NZTA.*

~~*(b) Whether local roading, and trees and planting on roads and lots, are proposed in general accordance with the Outline Development Plan, road cross section(s) and associated planting schedules and requirements shown in Appendix 39 and 40;*~~

~~*(c) Whether the roading and lot pattern follow a rectilinear pattern with orientations generally established by the surrounding road network, consistent with the typical subdivision patterns of the Rolleston rural area;*~~

~~*(d) Whether the roading pattern and proposed hard and soft landscape treatments in the road reserve will create a rural character to the development and distinguish it from conventional suburban development;*~~

~~*(e) Whether suburban road patterns and details such as cul de sac, arbitrary curves, and kerb and channels are avoided;*~~

~~*(f) The extent to which the maximum of 97 lots (Holmes) and 51 lots (Skellerup) within the area defined by the Outline Development Plan in Appendices 39 and 40, respectively, is met;*~~

~~*(g) Whether the creation of open space in rural production areas is consistent with the Countryside Areas identified on the Outline Development Plan in Appendix 39 and 40;*~~

~~*(h) Whether the provision of public walkways is consistent with the public walkways identified on the Outline Development Plan in Appendix 39;*~~

~~*(i) Whether there is a need for the western public walkway taking into account the ability to connect to future public walkways to the west (Holmes Block, Appendix 39);*~~

~~*(j) Whether at least 20ha of land is developed as a Lower Density Area with larger allotments (4ha or more) in general accordance with the location identified on the Outline Development Plan in Appendices 39 (Holmes) and 40 (Skellerup);*~~

~~*(k) In the event that it is developed first, whether the development of a Lower Density Area in advance of other development avoids frustrating the intentions of the Outline Development Plan or the ability to achieve integrated development over the Outline Development Plan area;*~~

~~*(l)Whether shelterbelt planting will achieve screening of activities occurring on Lot 3 DP 20007 (Skellerup Block, Appendix 40).*~~

~~*12.1.4.77 In relation to the Countryside Area Management Plan required for the Living 3 Zone west of Dunns Crossing Road, Rolleston as shown in Appendix 39 and 40:*~~

~~*(a) The adequacy of the management plan to achieve open space and/or rural character across the Countryside Area(s) in a manner that is compatible with the surrounding rural residential environment;*~~

~~*(b) The adequacy of proposed mechanisms to maintain and manage the Countryside Area(s) long term in a consistent manner;*~~

~~*(c) Whether rural landscape, visual and amenity value characteristics of the Countryside Area(s) are able to be maintained;*~~

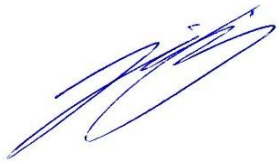
~~*(d) The extent to which potential adverse nuisance effects on occupiers of adjacent rural residential allotments will be internalised within the Countryside Area(s);*~~

~~*(e) The extent to which adverse effects of plant pests and fire hazard risks will be avoided or remedied; and*~~

~~*(f) The suitability of proposed access within the Countryside Area(s) along Dunns Crossing Road.*~~

5. Any other consequential amendments including but not limited to renumbering of clauses.

3. An assessment is provided in **Attachment 6** in accordance with the requirements of the Resource Management Act 1991 and including Section 32 of the Act.



**DATED:** 17 November 2020

**Jeremy Phillips, Director & Senior Planner**

(Signature of applicant or person authorised to sign on behalf)

**Address for service:**

Novo Group Limited
PO Box 365
Christchurch 8140

**Attention: Jeremy Phillips**

T: 03 365 5588

E: jeremy@novogroup.co.nz

**Address for Council fees:**

Rolleston West Residential Limited
PO Box 2726
Christchurch 8140

**Attention: Tim Carter**

T: 03 3791650

E: tim@cartergroup.co.nz

# Attachment 1: Certificates of Title

# RECORD OF TITLE
# UNDER LAND TRANSFER ACT 2017
# FREEHOLD
**Search Copy**

R.W. Muir
Registrar-General
of Land

| | |
|---|---|
| **Identifier** | **686982** |
| **Land Registration District** | **Canterbury** |
| **Date Issued** | 02 February 2015 |

**Prior References**
578660

| | |
|---|---|
| **Estate** | Fee Simple |
| **Area** | 87.5312 hectares more or less |
| **Legal Description** | Section 2 Survey Office Plan 480906 |

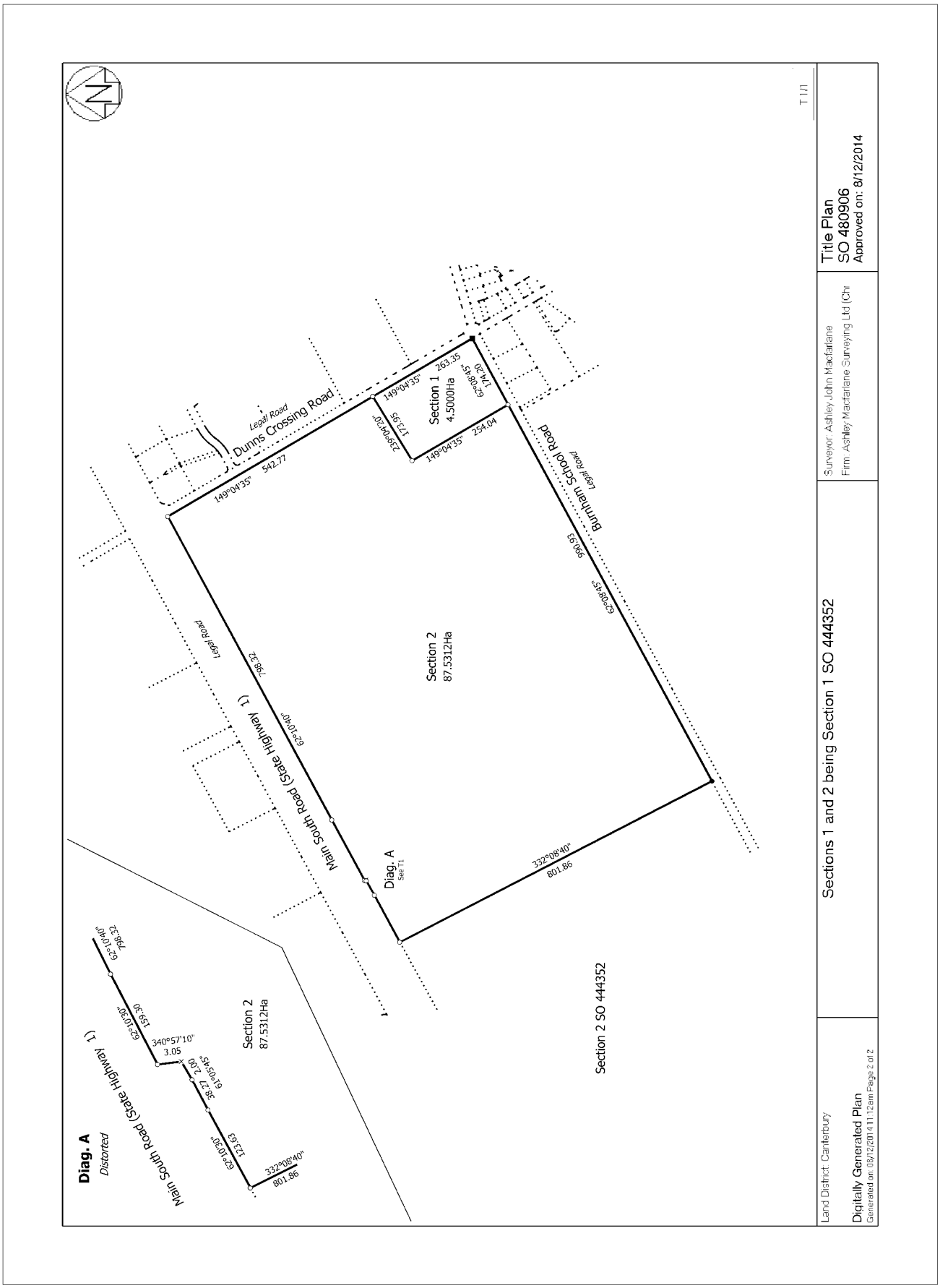
**Registered Owners**
White Gold Limited

**Interests**

110032.1 Gazette Notice declaring No 1 State Highway (Awanui-Bluff) fronting the within land to be a limited access road - 15.12.1976 at 9:25 am (Affects parts formerly Part Section 1 Reserve 309 formerly CT CB206/66 and Part Reserve 302 and Part Reserve 1759 formerly CT CB383/123)

9199072.3 Mortgage to ANZ National Bank Limited - 16.10.2012 at 1:37 pm

9886966.1 Compensation Certificate pursuant to Section 19 Public Works Act 1981 by Her Majesty the Queen - 5.11.2014 at 3:23 pm


Title Plan
SO 480906
Approved on: 8/12/2014
Surveyor: Ashley John Macfarlane
Firm: Ashley Macfarlane Surveying Ltd (Chr
Sections 1 and 2 being Section 1 SO 444352
Land District: Canterbury
Digitally Generated Plan
Generated on: 08/12/2014 11:12am Page 2 of 2
T 1/1
Section 1
4.5000Ha
Section 2
87.5312Ha
Section 2
87.5312Ha
Section 2 SO 444352
Legal Road
Dunns Crossing Road
Burnham School Road
Main South Road (State Highway 1)
Diag. A
See T1
Diag. A
Distorted
Main South Road (State Highway 1)
149°04'35"
542.77
263.35
254.04
990.93
798.32
801.86
332°08'40"
62°10'40"
62°09'45"
239°04'20"
340°57'10"
159.30
123.63
3.05
2.00
38.27

# RECORD OF TITLE
# UNDER LAND TRANSFER ACT 2017
# FREEHOLD
**Search Copy**

R.W. Muir
Registrar-General
of Land

| | |
|---|---|
| **Identifier** | **CB24F/1018** |
| **Land Registration District** | **Canterbury** |
| **Date Issued** | 03 May 1983 |

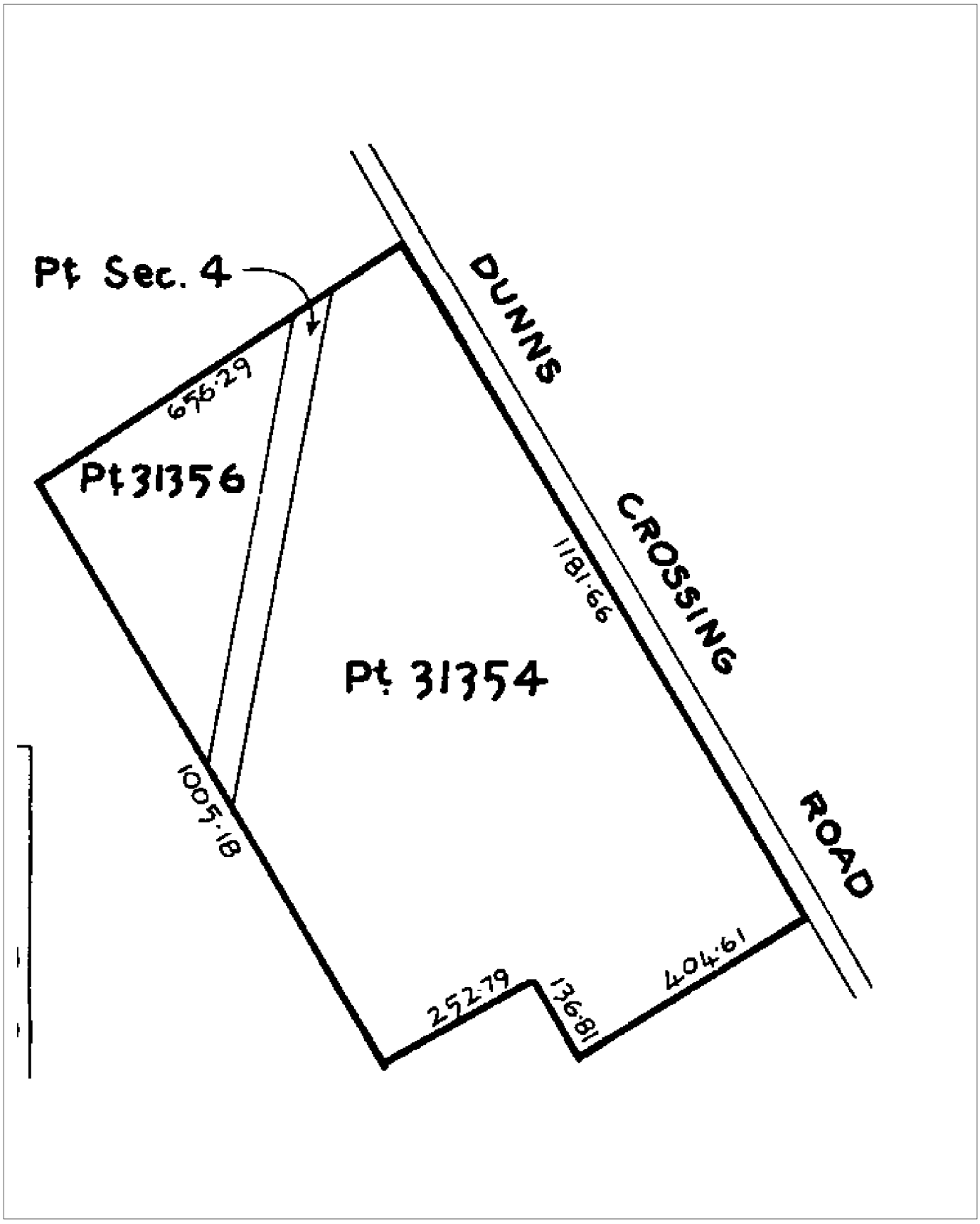
**Prior References**
CB178/46

| | |
|---|---|
| **Estate** | Fee Simple |
| **Area** | 72.6916 hectares more or less |
| **Legal Description** | Part Rural Section 31354, Part Rural Section 31356 and Part Section 4 Reserve 1342 |

**Registered Owners**
White Gold Limited

**Interests**

9199072.2 Mortgage to ANZ National Bank Limited - 16.10.2012 at 1:37 pm


Pt Sec. 4
DUNNS
CROSSING
ROAD
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Pt 31356
1181·66
Pt 31354
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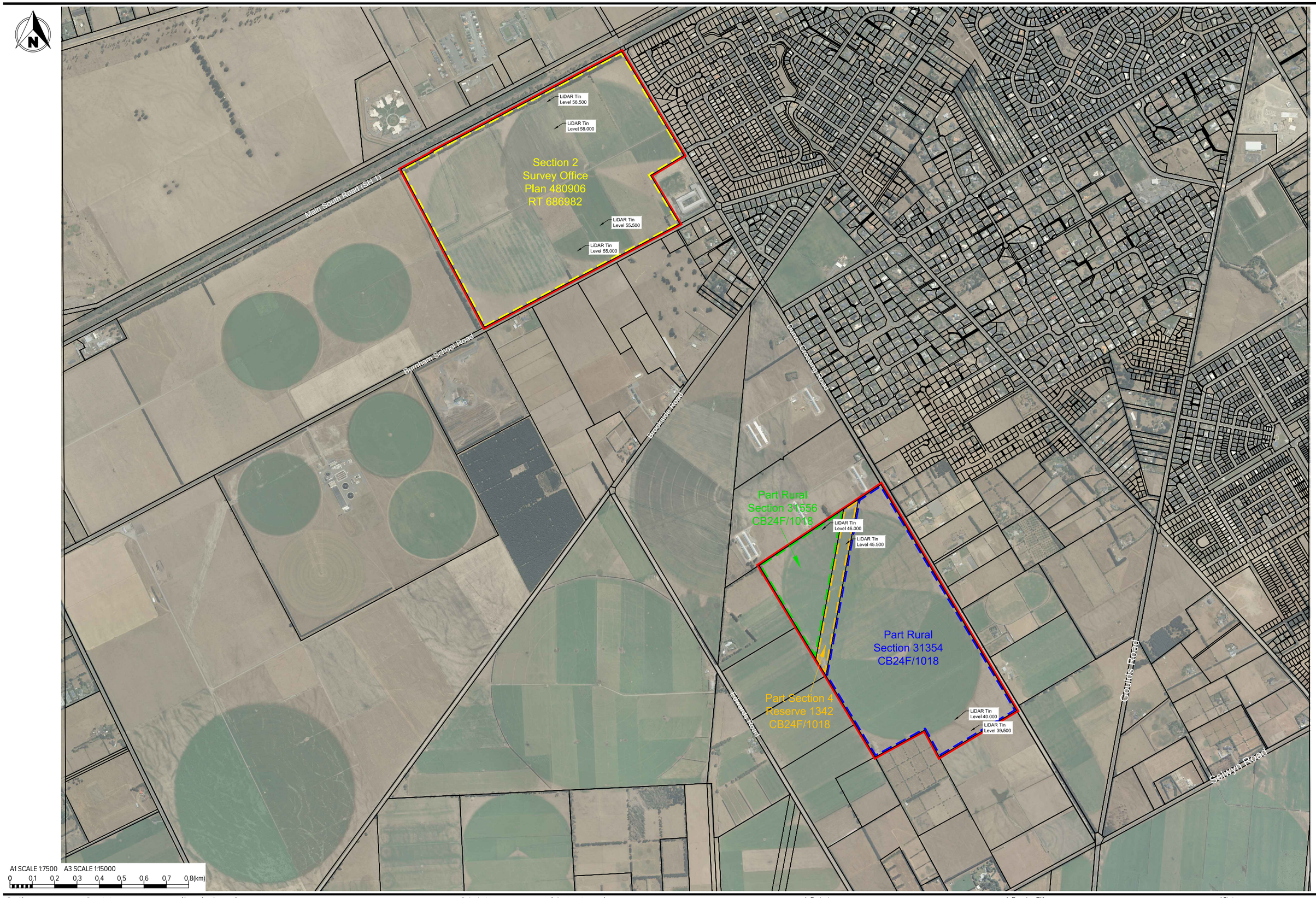
404·61

# Attachment 2: Location Plan

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| - | - | - | - |
| A | Preliminary Issue | BH | 12.11.20 |

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122 Montreal St, Sydenham, Christchurch 8022
Ph. 03 377 3290 11
Clayton St, Newmarket, Auckland 1149
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www.inovo.nz

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Approved PM
Date 03.11.20

Client: **ROLLESTON WEST RESIDENTIAL LIMITED**

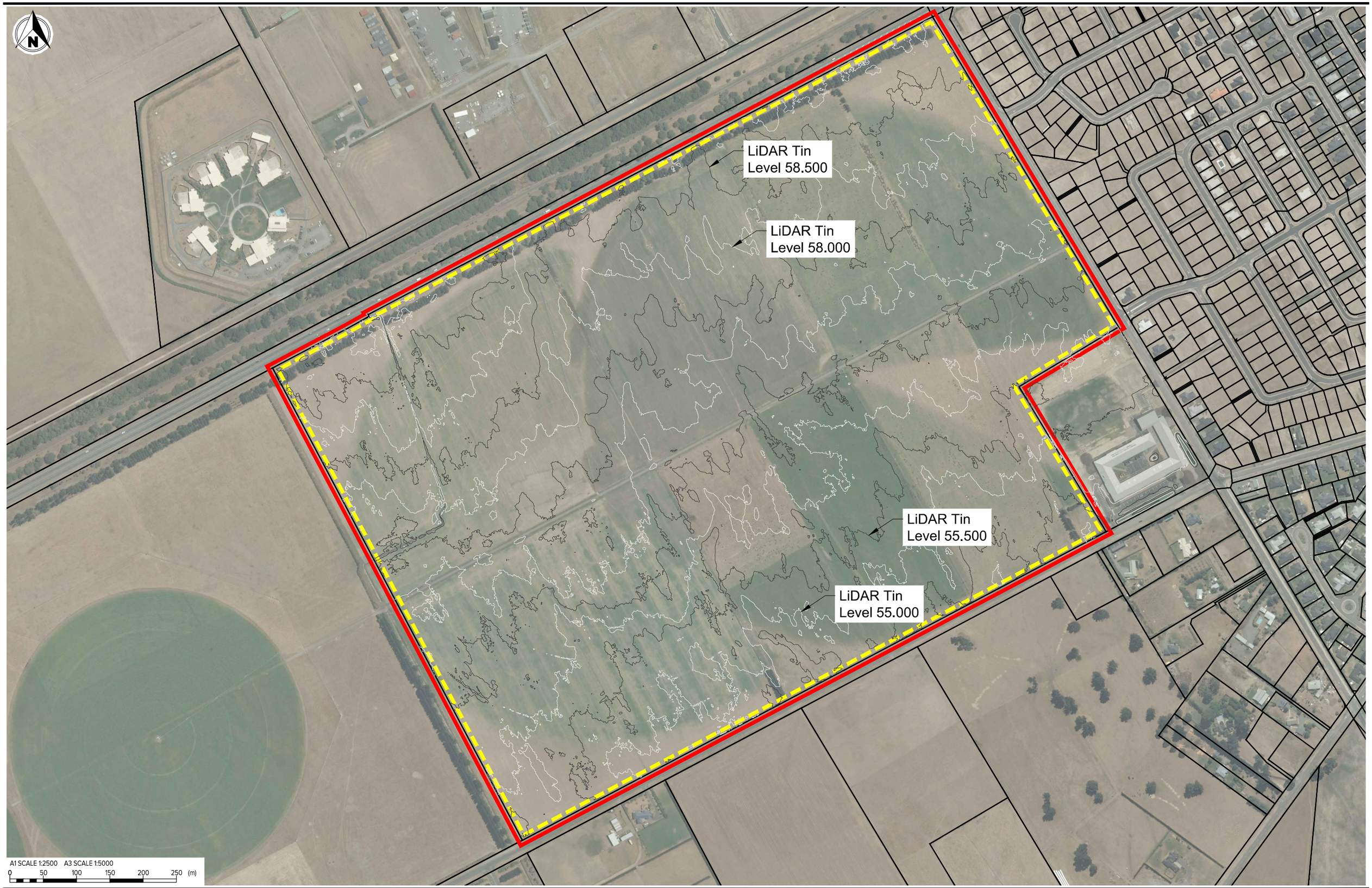
Project: **ROLLESTON WEST PLAN CHANGE**

Drawing Title: **EXISTING TITLES**

Status: **FOR INFORMATION**
**NOT FOR CONSTRUCTION**

Drawing No. **14720-E-200**
Rev A

FILE: O:\1. Projects\DS14700\14720 - Rolleston West Plan Change\05 Information Management\01 Survey\07 CAD\14720-E-200 Base Plan.dwg PLOTTED: 12/11/2020 11:45:35 am BY: Tim McLeod




| Rev# | Description | Drawn | Date |
|---|---|---|---|
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| - | - | - | - |
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| A | Preliminary Issue | BH | 12.11.20 |

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Approved PM
Date 03.11.20

Client: **ROLLESTON WEST RESIDENTIAL LIMITED**

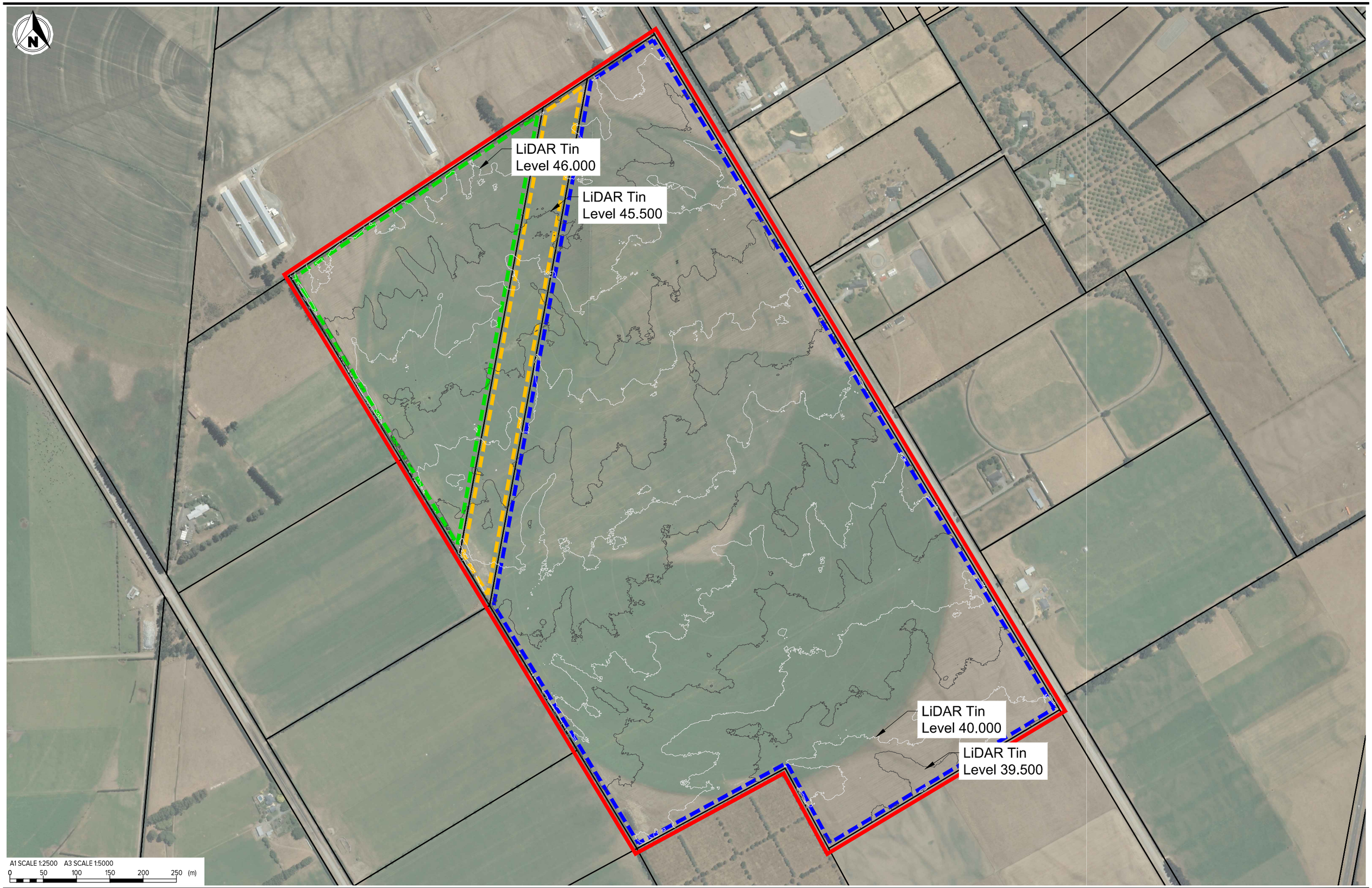
Project: **ROLLESTON WEST PLAN CHANGE**

Drawing Title: **HOLMES BLOCK LIDAR CONTOURS**

Status: **FOR INFORMATION**
**NOT FOR CONSTRUCTION**

Drawing No. **14720-E-201**
Rev A

FILE: O:\1. Projects\DS14700\14720 - Rolleston West Plan Change\05 Information Management\01 Survey\07 CAD\14720-E-200 Base Plan.dwg PLOTTED: 12/11/2020 11:23:31 am BY: Tim McLeod




| Rev# | Description | Drawn | Date |
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| A | Preliminary Issue | BH | 12.11.20 |

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Approved PM
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Client **ROLLESTON WEST RESIDENTIAL LIMITED**

Project **ROLLESTON WEST PLAN CHANGE**

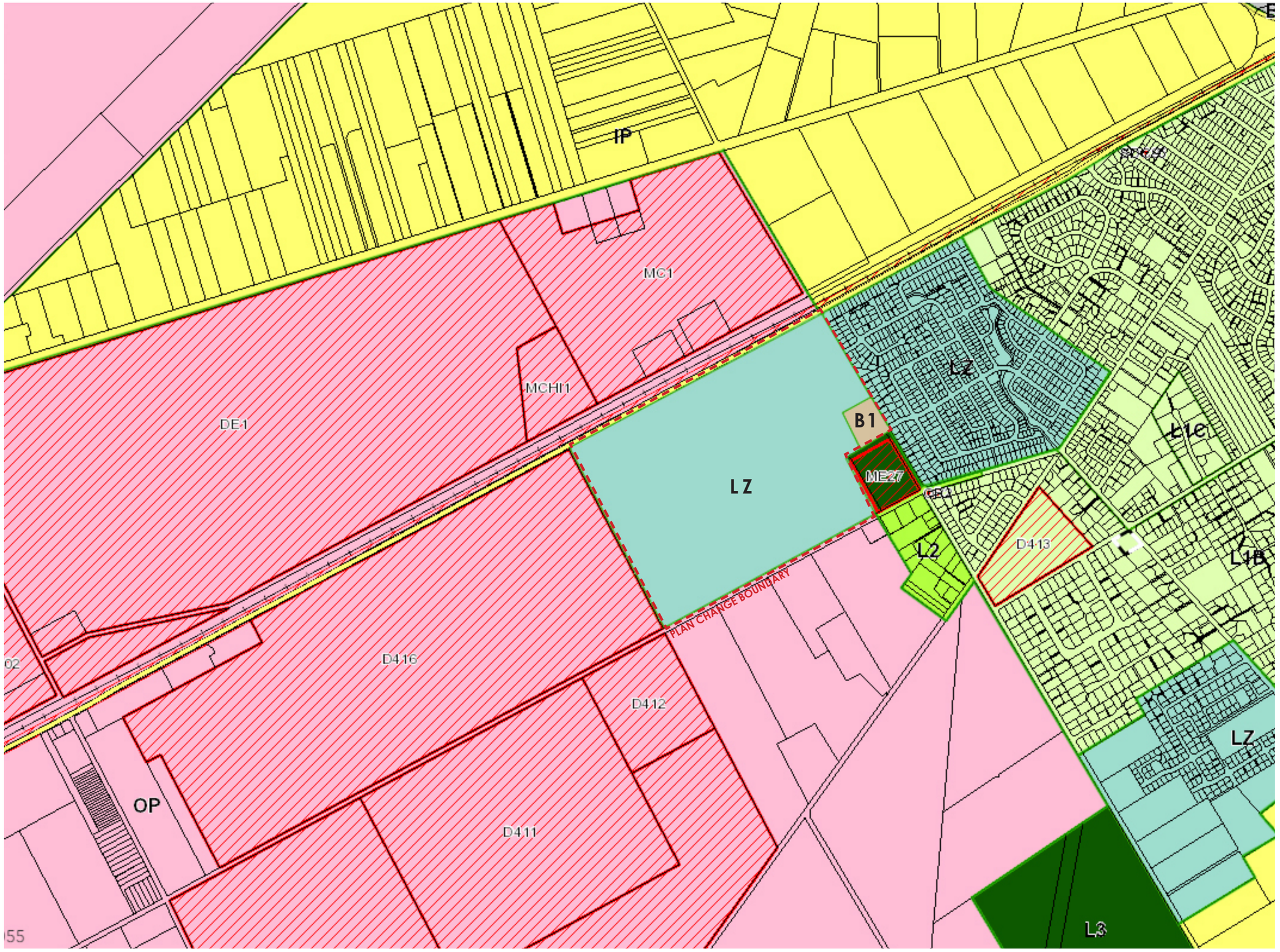
Drawing Title **SKELLERUP BLOCK LIDAR CONTOURS**

Status **FOR INFORMATION**
NOT FOR CONSTRUCTION

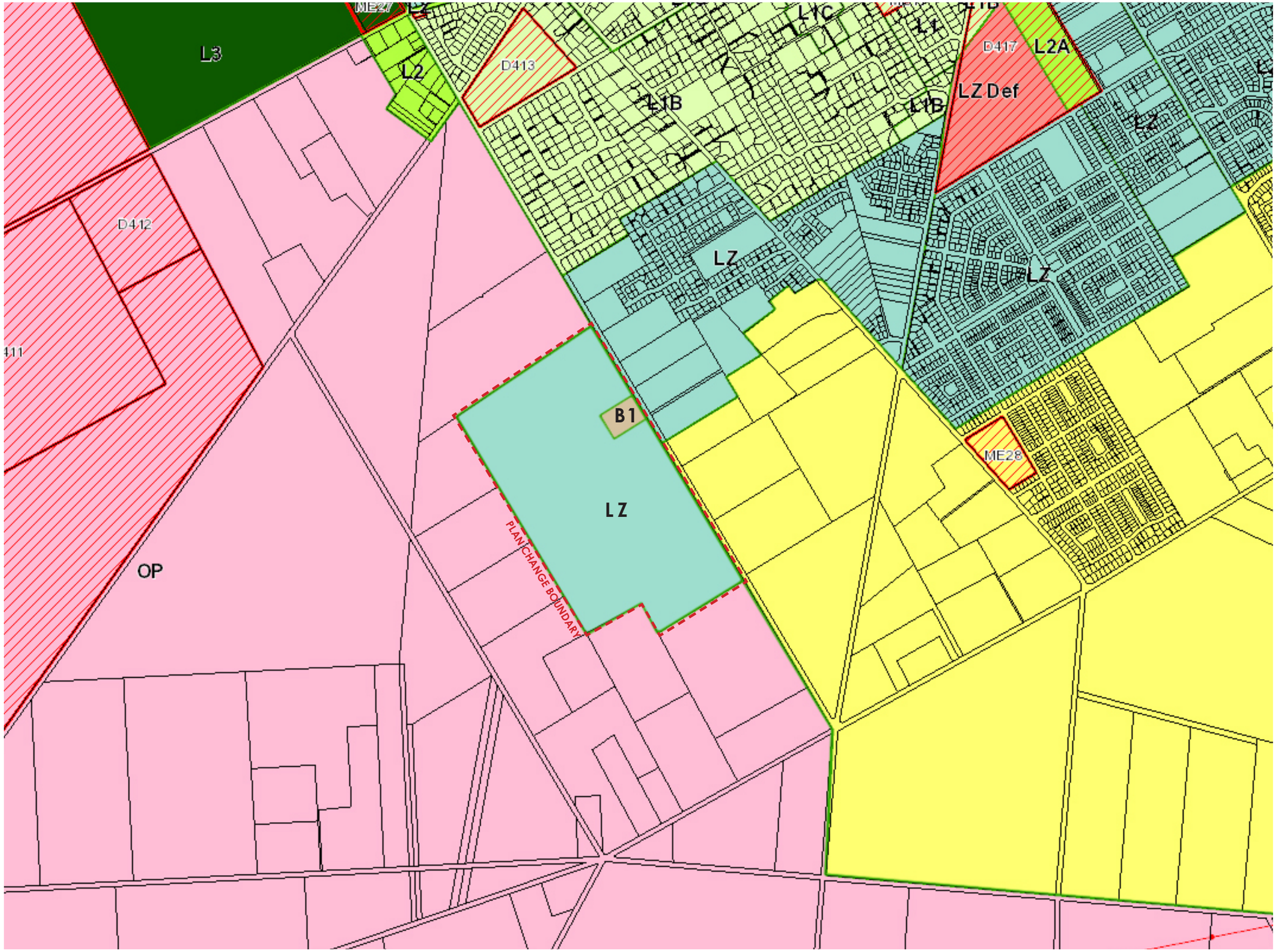
Drawing No. **14720-E-202**
Rev A

FILE: O:\1. Projects\DS14700\14720 - Rolleston West Plan Change\05 Information Management\01 Survey\07 CAD\14720-E-200 Base Plan.dwg PLOTTED: 12/11/2020 11:24:24 am BY: Tim McLeod

# Attachment 3: Proposed Planning Map Changes




*Map / image source: Selwyn District Council*




*Map / image source: Selwyn District Council*

# Attachment 4: Proposed (Amended) Outline Development Plan 39 – Holmes Block, Rolleston

# OUTLINE DEVELOPMENT PLAN 39 (HOLMES BLOCK)

**Introduction**

The Outline Development Plan (ODP) area comprises 87.5 hectares and is situated on the southwest corner of Main South Road (State Highway 1) and Dunns Crossing Road.

The ODP embodies a development framework and utilises design concepts that are in accordance with:

a. The Land Use Recovery Plan (LURP)

b. The Canterbury Regional Policy Statement

c. The Greater Christchurch Urban Development Strategy (UDS)

d. The Ministry for the Environment's Urban Design Protocol

e. The Selwyn District Council's 2009 Subdivision Design Guide

A single Overall ODP is accompanied by three more specific plans that reference the Density (Land Use), Movement Network, Green and Blue Networks.

**Land Use Plan**

The majority of the ODP area will provide for Living Z zoning with corresponding variety in densities, including Low Density (average allotment size of 600m$^2$ and a minimum individual allotment size of 500m$^2$), Medium Density Small-lot (maximum average of 500m$^2$, with minimum of 400m$^2$), and Medium Density Comprehensive (maximum average of 350m$^2$, with no minimum site size). Higher density (15hh/Ha) residential areas are proposed adjacent to key open spaces and green corridors.

A small Business 1 zoned local centre is proposed adjacent to the intersection of Dunns Crossing Road, the proposed Primary Road and West Rolleston Primary School. This will provide for some of the convenience needs of residents in the immediate area.

**Movement Network**

For the purposes of this ODP, it is anticipated that the built standard for a "Primary Route" will be the equivalent to the District Plan standards for a Collector Road, and a "Secondary Route" will be the equivalent to the District Plan standards for a Local-Major or Local-Intermediate Road.

The ODP provides for an integrated transport network incorporating:

a. A primary route that provides an east-to-west route through that part of the ODP area to the west of Dunns Crossing Road. This provides a connection to Burnham School Road, and a potential future connection to land further to the south.

b. Secondary routes are otherwise provided throughout the ODP block and are intended to provided ease of movement access in a north-to-south and east-to-west direction through the block.

c. Shared pedestrian and cycle connections are provided centrally through the ODP area to enhance safe walking and cycling opportunities.

The remaining internal roading layout must provide for long term interconnectivity once full development is achieved. An integrated network of tertiary roads must facilitate the internal distribution of traffic, and if necessary, provide additional property access.

**Green Network**

A recreation reserve and pocket park is provided in addition to green links and reserves that provide open space and facilitate attractive pedestrian connections.

The proposed reserve network provides an opportunity to create an ecological corridor. Plant selection in new reserves will include native tree and shrub plantings.

**Blue Network**

**Stormwater** - Stormwater runoff from individual sites will discharge primary runoff from rooves and hardstand areas directly to ground via on-site soak pits. Runoff from hardstand areas and roads will be collected and treated before discharging into ground via soakpits or infiltration trenches.In general, the first flush stormwater runoff will be generally treated through a swale or infiltration basin or proprietary stormwater treatment devices. Stormwater runoff from large rainfall events which exceed the first flush capacity can be discharged directly to ground using rapid infiltration trenches or soakpits. Flows in excess of the capacity of the primary system can be directed to the roads which will act as secondary flow paths to safely convey stormwater through the developments. The detailed design of stormwater management will be determined by the developer in collaboration with Council at the subdivision stage and in accordance with Environment Canterbury requirements.

**Water** – The water reticulation will be an extension of the existing water reticulation network bordering the site into each of the plan change blocks along proposed spine roads with minor upgrading of the existing network. Additional connections to other parts of the Council network to the northeast will be determined at the subdivision stage to increase network connectivity and resilience.

# OUTLINE DEVELOPMENT PLAN (ODP) - HOLMES BLOCK

LEGEND

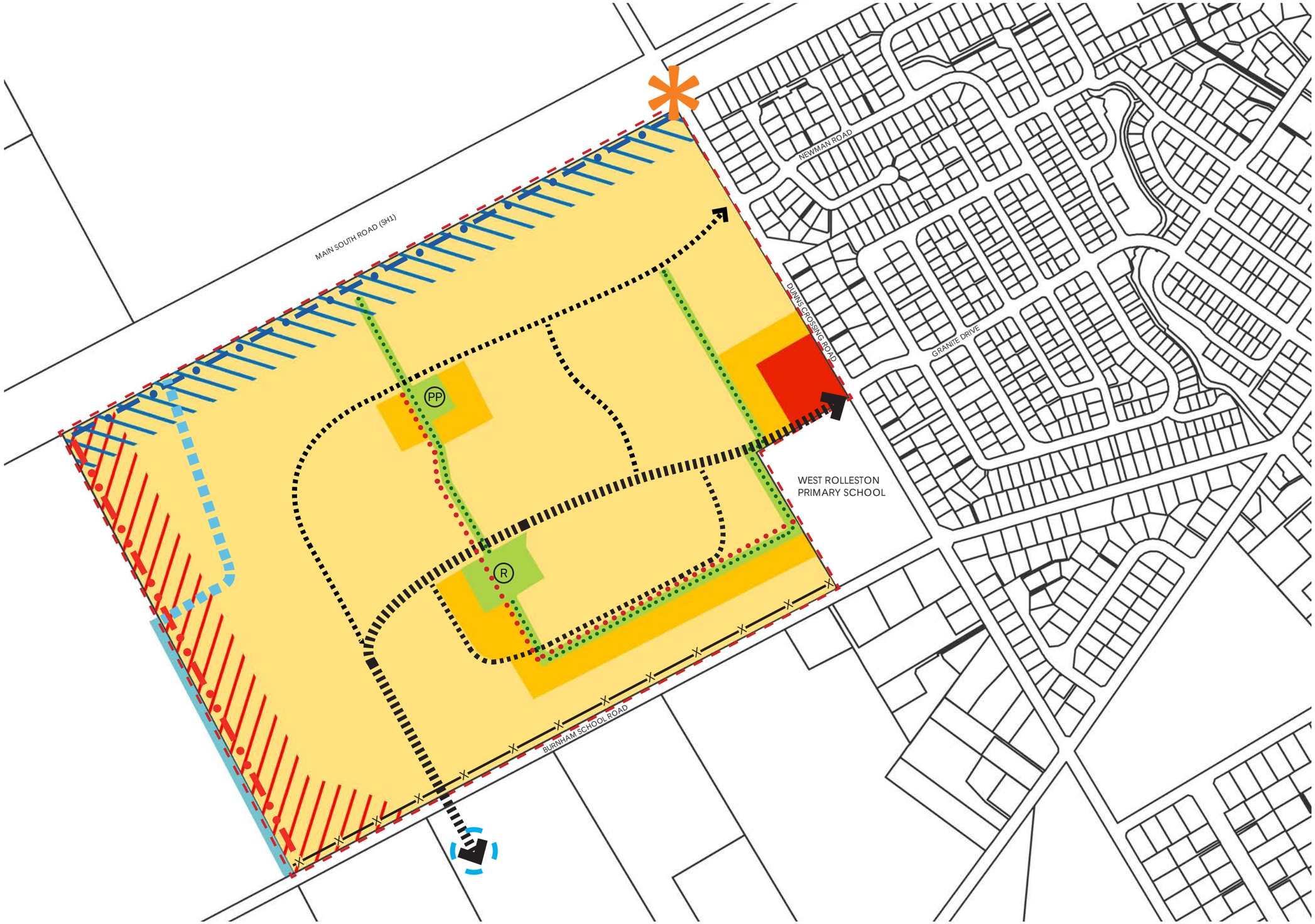
- Plan Change Boundary

**Living Z**

- General Residential Density (Minimum 12 Households/Ha
- Medium Residential Density (Minimum 15 Households/Ha)

**Business**

- Commercial / Business
- Primary Road
- Secondary Road
- 2.5m Shared Path (off road)
- Possible Future Connection
- Potential Intersection Upgrade
- Recreation Reserve
- Pocket Park
- Green Link
- Water Race
- Water Race Realigned
- Avoid access onto Burnham School Road from site
- Odour Constrained Area
- Bunding and Dense Planting
- 40m Noise Abatement Setback
- Acoustic Bund or Fencing



# LANDUSE AND DENSITY - HOLMES BLOCK

LEGEND

- Plan Change Boundary

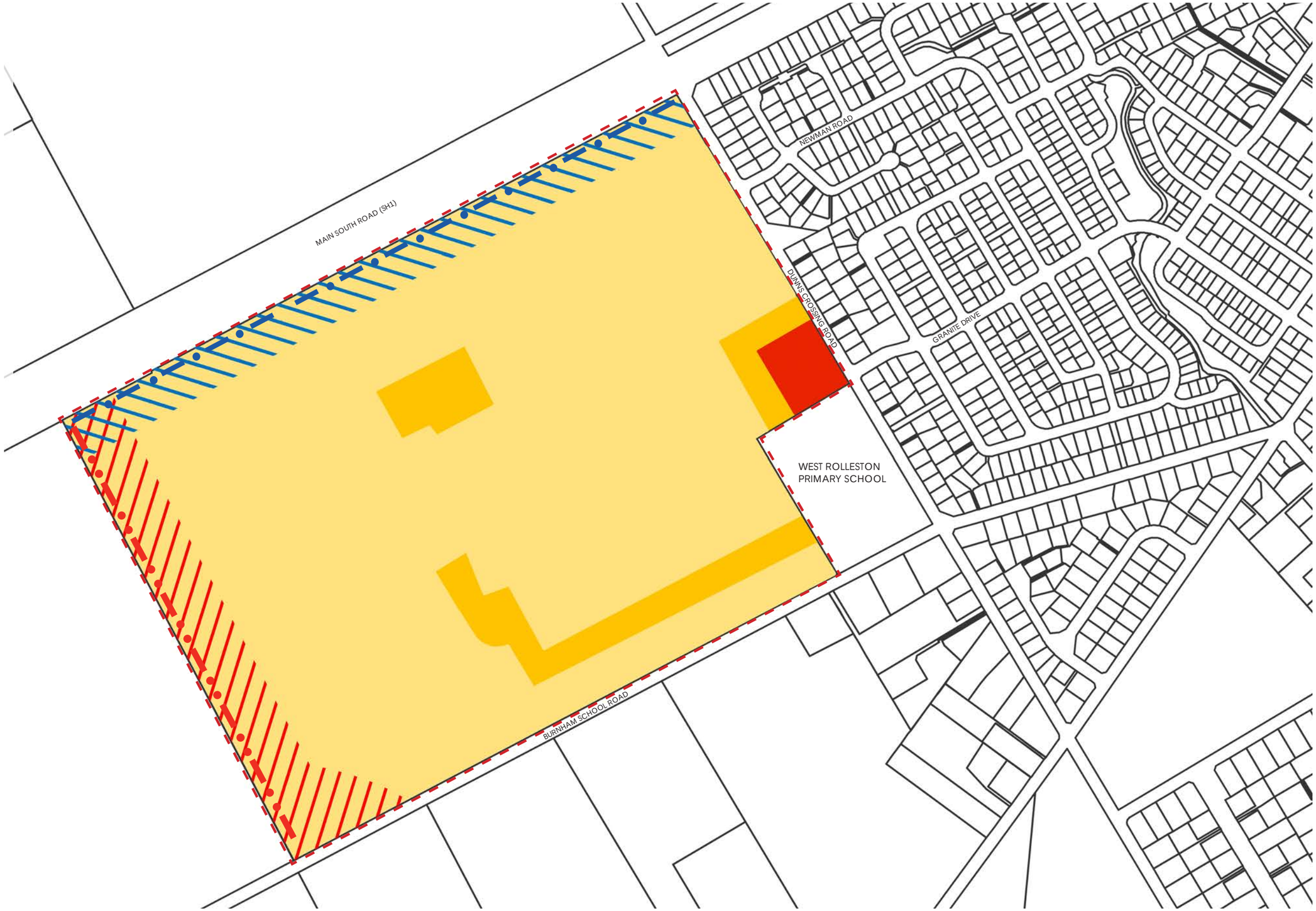
**Living Z**

- General Residential Density (Minimum 12 Households/Ha
- Medium Residential Density (Minimum 15 Households/Ha)

**Business**

- Commercial / Business

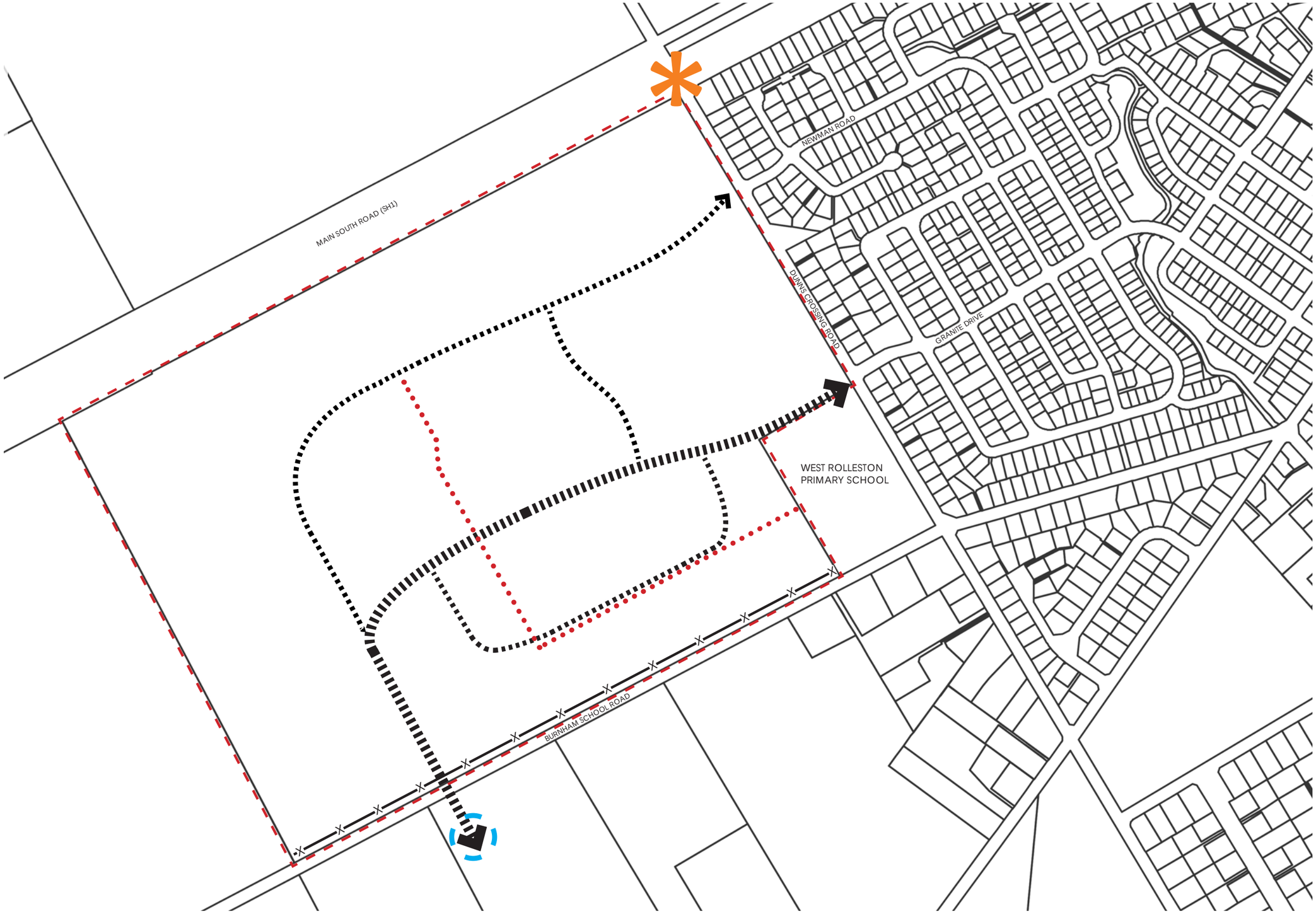
- Odour Constrained Area
- Bunding and Dense Planting
- 40m Noise Abatement Setback
- Acoustic Bund or Fencing



# MOVEMENT AND CONNECTIVITY - HOLMES BLOCK

LEGEND

- Plan Change Boundary
- Primary Road
- Secondary Road
- 2.5m Shared Path (off road)
- Possible Future Connection
- Avoid access onto Burnham School Road from site
- Potential Intersection Upgrade



# BLUE AND GREEN / OPEN SPACE NETWORK - HOLMES BLOCK

LEGEND

- Plan Change Boundary
- Recreation Reserve
- Pocket Park
- Green Link
- Water Race
- Water Race Realigned

# Attachment 5: Proposed (Amended) Outline Development Plan 40– Skellerup Block, Rolleston

# OUTLINE DEVELOPMENT PLAN 40 (SKELLERUP BLOCK)

**Introduction**

The Outline Development Plan (ODP) area comprises 72.7 hectares and is situated on the west side of Dunns Crossing Road, approximately midway between Selwyn Road and Brookside Road.

The ODP embodies a development framework and utilises design concepts that are in accordance with:

a. The Land Use Recovery Plan (LURP)

b. The Canterbury Regional Policy Statement

c. The Greater Christchurch Urban Development Strategy (UDS)

d. The Ministry for the Environment's Urban Design Protocol

e. The Selwyn District Council's 2009 Subdivision Design Guide

A single Overall ODP is accompanied by three more specific plans that reference the Density (Land Use), Movement Network, Green and Blue Networks.

**Land Use Plan**

The majority of the ODP area will provide for Living Z zoning with corresponding variety in densities, including Low Density (average allotment size of 600m$^2$ and a minimum individual allotment size of 500m$^2$), Medium Density Small-lot (maximum average of 500m$^2$, with minimum of 400m$^2$), and Medium Density Comprehensive (maximum average of 350m$^2$, with no minimum site size). Higher density (15hh/Ha) residential areas are proposed adjacent to key open spaces and green corridors.

A small Business 1 zoned local centre is proposed adjacent to the intersection of Dunns Crossing Road and the proposed Primary Road. This will provide for some of the convenience needs of residents in the immediate area.

**Movement Network**

For the purposes of this ODP, it is anticipated that the built standard for a "Primary Route" will be the equivalent to the District Plan standards for a Collector Road, and a "Secondary Route" will be the equivalent to the District Plan standards for a Local-Major or Local-Intermediate Road.

The ODP provides for an integrated transport network incorporating:

a. A primary route that provides east-to-west and north-to-south routes through the ODP area, connecting to Dunns Crossing Road in three locations. A potential future primary road connection and two secondary road connections are provided for land to the west.

b. Secondary routes are otherwise provided throughout the ODP block and are intended to provided ease of movement access in a north-to-south and east-to-west direction through the block.

c. Shared pedestrian and cycle connections are provided centrally through the ODP area to enhance safe walking and cycling opportunities.

The remaining internal roading layout must provide for long term interconnectivity once full development is achieved. An integrated network of tertiary roads must facilitate the internal distribution of traffic, and if necessary, provide additional property access.

**Green Network**

Three recreation reserves are provided in addition to green links and reserves that provide open space and facilitate attractive pedestrian connections.

The proposed reserve network provides an opportunity to create an ecological corridor. Plant selection in new reserves will include native tree and shrub plantings.

**Blue Network**

**Stormwater** - Stormwater runoff from individual sites will discharge primary runoff from rooves and hardstand areas directly to ground via on-site soak pits. Runoff from hardstand areas and roads will be collected and treated before discharging into ground via soakpits or infiltration trenches.In general, the first flush stormwater runoff will be generally treated through a swale or infiltration basin or proprietary stormwater treatment devices. Stormwater runoff from large rainfall events which exceed the first flush capacity can be discharged directly to ground using rapid infiltration trenches or soakpits. Flows in excess of the capacity of the primary system can be directed to the roads which will act as secondary flow paths to safely convey stormwater through the developments. The detailed design of stormwater management will be determined by the developer in collaboration with Council at the subdivision stage and in accordance with Environment Canterbury requirements.

**Water** – The water reticulation will be an extension of the existing water reticulation network bordering the site into each of the plan change blocks along proposed spine roads with minor upgrading of the existing network. Additional connections to other parts of the Council network to the northeast will be determined at the subdivision stage to increase network connectivity and resilience.

# OUTLINE DEVELOPMENT PLAN (ODP) - SKELLERUP BLOCK

LEGEND

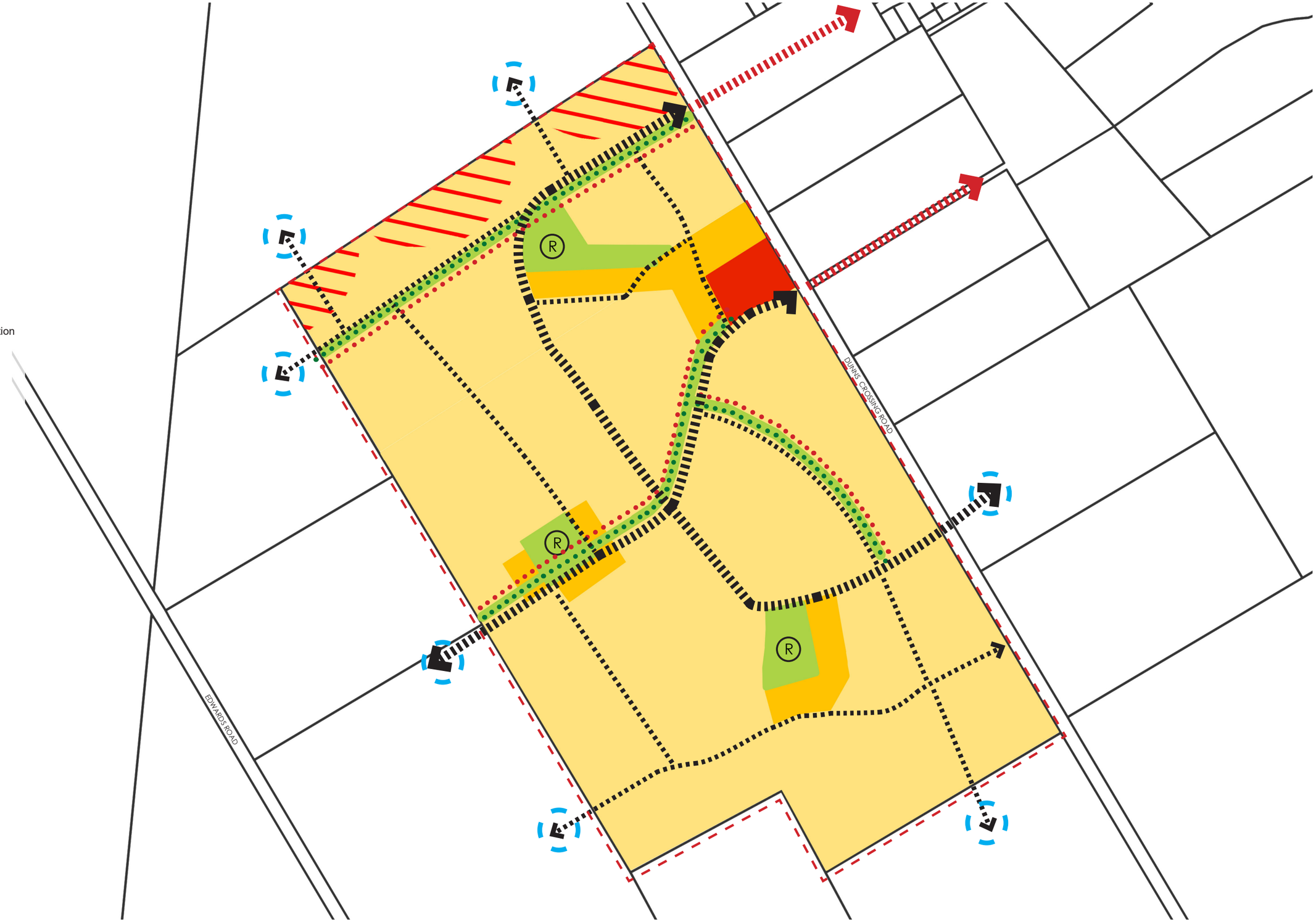
- Plan Change Boundary

**Living Z**

- General Residential Density (Minimum 12 Households/Ha
- Medium Residential Density (Minimum 15 Households/Ha)

**Business**

- Commercial / Business
- Primary Road
- Secondary Road
- Planned Future Road Connection (via other developments)
- 2.5m Shared Path (off road)
- Possible Future Connection
- Recreation Reserve
- Green Link
- Odour Constrained Area



# LANDUSE AND DENSITY - SKELLERUP BLOCK

LEGEND

Plan Change Boundary

**Living Z**

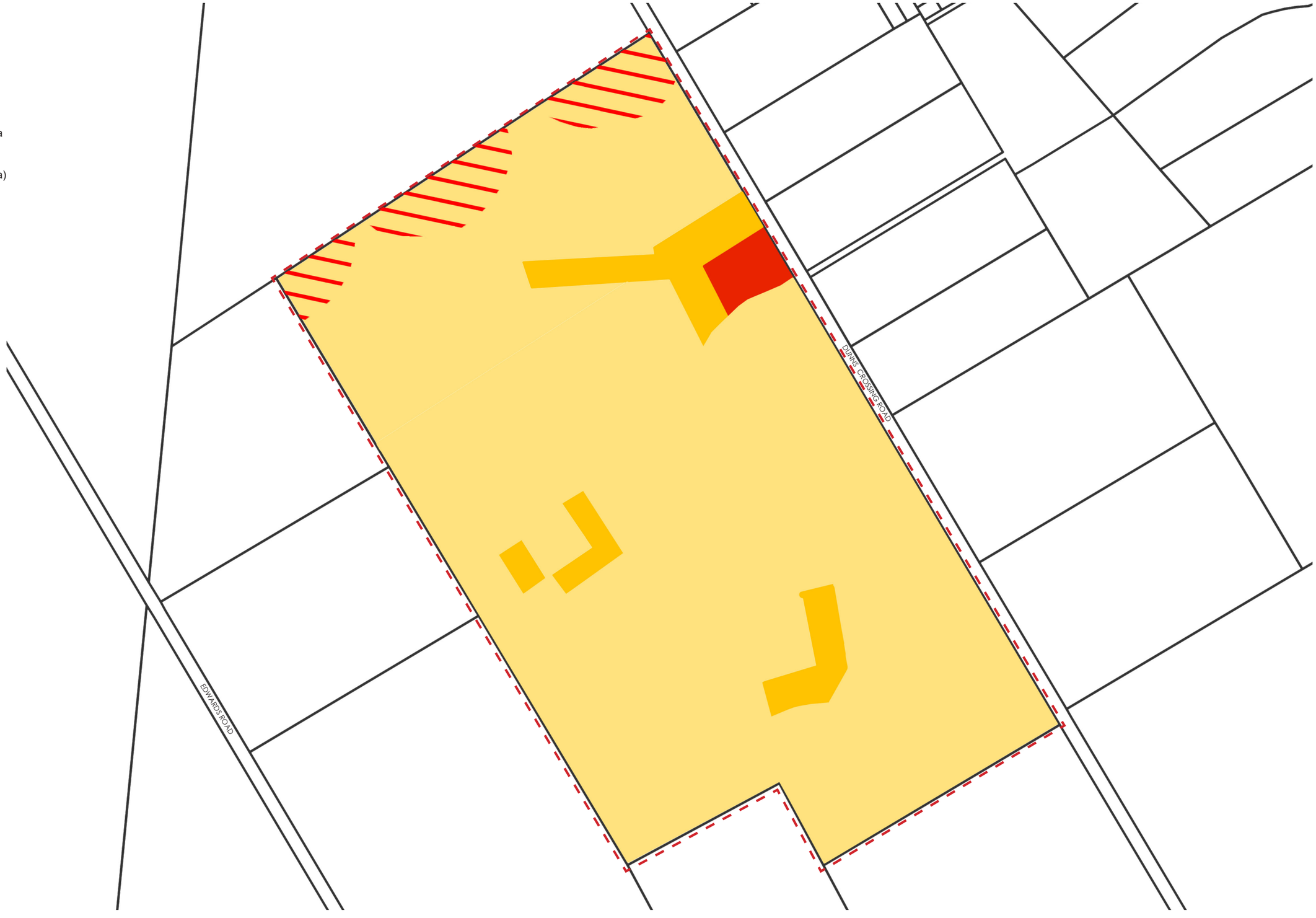
General Residential Density
(Minimum 12 Households/Ha

Medium Residential Density
(Minimum 15 Households/Ha)

**Business**

Commercial / Business

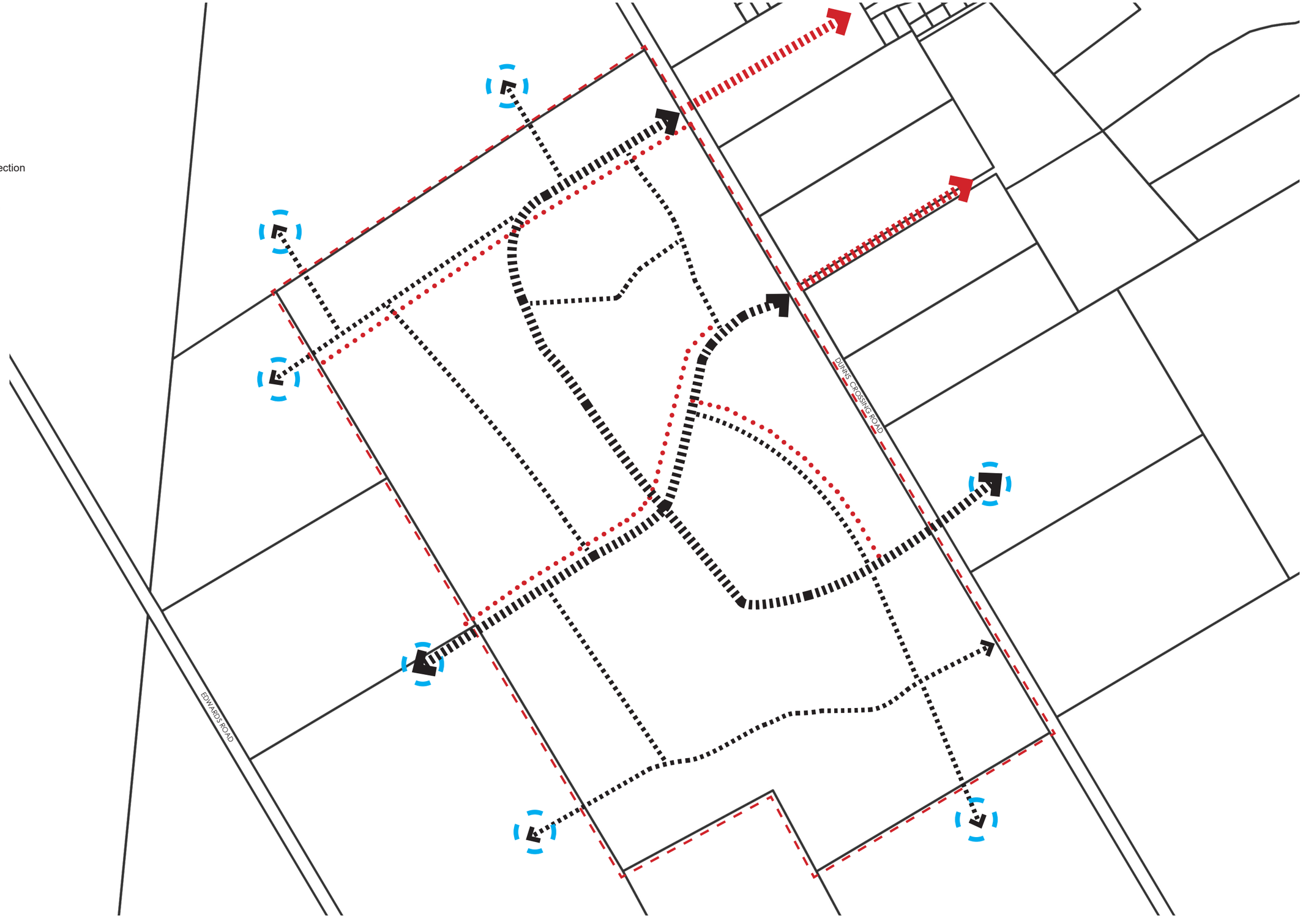
Odour Constrained Area



# MOVEMENT AND CONNECTIVITY - SKELLERUP BLOCK

LEGEND

- Plan Change Boundary
- Primary Road
- Secondary Road
- Planned Future Road Connection (via other developments)
- 2.5m Shared Path (off road)
- Possible Future Connection



# BLUE AND GREEN / OPEN SPACE NETWORK - SKELLERUP BLOCK

LEGEND

- Plan Change Boundary
- Recreation Reserve
- Green Link
- 500m and 800m Walkable Catchment

# Attachment 6: Section 32 Evaluation

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Appendix C Preliminary Site Investigation (PSI) Report
Appendix D Integrated Transport Assessment
Appendix E Landscape and Urban Design Assessment
Appendix F Ecological Assessment
Appendix G Economic Assessment
Appendix H Odour Assessment
Appendix I Acoustic Assessment

# Introduction

1. Rolleston West Residential Limited ('RWRL') requests a change to the Selwyn District Plan to rezone approximately 160 hectares of Living 3 zoned land, to Living Z and Business 1 (Local Centre), at Rolleston.

2. This document forms the Section 32 evaluation of the plan change, consisting of an evaluation of the contents of the Proposed Plan Change, and incorporates material from the following documents:

   - **Appendix A** Infrastructure Assessment
   - **Appendix B** Geotechnical Assessment
   - **Appendix C** Preliminary Site Investigation (PSI) Report
   - **Appendix D** Integrated Transport Assessment
   - **Appendix E** Landscape and Urban Design Assessment
   - **Appendix F** Ecological Assessment
   - **Appendix G** Economic Assessment
   - **Appendix H** Odour Assessment
   - **Appendix I** Acoustic Assessment

3. The subject land is presently zoned Living 3. The Holmes Block immediately adjoins a Living 2 zone to the south and Living Z zone on the eastern side of Dunns Crossing Road. The Skellerup Block also adjoins a Living Z zone on the eastern side of Dunns Crossing Road. The balance of land adjoining the Plan Change site is zoned Rural Outer Plains or Rural Inner Plains.

4. The density of development and Outline Development Plan (ODP) layout proposed via this plan change application is consistent, and compatible with that of the adjoining Living Z zoned land to the east beyond Dunns Crossing Road.

5. This plan change specifically accounts for the National Policy Statement on Urban Development 2020 (NPS-UD) which recognises the national significance of: having well-functioning urban environments; and providing sufficient development capacity to meet the different needs of people and communities.

6. The Ministry for the Environment (MfE) note that the NPS-UD is needed because: *'Some urban areas in New Zealand are growing quickly. To support productive and well-functioning cities, it is important that there are adequate opportunities for land to be developed to meet community business and housing needs'*[1]. MfE further note: *'The NPS-UD 2020 requires councils to plan well for growth and ensure a well-functioning urban*

[1] https://www.mfe.govt.nz/about-national-policy-statement-urban-development

*environment for all people, communities and future generations. This includes…* ***ensuring that plans make room for growth both 'up' and 'out', and that rules are not unnecessarily constraining growth'.***

7. This plan change strongly supports and is consistent with the NPS-UD, as is explained further in the assessment that follows.

## Statutory Requirements of the Act

8. This Plan Change request is made under the Resource Management Act 1991. This section sets out the relevant framework of the Act under which the request is made, with the subsequent sections then providing the relevant assessment of each part of the framework.

9. Section 73(2) of the RMA provides that: '*Any person may request a territorial authority to change a district plan, and the plan may be changed in the manner set out in Part 2 or 5 of Schedule 1'.*

10. Part 5 of Schedule 1 is not relevant to this particular plan change application as it relates to the use of the 'streamlined planning process', which is not proposed in this instance.

11. Part 2 of Schedule 1 relevantly relates to requests for changes to plans of local authorities. Clause 21(1) restates that any person may request a change to a district plan. Clause 22 of Part 2 of Schedule 1 states:

> *(1) A request made under clause 21 shall be made to the appropriate local authority in writing and shall explain the purpose of, and reasons for, the proposed plan or change to a policy statement or plan and contain an evaluation report prepared in accordance with section 32 for the proposed plan or change.*
>
> *(2) Where environmental effects are anticipated, the request shall describe those effects, taking into account clauses 6 and 7 of Schedule 4, in such detail as corresponds with the scale and significance of the actual or potential environmental effects anticipated from the implementation of the change, policy statement, or plan.*

12. The **purpose** of this Plan Change is to provide for an extension of the adjoining existing urban residential area of Rolleston (with provision for some associated local business services) in a manner that adds significantly to development capacity and provides for increased competition and choice in residential land markets whilst managing adverse effects of the change in land use on the surrounding area.

13. Provision for a variety of densities (including medium density and lower density development) within the Plan Change area is considered appropriate to provide choice, help address declining housing affordability, and enable persons and the community to provide for their health and wellbeing, while avoiding, remedying or mitigating potential adverse effects. While the proposal will result in a change to an urban form from the rural-residential form that exists currently, the proposal is considered to be an efficient use of the physical land resource.

14. The **reasons** for the Plan Change are:

    a. The existing zoning and associated plan provisions anticipate rural-residential development of the site, but this has not eventuated. As such, the current land use is not achieving the District Plan's objectives for the land.

b. The rural-residential development anticipated by the current Living 3 zoning of the subject land, is an inefficient use of the land relative to urban-residential use and development.

c. The location of the site is considered appropriate for an expansion of this type of development accounting for: efficiencies gained by the expansion of the existing Rolleston residential area and associated infrastructure; and the site's adjacency to existing urban residential activity and the associated high level of accessibility and connectivity to the surrounding area.

d. As concluded in the economic assessment (Appendix G), the proposed Plan Change:

    i. Will provide for increased competition and choice in residential land markets and help address declining housing affordability. It may also increase levels of economic activity and population in Rolleston and the Selwyn District.

    ii. Will not give rise to economic externality costs.

    iii. Would add significantly to residential development capacity both in the context of the existing scale of Rolleston and the Selwyn District, and for the future forecast growth of both areas.

e. The proposed Plan Change is consistent with the Government's recently released National Policy Statement on Urban Development 2020 and its predecessor, the National Policy Statement on Urban Development Capacity 2016. In particular, it will enable *'people and communities to provide for their … economic (and social) ... well being';* and promote *'the efficient use and development of natural and physical resources'.*

15. The evaluation report undertaken in accordance with section 32 of the RMA is set out in the 'Evaluation of the Proposal' and 'Evaluation of the preferred option for provisions' in Sections 5 and 6 of this report, and an assessment of the environmental effects anticipated by the implementation of the changes is set out later in this report.

16. Consideration needs to be given to whether the Plan Change accords with and will assist the Council in carrying out its functions under section 31 of the RMA to, among other things, achieve integrated management of the effects of the use, development, or protection of land and associated resources. This includes the control of the actual and potential effects of land use or development on the environment in accordance with the provisions of Part 2 while recognising and providing for section 6 matters, having particular regard to section 7 matters and taking into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

17. Sections 74 and 75 of the RMA also set out legal obligations when changing a district plan. As required by these sections, the Plan Change must specifically be in accordance with, give effect to, not be inconsistent with, take into account, or have regard to the specified documents / provisions. Consideration of these documents is set out later this report.

## The Site and Surrounding Environment

18. The subject land is located generally on the west side of the existing Rolleston township, to the west of Dunns Crossing Road, and to the south of Main South Road / State Highway 1.

19. The subject land has an area of approximately 160 hectares and is comprised of two separate blocks: the Holmes Block being an 87.5 hectare property situated on the southwest corner of Dunns Crossing Road and Main South Road; and, the Skellerup Block, being a 72.7 hectare property situated on the west side of Dunns Crossing Road, approximately midway between Selwyn Road and Brookside Road.

20. The Certificates of Title of affected land are included in **Attachment 1** of the Plan Change Application. The site's location is indicated on the aerial photograph in **Figure 1** below, and in the location plan, planning map proposal, and ODPs contained in **Attachments 2 - 5** of the Plan Change Application.

21. The site has frontage and access to/from Dunns Crossing Road to the east. Dunns Crossing Road is an arterial road extending from Selwyn Road to the south to Main South Road (State Highway 1) to the north. The Holmes Block also has access to Burnham School Road, a local road which connects to Dunns Crossing Road.

22. To the east of the site is the existing Rolleston township, including recently constructed and progressively developing residential subdivisions within ODP Areas 1 and 12 in the Selwyn District Plan.

23. To the south and west is Rural Zone land used predominantly for rural activity, rural-residential activity. Notably, the Rolleston Wastewater Treatment Plant and Rolleston Resource Recovery Park are located to the southwest of the Holmes Block, and intensive farming poultry sheds are situated to the north of the Skellerup Block.

24. The site itself features land used for cropping and pastoral grazing. There are no notable clusters of buildings or other improvements on the land.

25. The attributes of the site and locality are further described in the technical reports appended to this assessment, including:

    a. Infrastructure / servicing, and ground and surface water characteristics (**Appendix A**);

    b. Geotechnical and land characteristics (**Appendices B and C**);

    c. Transport (**Appendix D**);

    d. Landscape and urban design attributes (**Appendix E**);

    e. Ecological attributes, including waterbodies (**Appendix F**);

    f. Surrounding odour generating activities (**Appendix H**); and.

    g. Noise characteristics (**Appendix I**).

26. The reader is referred to these appended reports for these further details of the site and surrounds.

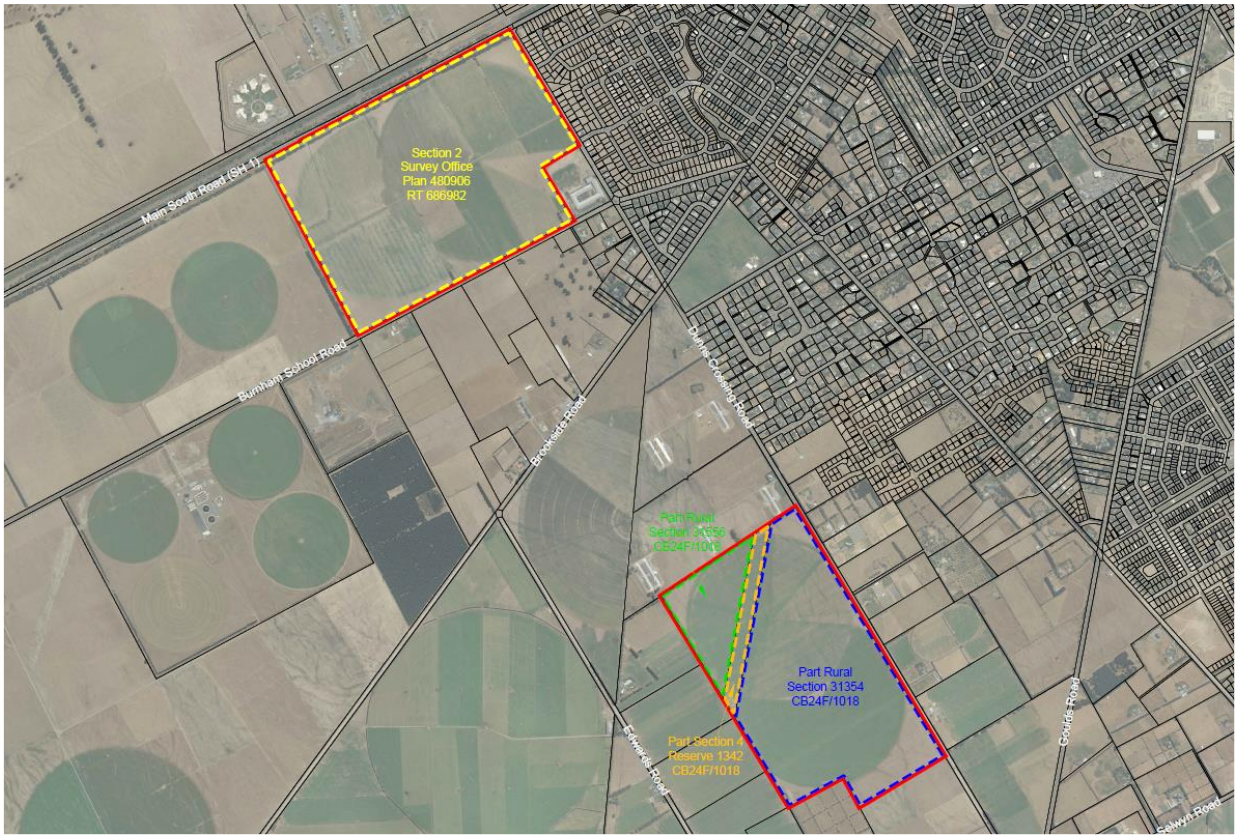


**Figure 1: Aerial photograph indicating subject land (Source: Inovo Projects)**

# The Plan Change

## Description of the Proposal

27. It is proposed to rezone approximately 160 hectares of Living 3 Zone land for primarily residential purposes, with Outline Development Plans (ODPs) guiding the form and layout of future development.

28. The plan change and ODPs adopt two zone types from the District Plan, being: Living Z, and Business 1 (Local Centre). Aside from a change to the planning map, insertion of amended ODPs into the Plan, and amendments to provisions to reflect the change in zoning, no other substantive changes, additions or deletions are proposed to the current content of the District Plan. In particular, no changes to objectives or policies are proposed.

29. The Living Z zone is proposed for the majority of the plan change site and this is a natural extension of the existing residential areas on the opposite (eastern) side of Dunns Crossing Road. This zone will provide for variable lot sizes, including Low Density (average allotment size of 600m$^2$ and a minimum individual allotment size of 500m$^2$), Medium Density Small-lot (maximum average of 500m$^2$, with minimum of 400m$^2$), and Medium Density Comprehensive (maximum average of 350m$^2$, with no minimum site size).

30. A Business 1 zoned local centre is proposed on each block to provide for a small commercial area or neighbourhood shops. Under this zoning, retail activity is limited to a total floor area (in the centre) of 450m$^2$ GFA, and individual tenancies will not exceed 350m$^2$. Accordingly, this small local centre is envisaged to serve the new community with day to day products, with likely tenants being a dairy, takeaways and a café, or similar.

31. The ODP area is designed to achieve an overall minimum net density of 12 households per hectare, noting that the Living Z zoning provides for the provision of higher density (15hh/Ha) residential areas adjacent to key open spaces and green corridors. Based on these densities and the developable areas on the plan change site[2], the proposed Plan Change is envisaged to provide for the establishment of up to 2,100 new households (1150 on the Holmes Block and 950 on the Skellerup Block).

## Outline Development Plan - Layers

32. **Attachments 4 and 5** to the Plan Change entail overall ODPs, plus separate layer diagrams as described below for the Holmes and Skellerup blocks respectively.

33. The ODP embodies a development framework and utilises design concepts that are in accordance with:

    a. The Land Use Recovery Plan (LURP)

    b. The Canterbury Regional Policy Statement

[2] The developable area of the plan change land accounts for the definition of 'net density' in the Canterbury Regional Policy Statement which specifies land that is to be included and excluded for the purposes of determining net density.

c. The Greater Christchurch Urban Development Strategy (UDS)

d. The Ministry for the Environment's Urban Design Protocol

e. The Selwyn District Council's 2009 Subdivision Design Guide

34. A single Overall ODP for each block is accompanied by three more specific plans that reference the Density (Land Use), Movement Network, Green and Blue Networks. These attributes are described in further detail in the covering text for the ODPs (see **Attachments 4 and 5**).

## Urban Design Attributes

35. The urban design attributes of the plan change are described in detail in the urban design assessment by DCM Urban Design and Inovo Projects in **Appendix E.**

36. That assessment relevantly notes that the aim of the plan change is:

> *'to create diversity and variety of housing typology without compromising lifestyle. The provision of smaller residential lot sizes are recognised as an important method to reduce sale prices and meet the demands of a greater proportion of the community, particularly first home buyers seeking a warm, energy efficient home that meets modern lifestyle needs. The density provides for a mix of dwelling types and lot sizes to cater to a wide range of the residential market. It allows for people of different ages and incomes to mix and create a diverse community, as well as for people to move within the development as their needs change'.*

37. The urban design assessment also provides a summary of the key features of the ODP underpinning the plan change, noting this will:

a. Provide a diversity of house size and lot size to provide choice;

b. Locate higher density with higher amenity areas;

c. Create a street hierarchy providing different modal allocation;

d. Continue a well-connected network which combines with the green network and existing facilities connecting to key destinations (school, parks, childcare, town centre);

e. Create a high level of legibility through street hierarchy;

f. Prioritise walking and cycling with a mix of on-road, separate, and off-road facilities to promote active transport modes;

g. Avoid direct access onto Burnham School Road for individual properties;

h. Create streets with a high level of amenity;

i. Provide a quantity of greenspace and facilities appropriate for the future population;

j. Integrate the green and movement networks to create a high level of connectivity, amenity and active travel options; and

k. Encourage the use of low impact design techniques including grass swales and soakage pits.

## Transport Attributes

38. Other than deleting some provisions that were specific to the form of development envisaged by the Living 3 zoning, the proposal does not entail any changes to the transport provisions of the District Plan, which will apply at the time any physical subdivision or development of the land is proposed.

39. The transport assessment in **Appendix D** otherwise describes the relevant transport attributes of the proposal, which are embodied in the ODP and are described in paragraph 37 above.

## Servicing

40. The development will be fully reticulated with sewer, water, stormwater, electricity and telecommunications, as set out in the Infrastructure Report attached in **Appendix A**.

## Proposed Amendments to the District Plan

41. The following amendments to the Selwyn District Plan are proposed:

1. To amend the Selwyn District Plan Planning Maps, by rezoning the site to Living Z and Business 1 (Local Centre) as shown in **Attachment 3**.

2. To amend Township Volume, Appendix 39 Outline Development Plan- Holmes Block, Rolleston by inserting the ODP attached in **Attachment 4**.

3. To amend Township Volume, Appendix 40 Outline Development Plan- Skellerup Block, Rolleston by inserting the ODP attached in **Attachment 5**.

4. To amend or delete those District Plan provisions referring to the subject land as a Living 3 zone, reference it as a Living Z zone, and otherwise ensure that site specific requirements embodied in the ODP's are suitably referenced by relevant rules. The Plan Change request provides details of the specific amendments proposed.

5. Any other consequential amendments, including but not limited to renumbering of clauses.

## Consultation

42. The applicant's consultants have discussed the application with Selwyn Council staff through the development of this proposal, primarily to ensure that the development can be adequately serviced. Council staff have also been consulted in regards the NPS-UD and development capacity at Rolleston.

43. Wider consultation, including consultation with local Rūnanga via Mahaanui Kurataiao Limited (MKT) in particular, has not been undertaken to date, noting the very compressed timeframes for preparing this plan change proposal. However, the applicant has had regard to the outcomes of consultation with Rūnanga and others for other recent residential zoning proposals elsewhere in Selwyn District. Accordingly, consultation with MKT has been commenced, coincidental to the submission of this plan change application.

## Assessment of Environmental Effects of the Proposed Plan Change

44. This assessment is being undertaken in respect of Clause 22(2) of Schedule 1 of the Act that requires the following be undertaken:

> *(2) Where environmental effects are anticipated, the request shall describe those effects, taking into account clauses 6 and 7 of Schedule 4, in such detail as corresponds with the scale and significance of the actual or potential environmental effects anticipated from the implementation of the change, policy statement, or plan. 7.2 Clause 6 outlines the information required in an assessment of environmental effects. In comparison Clause 7 specifies the range of matters that must be addressed by an assessment of environmental effects.*

45. The range of actual or potential environmental effects arising from the plan change request are seen as being limited to the following matters:

a. Infrastructure;

b. Natural Hazards and Contaminated Land;

c. Transport;

d. Landscape and Visual Effects;

e. Amenity Values;

f. Urban Design and Urban Form;

g. Ecological Effects;

h. Reverse Sensitivity;

i. Sites of Significance to Iwi;

j. Economic Effects.

**Infrastructure**

46. The potential impacts of additional residential density on infrastructure, with specific regard to the capacity of existing reticulated sewer and water systems to service the proposed zone and stormwater management, is assessed in the Infrastructure Report attached in **Appendix A**, prepared by Inovo Projects with input from WSP.

47. In summary, the Inovo report concludes:

> *'Primary stormwater runoff from residential allotments will be discharged directly to ground. Soakpits on individual sites will be constructed as part of the building consent process. Drainage and soakpits associated with roads will be constructed as part of any future subdivision and vested in SDC. The development will be designed to ensure that secondary flow will safely drain from the sections via the roading networks.*

*The majority of new sites can be serviced by gravity sewer network discharging to new pump stations to be developed to cater for each block. The Holmes Block pump station, as an option, could discharge into the existing Ø300mm rising main in Burnham School Road. It is anticipated that a new pump station would be developed further south along Dunns Crossing Road to service the Skellerup Block as well as land to the east.*

*This pump station could discharge into the existing Ø630mm rising main in Selwyn Road or via a new rising main directly to The Pines Wastewater Treatment Plant.*

*Water reticulation will be an extension of the existing SDC water reticulation network bordering the site. Extension of the existing main in Dunns Crossing Road to connect to the existing network in Selwyn Road may be required to ensure adequate water supply. Additional connections to other parts of the SDC network to the east will be determined at the subdivision stage to increase network connectivity and resilience.*

*Existing electricity and fibre broadband networks in the neighbouring developments can be extended to service the proposed plan change areas. Electricity and telecommunications will be provided to all sites to utility company and industry standards. All cables within the development sites will be installed underground and kiosks will be constructed on separate individual lots.*

*From an infrastructure perspective, the plan change can be supported by either the extension of existing infrastructure from neighbouring subdivisions or the provision of new water supply and wastewater infrastructure to service the development areas'.*

48. The conclusions in the Infrastructure Report are accepted and adopted, and on that basis it is considered that any adverse effects associated with infrastructure establishment and servicing for the proposal can be adequately avoided or mitigated.

**Natural Hazards and Contaminated Land**

49. The Plan Change site is identified on Selwyn District Council flooding maps as being potentially subject to flood hazard risks. This potential natural hazard risk has been accounted for in the assessment by Inovo Projects in **Appendix A** which states:

*'As is typical of the Canterbury Plains, overland flow generated by continuous heavy rain or thunderstorms that the land cannot absorb becomes concentrated in shallow channels that cross the plains. The flood modelling indicates channels crossing or originating within the subject sites and continuing over the south boundary of both blocks. The predicted floodwater depth is generally less than 0.4m.*

*In general, ground levels for residential lots will be set above internal road levels so the roads act as secondary flow paths to safely convey floodwaters to the downslope side of the site.*

*Construction of a potential noise bund along the SH1 boundary to the Holmes Block will partially cut-off overland flow from up-slope. Flow cut off by the potential noise bund would be directed along roadside drains*

*A flood risk assessment will be carried out at subdivision consent application stage as required by Section 106 of the Resource Management Act. Overland flow from upstream catchments will be considered to ensure that any potential adverse stormwater effects can be appropriately mitigated and minimum floor level rules set at the time of subdivision and / or residential development'.*

50. Based on this assessment, flood hazard effects associated with the proposal can be adequately avoided or mitigated.

51. Aside from flooding, the Plan Change site is not subject to any other notable natural hazards. A geotechnical assessment of the land by Coffey is provided in **Appendix B** and concludes:

*'We consider that the site is suitable for development subject to further investigation and design at the subdivision consent stage. Based on the mapped geology and on-site testing carried out to date, the site is considered TC1-like.*

*Additional geotechnical investigation will be required to refine the ground model and address any geotechnical risks for the proposed Lots once a subdivision plan has been further developed'.*

52. A Preliminary Site Investigations has also been undertaken by Coffey. Whilst this identifies the presence of HAIL activities on the site, it ultimately concludes that:

*'Due to the likely presence of HAIL activities on the site, the NESCS regulations are considered to apply to the site. Subdividing or changing land use is a permitted activity under section 8(4)(b) of the NESCS if the report on the site states that it is highly unlikely that there will be a risk to human health if the activity is done to the piece of land.*

*The potential of contamination to soil associated with the identified potential sources of contamination are considered low (refer to Table 2 above), depending on the activity identified. It is considered unlikely that there will be a risk to human health with the proposed plan change and subdivision providing that the potential contaminant source areas listed in Table 2 are assessed.*

*The site is considered to be suitable for plan change and subdivision, with any consent granted for the site, conditional on a detailed site investigation (DSI) being carried out prior to any earthworks and or building consents being granted'.*

53. Based on the assessment of flood hazard risk by Inovo Projects (**Appendix A**), the geotechnical assessment by Coffey (**Appendix B**), the absence of any other notable natural hazard risks, and the PSI by Coffey (**Appendix C**), it is considered that any potential adverse effects associated with natural hazards and/or contaminated land can be adequately avoided or mitigated.

**Transport**

54. Transport effects on the safety and efficiency of the road network may arise from the proposed rezoning. An Integrated Transport Assessment has been prepared for the proposal by Novo Group, attached in **Appendix D**.

55. That assessment considers the proposed transport connections provided by the proposed Outline Development Plan, and transportation related impacts of the increase in the number of allotments that can be developed with the proposed Plan Change.

56. With respect to accessibility the assessment states:

> *'There is no public transport in the immediate vicinity of the Plan Change sites at present. The closest bus service is the Yellow Line, which undertakes a loop on Brookside Road, a short segment of Dunns Crossing Road and then Lowes Road to head back to Rolleston Town Centre. The Plan Change sites do include road networks that would enable bus services to route through the sites on the Primary Road network, so these could accommodate passenger transport in the future.*
>
> *The proposed site will include pedestrian and cycle links within the Plan Change area, as well as providing small local commercial areas that are intended to provide for everyday shopping and further reduce the need to travel by car for local trips. It is also noted that the Holmes Block has a boundary with the West Rolleston Primary School and there is a pre-school at the Burnham School Road / Dunns Crossing Road intersection. These place education facilities within walking distance of this site.*
>
> *These Plan Change sites are within approximately 4.5km of Rolleston Town Centre, which means residents will be able to comfortably cycle to / from the shopping and employment in that area.*
>
> *The above is considered to be sufficient to confirm that the site has access to a range of everyday facilities without the need to drive'.*

57. Accounting for the above, the proposal will support a well-functioning urban environment and the aspiration in policy 1 of the NPS-UD that urban environments will:

    c. *'have good accessibility for all people between housing, jobs, community services, natural spaces, and open spaces, including by way of public or active transport';*

    e. *'support reductions in greenhouse gas emissions'; and*

    f. *'are resilient to the likely current and future effects of climate change'*[3]*.*

58. In respect of road network safety and efficiency, the ITA concludes:

[3] Resilience to climate change is achieved through increased network redundancy (e.g. alternative routes and mode choice) and intensifying land use in a location away from locations exposed to climate change induced hazards (e.g. coastal / low lying areas). See: https://motu.nz/assets/Documents/our-work/environment/climate-change-impacts/Transport-Dialogue-Report.pdf

*'The SH1 / Dunns Crossing Road / Walkers Road is assumed to be upgraded to a roundabout within the next three to four years, as has been advised by the NZTA and Council. This intersection is predicted to operate satisfactorily with the inclusion of Plan Change traffic.*

*It is understood that the Council intend to install traffic signals at the Dunns Crossing Road / Burnham School Road intersection. A concept arrangement has been tested and this layout can accommodate the traffic associated with the proposed Plan Change.*

*The Dunns Crossing Road / Lowes Road intersection is predicted to operate over the practical capacity threshold with the Plan Change traffic added to the network. A concept traffic signal scheme has been tested at this location and was found to operate satisfactorily.*

*The traffic capacity of other intersections in the immediate vicinity of the Plan Change sites have been assessed and found to be acceptable.*

*The traffic capacity of the site accesses has been assessed and found to be acceptable. There will also be sufficient sight distance for these intersections to operate safely.*

*Conclusion*

*Overall, it is considered that the transport effects of the proposed Plan Change will be acceptable on the surrounding transport network based on the committed and/or planned off-site improvements outlined in this report'.*

59. The findings of the Integrated Transport Assessment are accepted and adopted, and on that basis it is considered that the potential adverse traffic effects of the proposal can be adequately avoided or mitigated and positive transportation outcomes will be achieved in respect of accessibility, reduced greenhouse gas emissions and resilience to climate change.

**Landscape / Visual Effects and Amenity Values**

60. The Resource Management Act defines amenity values as '…*those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes'*.

61. The current character and amenity of the site and surrounds can be characterised as rural within the Plan Change site itself, albeit the current Living 3 zoning of the land contemplates a modified rural-residential character and amenity. The site is not identified as an outstanding landscape in any statutory planning document, nor is it considered to contain any features or landforms of significant landscape value (in respect of Section 6(b) of the Resource Management Act).

62. A Landscape and Visual Effects assessment of the proposed Plan Change has been undertaken by DCM Urban Ltd, and is attached in **Appendix E**. That assessment considered the existing landscape character of the environment, and the potential

visual/visual amenity impacts of the proposed rezoning. The visual assessment was undertaken from multiple reference points around the site.

63. The visual assessment provides the following summary in respect of effects on visual amenity:

> *'The proposal would result in an overall change in character from open and rural to one that is more dense and suburban in nature but is anticipated to a degree with the current Living 3 zoning. The receiving environment is to maintain aspects of openness through the restoration and retention of green corridors and providing connectivity and accessibility throughout the wider site. Management of fencing and bulk and location of the development will also help create a sense of openness throughout the site. The highest likely effects after mitigation will be experienced by those residential properties closest to the proposal, along Dunns Crossing Road. Though there is a change from rural to suburban, from this location the magnitude of change is considered low as the proposal is an extension of the existing development present on the other side of Dunns Crossing Road. Motorists have a temporary view of the development and are anticipated to expect change in land from rural to suburban as they travel to/from Rolleston township.*
>
> *Overall, the scale and bulk and location of the proposal would allow it to appear as a natural extension of existing development within Rolleston, with an anticipated low magnitude of change'.*

64. The assessment then refers to mitigation measures that are incorporated within the plan change (primarily through the ODP and the adoption / location of different zones) to either avoid, remedy or mitigate any potential effects on landscape character, landscape values and/or visual amenity. In summary, the visual assessment concludes:

> *'In terms of the National Policy Statement: Urban Development, Policy 8, the proposed Plan Change will add significant residential capacity with a proposed density ranging between 12 and 15 hh/Ha. This is higher than the recommended density in the Township objectives and policies for the Living Z zone, but is considered appropriate to meet the outcomes desired by the NPS:UD (2020). Any amenity effects on existing and future residents can be successfully mitigated through the proposed mitigation measures.*
>
> *In terms of landscape character and values of the area, subject to the mitigation measures proposed, the proposal will result in an acceptable magnitude of change on the existing rural landscape character and values. The existing character of the Plan Change areas are already highly modified with no natural features of note. The partially open character of the site will change to a character which is more compartmentalised into smaller units, but which can be partially mitigated through fencing controls and landscape planting to retain a high level of amenity. This change to the open character is already anticipated in the current Living 3 zoning.*
>
> *In terms of visual amenity, the adjacent rural properties will experience a change in the openness of views across the space. Adjoining suburban residential*

*properties, current and future, overlooking the Plan Change areas will have a mix of open, partial, and screened views of future development. Changes to experience by these residents are considered Low given the character of existing views and existing boundary treatment'.*

65. The findings of that assessment are accepted and adopted, and on that basis it is considered that the potential adverse visual and landscape effects of the proposal can be adequately avoided or mitigated.

66. Effects on broader amenity values are similarly considered to be less than minor, with the character and amenity values of what is currently zoned for rural-residential activity becoming urban-residential in nature, consistent with the wider Rolleston township.

**Urban Design & Urban Form**

67. A consideration of the National Policy Statement – Urban Development (addressed below) is whether the Plan Change will provide for a well-functioning urban environment. This includes consideration of the urban form and in particular whether the direction of growth provided for by this Plan Change application will create an appropriate urban form and density for the Rolleston township.

68. The urban design assessment by DCM Urban Design in **Appendix E** addresses this and paragraph 37 above has outlined the key urban design and urban form outcomes that the proposed ODP will achieve.

69. The urban design assessment otherwise notes that the design principles that underpin the ODP are in line with the Ministry for the Environment's design guide for urban New Zealand "People Places Spaces", as follows:

    a. **Consolidation and dispersal** – This principle is achieved through the density and land use elements of the ODP which promote higher-intensity development around existing or new nodes and lower density on the periphery. This allows local communities, businesses and public transport to be strengthened and resource efficiencies achieved, while reducing environmental impacts on peripheral areas.

    b. **Integration and connectivity** – This principle is achieved through the movement network on the ODP, noting this promotes development that is integrated and connected with its surrounding environment and community. This facilitates ease of access, economy of movement and improved social interaction.

    c. **Diversity and adaptability** – This principle is achieved through the variation in typology and lot size which promotes and diversity and provides scope to respond efficiently to social, technical and economic changes.

    d. **Legibility and identity** – This principle is achieved through the green and blue network layers of the ODP, which promote environments that are easily understood by their users, and display a strong local identity and appropriate visual character. This facilitates an enhanced usage, enjoyment and pride in local places.

e. **Environmental responsiveness** – This principle is achieved through the green and blue layers of the ODP which are responsive to natural features, ecosystems, water quality, reduced energy usage and waste production.

70. In terms of the criteria in Policy 1 of the NPS-UD for 'well-functioning urban environments', and accounting for the assessment by DCM Urban Design, the proposed Plan Change will:

a. Enable:

i. a variety of homes, through the Living Z zoning that provides for diversity in the type, price, and location, of different households (and better provides for such variety relative to the Living 3 rural-residential housing currently provided for on the subject land);

ii. Māori to express their cultural traditions and norms, to the extent this is relevant for the site.

b. Have suitable provision for business on each block, through a small local centre that will service local needs and supplement the services otherwise found in the Rolleston town centre and in other local centres within the township.

c. Provide good accessibility for all people between housing, jobs, community services, natural spaces, and open spaces, including by way of public or active transport. This will be achieved through the provision of good connectivity within the development, linkages to surrounding residential zones and the Rolleston township generally, and good accessibility to the strategic road network that connects to Greater Christchurch.

d. Support the competitive operation of land and development markets, accounting for the increased choice and diversity in housing that the proposal will deliver and the economic assessment in **Appendix G**.

e. Support reductions in greenhouse gas emissions, through a movement network that promotes walkability and connectivity in order to reduce car dependency for short local trips and readily provides for servicing by existing public transport.

f. Be resilient to the likely current and future effects of climate change accounting for its distance from coastal and low lying areas susceptible to sea-level rise and storm surges, the flooding assessment in **Appendix A** which accounts for the land's resilience to heavy rainfall events/frequency, and the potential for building and landscape design to address increased mean temperatures or amplification of heat extremes.

71. Accounting for the assessment above, the proposed plan change is considered to provide an appropriate standard of urban design and urban form and deliver a well-functioning urban environment as sought by the NPS-UD.

**Ecological Effects**

72. A desktop assessment of the existing ecological values of the subject land and the potential ecological effects associated with the development likely to result from the proposed plan change has been undertaken by Aquatic Ecology Ltd, and is attached in **Appendix F**.

73. The conclusion from that assessment is:

> *'The only aquatic habitat with potentially some ecological value is the raceway which passes through the western corner of the Holmes Block. Due to the screening of the inflow at the Waimakariri River intake, and the distance from the sea, fish diversity and abundance is expected to be low. Invertebrate biodiversity is already likely to be compromised for multiple reasons associated with the existing raceway management.*
>
> *It is likely that there is a number of common fish species in the raceway reach through the Holmes Block, but these are likely to have little or no conservation value.*
>
> *Overall, from a plan change/rezoning perspective, if the development adheres to the 10m waterbody setback rules the likelihood of negative ecological impacts are low'.*

74. Accounting for this assessment, the potential adverse ecological effects of the proposal can be adequately avoided or mitigated.

**Reverse Sensitivity**

75. As noted above, the Rolleston Wastewater Treatment Plan and Rolleston Resource Recovery Park are located to the southwest of the Holmes Block, and intensive farming poultry sheds are situated to the north of the Skellerup Block. Accounting for these activities and their relationship to the proposal, an assessment of potential odour effects and reverse sensitivity has been prepared by Golder Associates (**Appendix H)**.

76. The Golder assessment recommends the adoption of buffer distances as a clear and effective method for avoiding reverse sensitivity due to odour. These buffers are set out in Table 1 and Figures 1 and 2 of the Golder assessment and have been incorporated into the ODPs. Existing rules in the District Plan (that reference ODPs) provide a mechanism for enforcing these buffers.

77. To the extent that the Golder assessment notes that the proposed buffers/setbacks may be able to be reduced following a further, detailed assessment, that option would be available if required through a resource consent process.

78. Based on their assessment and recommended mitigation measures / buffers Golder conclude:

> *'that rezoning from rural-residential to residential would not result in reverse sensitivity to odour effects'.*

79. In addition to the potential reverse sensitivity effects described above, it is also relevant to consider the potential for reverse sensitivity associated with road traffic noise along State Highway 1. In general terms, the proposal adopts the same methods of avoiding or mitigating these effects as other residential land further east which adjoins the State Highway. For example, a 40m setback/buffer for dwellings is provided for on the ODP for the Holmes Block and this ODP also notes the requirement for an acoustic bund and fence along this boundary. The acoustic assessment in **Appendix I** endorses this approach and accordingly any effects in this respect will be appropriately avoided or mitigated.

80. There are no other incompatible or potentially incompatible activities in the vicinity of the Plan Change site and accordingly, the potential adverse reverse sensitivity effects from the Plan Change proposal are considered to be negligible.

**Sites of Significance to Iwi**

81. Based on feedback from Rūnanga on other similar rezoning proposals, it is anticipated that the proposed on-site land-based stormwater management proposed and adoption of Accidental Discovery Protocol at the time of site development will assist in mitigating against the potential adverse effects of land use, development and earthworks on cultural values generally. Further, the provision of locally sourced indigenous vegetation within the plan change site as it develops is a matter that will be addressed at the time of subdivision and development and support cultural values associated with the site. It is expected that any subdivision consent for development of the zone can and will incorporate conditions of consent addressing these requirements.

82. Whilst the site contains no natural surface waterbodies or springs or identified/listed Wāhi Tapu, Tāonga or other sites of significance to Iwi, consultation with MKT will be progressed in respect of the plan change.

**Loss of Agricultural Production**

83. The proposed plan change will result in land that is currently zoned Living 3 (for rural residential development and use) converting to an urban residential zoning and land use. Under the land use capability classifications, the land includes class 5 soils (see **Figure 2**).

84. Against this context, the proposal will not result in any loss of versatile soil. In terms of costs associated with lost agricultural production, the economic assessment (**Appendix G**) notes that this will not result in economic costs borne by the wider community and ultimately there is a transfer of economic activity rather than a net loss in productive use.

85. Whilst the Plan Change proposal will result in the loss of some existing agricultural production, accounting for the current Living 3 zoning of the land any corresponding effects will not be significant or unacceptable.

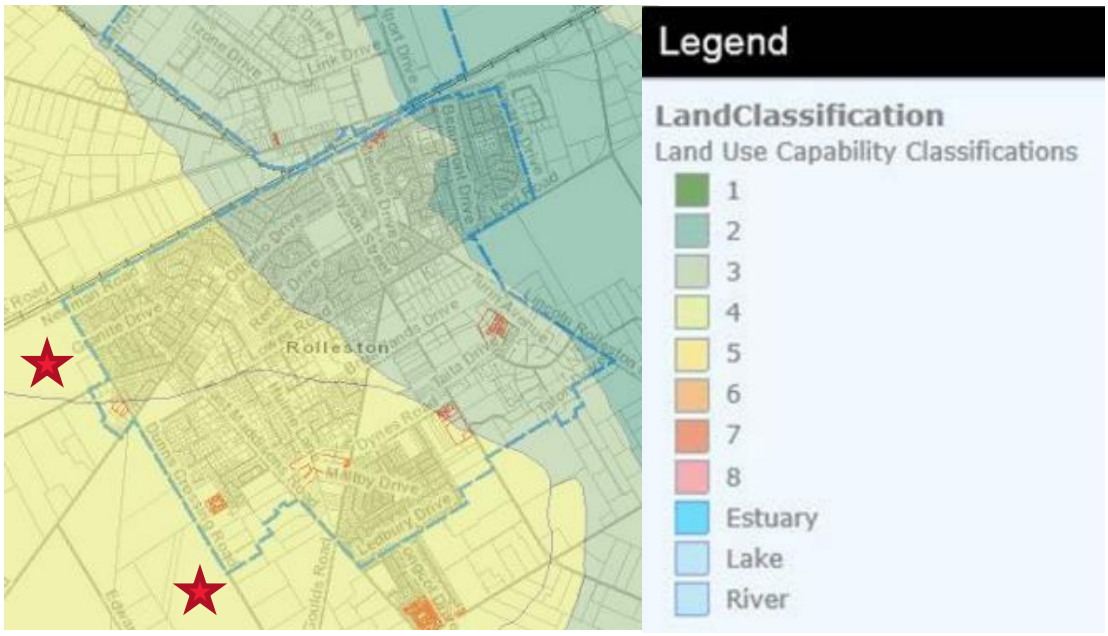


**Figure 2: Versatile Soils Map (Source: Selwyn District Council)**

**Retail Effects**

86. As noted above, the retail centre and Business 1 zoning proposed for each block is of a small scale and is intended only to meet the convenience needs of the local residents. In particular, under the applicable District Plan rules for the zone, retail activity will be limited in the centre to a total floor area of 450m$^2$, and individual tenancies will not exceed 350m$^2$.

87. Accounting for these attributes, the proposed Business 1 zone will not undermine the viability, vibrancy and amenity values of existing centres (large or small) within Rolleston or elsewhere within the Selwyn District.

88. Moreover, to the extent that the Plan Change increases the extent of residential development in Rolleston and the District, the proposed Plan Change will increase the viability, vibrancy and amenity values of larger centres in Rolleston and the District.

89. The conclusions above are endorsed by the economic assessment in **Appendix G**.

**Economic Effects**

90. Beyond the potential economic costs and effects discussed above, the economic assessment in **Appendix G** has addressed other potential economic benefits and costs associated with the plan change proposal. This includes:

    a. Additional employment, income and expenditure generated by the proposal, including increased economies of scale, increased competition, reduced unemployment and underemployment, and increased quality of central government provided services.

    b. Increased competition and choice in residential housing markets, in a manner that is strongly and directly consistent with the NPS-UD.

c. Utility costs, which will not arise in a manner that requires cross-subsidisation by other ratepayers, residents or businesses within the Selwyn District.

d. Transport costs, which may arise relative to residential development in closer proximity to centres of employment, commercial activity, etc. However, such transport costs are internalised to future residents, or externalised in respect of potential road accidents, congestion, greenhouse gas emissions, etc. which are likely to be similar to alternative residential development sites within the Selwyn District.

91. Accounting for the economic assessment in **Appendix G**, the economic effects of the proposed Plan Change are considered to be acceptable.

**Summary of Effects**

92. In summary and for the reasons set out above, it is concluded that the potential adverse effects of the proposed plan change can be adequately avoided or mitigated.

## Statutory Requirements of Section 32 of the Act

93. Before a proposed plan change is publicly notified an evaluation must be carried out by the person making the request. The evaluation, carried out under Section 32 of the Resource Management Act, must examine:

> *(a) the extent to which the objectives of the proposal being evaluated are the most appropriate way to achieve the purpose of the Act; and*
>
> *(b) whether, the provisions in the proposal are the most appropriate way to achieve the objectives by:*
>
> > *(i) identifying other reasonably practicable options for achieving the objectives; and*
> >
> > *(ii) assessing the efficiency and effectiveness of the provisions in achieving the objectives; and*
> >
> > *(iii) summarising the reasons for deciding on the provisions; and*
>
> *(c) contain a level of detail that corresponds to the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposal.*

94. In assessing the efficiency and effectiveness of the provisions, the evaluation must also:

- Identify and assess the benefits and costs of effects, including opportunities for economic growth and employment;
- If practicable, quantify these benefits and costs;
- Assess the risk of acting or not acting if there is uncertain or insufficient information about the subject matter of the provisions.

95. Section 32(6) clarifies that where no actual objectives are stated in the proposal, the objective is the purpose of the proposal.

96. A Ministry for the Environment guide to Section 32[4] notes that Section 32 case law has interpreted 'most appropriate' to mean "suitable, but not necessarily superior". "Effectiveness" is noted in the guide as assessing the contribution new provisions make towards achieving the objective, and how successful they are likely to be in solving the problem they were designed to address. "Efficiency" is noted as measuring whether the provisions will be likely to achieve the objectives at the lowest total cost to all members of society, or achieves the highest net benefit to all of society. The assessment of efficiency under the RMA involves the inclusion of a broad range of costs and benefits, many intangible and non-monetary.

[4] MfE, A Guide to Section 32 of the Resource Management Act 1991 (2017), Wellington.

## Objectives and Policies of the Selwyn District Plan

97. Section 32(1)(a) requires examination of the extent to which the objectives of the proposal are the most appropriate way to achieve the purpose of the Act.

98. The proposal does not involve any new, or the alteration of any existing, objectives of the Selwyn District Plan. The existing objectives are assumed to be the most appropriate for achieving the purpose of the Resource Management Act, having previously been assessed as such.

99. In regard to the more general objective of the proposal, being the purpose of the proposal, the objective is to provide for an extension of the adjoining existing urban residential area of Rolleston (with provision for some associated local business services) in a manner that adds significantly to development capacity and provides for increased competition and choice in residential land markets.

100. Provision for a variety of densities (including medium density and lower density development) within the Plan Change area is considered appropriate to provide choice, help address declining housing affordability, and enable persons and the community to provide for their health and wellbeing, while avoiding, remedying or mitigating potential adverse effects. While the proposal will result in a change to an urban form from the rural-residential form that exists currently, the proposal is considered to be an efficient use of the physical land resource.

101. Section 32(1)(b) requires examination of whether the proposed plan change provisions are the most appropriate way of achieving the District Plan objectives. There are several objectives and policies specific to the form and development of the Rolleston township itself. There are also objectives and policies addressing urban form and residential amenity generally. These are addressed in **Table 1** below.

**Table 1: Assessment of relevant plan provisions against the objectives of the District Plan**

| District Plan provisions | Comment / Assessment |
|---|---|
| ***Township Volume - Chapter B4 Growth Townships*** | |
| *Objective B4.1.1*<br><br>*A range of living environments is provided for in townships, while maintaining the overall 'spacious' character of Living zones, except within Medium Density areas identified in an Outline Development Plan where a high quality, medium density of development is anticipated.*<br><br>*Objective B4.1.2*<br><br>*New residential areas are pleasant places to live and add to the character and amenity values of townships.*<br><br>*Policy B4.1.10*<br><br>*Ensure there is adequate open space in townships to mitigate adverse effects of buildings on the aesthetic and amenity values and "spacious" character.* | The proposal will ensure that Rolleston continues to provide for a range of living environments generally. The subject land itself will also provide for arrange of living environments, including high quality, medium density development.<br><br>As set out in the urban design assessment in Appendix E, the subject area will be a pleasant place to live and will contribute to the character and amenity of Rolleston.<br><br>Open space is provided throughout the plan change site, including greenspaces/links, and recreation reserves. |

*Objective B4.3.1*

*The expansion of townships does not adversely affect:*

- *Natural or physical resources;*
- *Other activities;*
- *Amenity values of the township or the rural area; or*
- *Sites with special ecological, cultural, heritage or landscape values.*

*Objective B4.3.3*

*For townships within the Greater Christchurch area, new residential or business development is to be provided within existing zoned land or priority areas identified in the Regional Policy Statement and such development is to occur in general accordance with an operative Outline Development Plan.*

*Objective B4.3.4*

*New areas for residential or business development support the timely, efficient and integrated provision of infrastructure, including appropriate transport and movement networks through a coordinated and phased development approach.*

*Objective B4.3.5*

*Ensure that sufficient land is made available in the District Plan to accommodate additional households in the Selwyn District portion of the Greater Christchurch area between 2013 and 2028 through both Greenfield growth areas and consolidation within existing townships.*

*Policy B4.3.1*

*Ensure new residential, rural residential or business development either:*

*- Complies with the Plan policies for the Rural Zone; or*

*- The land is rezoned to an appropriate Living Zone that provides for rural-residential activities (as defined within the Regional Policy Statement) in accordance with an Outline Development Plan incorporated into the District Plan; or*

*- The land is rezoned to an appropriate Living or Business zone and, where within the Greater Christchurch area, is contained within existing zoned land and greenfield priority areas identified in the Regional Policy Statement and developed in accordance with an Outline Development Plan incorporated into the District Plan.*

*Policy B4.3.3*

*Avoid zoning patterns that leave land zoned Rural surrounded on three or more boundaries with land zoned Living or Business.*

*Policy B4.3.6*

*Encourage townships to expand in a compact shape where practical.*

The Plan Change will not adversely affect any notable natural or physical resources, noting the land is presently zoned Living 3 and provides for rural-residential development. There are no other activities that the expansion will adversely affect, and amenity values will generally be maintained, albeit the values of the site itself will change from a rural-residential to an urban-residential amenity. The site has no notable special values.

The proposal will not be consistent with Objective B4.3.3 and Policy B4.3.1 in so far as the development will not be within a priority area, however an ODP is proposed.

In regard to infrastructure, the proposal will place additional demand on services such as water and sewer. Upgrades will be required to service the proposal site and this can be undertaken through a combination of developer contribution and existing planned Council upgrades.

The proposal will not leave Rural zoned land surrounded by urban zoning.

The township shape will remain reasonably compact, albeit the proposal will expand the township further to the west rather than consolidating development closer to the town centre.

| | |
|---|---|
| *Policy B4.3.71*<br><br>*Avoid rezoning land for new residential or business development (other than Business 2 and 2A Zoning), west of SH1 and the South Island Main Trunk Line (SIMTL).*<br><br>*Policy B4.3.72*<br><br>*Avoid rezoning land for new residential development in areas shown under the Airport Flightpath Noise Contours for 50 dBA Ldn or greater, on Planning Map 013.*<br><br>*Policy B4.3.75*<br><br>*Encourage integration between rezoning land for new residential development at Rolleston and associated provisions for utilities, community facilities and areas for business development.* | The proposal does not entail rezoning of land for residential development west of SH1 or the SIMTL, or under airport noise contours.<br><br>Accounting for its location (adjacent to West Rolleston Primary School), physical connectivity, provision of small local business centres, and the infrastructure assessment in Appendix A, the proposal will achieve the integration sought by policy B4.3.75. |
| *Township Volume: Chapter B2 Physical Resources* | |
| *Objective B2.1.1*<br>*An integrated approach to land use and transport planning to ensure the safe and efficient operation of the District's roads, pathways, railway lines and airfields is not compromised by adverse effects from activities on surrounding land or by residential growth.*<br><br>*Objective B2.1.2*<br>*An integrated approach to land use and transport planning to manage and minimise adverse effects of transport networks on adjoining land uses, and to avoid "reverse sensitivity" effects on the operation of transport networks.*<br><br>*Objective B2.1.3*<br>*Future road networks and transport corridors are designed, located and protected, to promote transport choice and provide for: a range of sustainable transport modes; and alternatives to road movement of freight such as rail.*<br><br>*Objective B2.1.4*<br>*Adverse effects of land transport networks on natural or physical resources or amenity values, are avoided, remedied or mitigated, including adverse effects on the environment from construction, operation and maintenance.*<br>*Objective B2.1.5*<br><br>*Policy B2.1.2*<br>*Manage effects of activities on the safe and efficient operation of the District's existing and planned road network, considering the classification and function of each road in the hierarchy.*<br><br>*Policy B2.1.3*<br>*Recognise and protect the primary function of roads classified as State Highways and Arterial Roads in Part E, Appendix 7, to ensure the safe and efficient flow of 'through' traffic en route to its destination.*<br><br>*Policy B2.1.4(a)*<br>*Ensure all sites, allotments or properties have legal access to a legal road which is formed to the standard necessary to meet the needs of the activity considering:*<br>*– the number and type of vehicle movements generated by the activity;*<br>*– the road classification and function; and* | The Transport Assessment contained in Appendix D has confirmed that traffic generated from the proposal can be safely accommodated within the road network. Any new roads within the subdivision will be designed in accordance with the current standards of the District Plan.<br><br>In regard Policy 2.1.15, the proposed Outline Development Plan for the subject site includes requirement for new pedestrian links within the subject to area, to ensure adequate connectivity for a range of transport modes.<br><br>In regard the arterial function of Dunns Crossing Road, the proposal recognises and protects the function of this road and provides for its efficient flow.<br><br>In regards increasing transport demand, as discussed above the proposal provides good accessibility for alternative transport modes, including public transport.<br><br>The proposal is consistent with Policy B2.1.23, insofar that the site is already subject to a Living zoning, though in any case the proposal remains on the south side of the State Highway.<br><br>In regards utilities and as stated in the Infrastructure Report contained in **Appendix A,** sewer and water servicing demands from the proposal can be met.<br><br>Insofar that policy B2.2.5 seeks to avoid 'reverse sensitivity' effects on utilities, the odour assessment (Appendix H) and acoustic assessment (Appendix I) confirms that such effect will be avoided through the methods in the District Plan and buffers identified on the ODP. |

*– any pedestrian, cycle, public transport or other stock access required by the activity.*

*Policy B2.1.12*
*Address the impact of new residential or business activities on both the local roads around the site and the District's road network, particularly Arterial Road links with Christchurch City.*

*Policy B2.1.13*
*Minimise the effects of increasing transport demand associated with areas identified for urban growth by promoting efficient and consolidated land use patterns that will reduce the demand for transport.*

*Policy B2.1.15*
*Require pedestrian and cycle links in new and redeveloped residential or business areas, where such links are likely to provide a safe, attractive and accessible alternative route for pedestrians and cyclists, to surrounding residential areas, business or community facilities.*

*Policy B2.1.23*
*Where a township is already largely developed on both sides of a State Highway or railway line:*
*– Discourage new residential or business development from extending the township further along the State Highway or railway line if there are alternative, suitable sites; or, if not,*
*– Restrict new residential or business areas to extending further along one side of the State Highway or railway line only.*

*Objective B2.2.2*
*Efficient use of utilities is promoted.*

*Objective B2.2.3*
*The provision of utilities where any adverse effects on the receiving environment and on people's health, safety and wellbeing is managed having regard to the scale, appearance, location and operational requirements of the facilities.*

*Policy B2.2.2*
*Ensure activities have access to the utilities they require at the boundary prior to any new allotment being sold; or prior to any new activity taking place on an existing allotment.*

*Policy B2.2.3*
*Encourage the "market" to determine the efficient use of utilities.*

*Policy B2.2.5*
*Avoid potential 'reverse sensitivity' effects of activities on the efficient development, use and maintenance of utilities*

***Township Volume: Chapter B3 Health and Safety Values***

*Objective B3.1.1*

*Ensure activities do not lead to or intensify the effects of natural hazards.*

*Objective B3.1.2*
*Ensure potential loss of life or damage to property from natural hazards is mitigated.*

*Objective B3.1.3*
*Ensure methods to mitigate natural hazards do not create or exacerbate adverse effects on other people or the environment.*

Flood hazard effects have been appropriately managed and mitigated as described in **Appendix A** and there are no other notable natural hazards within the Plan Change area. Geotechnical investigations have indicated that the land predominantly has a technical category of TC1.

*Objective B3.4.4 states:*

*Growth of existing townships has a compact urban form and provides a variety of living environments and housing choices for residents, including medium density housing typologies located within areas identified in an Outline Development Plan.*

*Objective B3.4.5*
*Urban growth within and adjoining townships will provide a high level of connectivity both within the development and with adjoining land areas (where these have been or are likely to be developed for urban activities or public reserves) and will provide suitable access to a variety of forms of transport.*

*Policy B3.4.1*

*To provide zones in townships based on the existing quality of the environment, character and amenity values, except within Outline Development Plan areas in the Greater Christchurch area where provision is made for high quality medium density housing.*

*Policy B3.4.3*

*To provide Living zones which:*

- *are pleasant places to live in and provide for the health and safety of people and their communities;*
- *are less busy and more spacious than residential areas in metropolitan centres;*
- *have safe and easy access for residents to associated services and facilities;*
- *provide for a variety of living environments and housing choices for residents, including medium density areas identified in Outline Development Plans;*
- *ensure medium density residential areas identified in Outline Development Plans are located within close proximity to open spaces and/or community facilities and*
- *ensure that new medium density residential developments identified in Outline Development Plans are designed in accordance with the following design principles:*
    - *access and connections to surrounding residential areas and community facilities and neighbourhood centres are provided for through a range of transport modes;*
    - *block proportions are small, easily navigable and convenient to encourage cycle and pedestrian movement;*
    - *streets are aligned to take advantage of views and landscape elements;*
    - *section proportions are designed to allow for private open space and sunlight admission;*
    - *a subdivision layout that minimises the number of rear lots;*
    - *layout and design of dwellings encourage high levels of interface with roads, reserves and other dwellings;*
    - *a diversity of living environments and housing types are provided to reflect different lifestyle choices and needs of the community;*

The proposal will maintain a relatively compact town form albeit the town will extend further to the west than is currently the case. The proposal will provide for a variety of living environments and housing choices.

The Plan Change area will have a good level of connectivity to the remainder of the township, with provision for pedestrian and cycle links as well as vehicle access and potential servicing by public transport.

The proposal will provide for a character and amenity that is consistent with the remainder of the Rolleston Township and the existing subdivisions on the eastern side of Dunns Crossing Road.

The proposed Living zone will meet the outcomes sought by Policy B3.4.3.

As noted above, the odour assessment (Appendix H) and acoustic assessment (Appendix I) confirm that reverse sensitivity effects will be avoided, remedied or mitigated.

- *a balance between built form and open spaces complements the existing character and amenity of the surrounding environment and;*
- *any existing natural, cultural, historical and other unique features of the area are incorporated where possible to provide a sense of place, identity and community.*

*Policy B3.4.39*

*Avoid rezoning land for new residential development adjoining or near to existing activities which are likely to be incompatible with residential activities, unless any potential 'reverse sensitivity' effects will be avoided, remedied or mitigated.*

***Township Volume: Chapter B1 Natural Resources***

*Objective B1.1.2*

*New residential or business activities do not create shortages of land or soil resources for other activities in the future.*

*Policy B1.1.8*
*Avoid rezoning land which contains versatile soils for new residential or business development if:*
*- the land is appropriate for other activities; and*
*- there are other areas adjoining the township which are appropriate for new residential or business development which do not contain versatile soils.*

*Objective B1.2.2*
*Activities on land and the surface of water in Selwyn District:*
*- Do not adversely affect ground or surface water resources;*
*- Do not adversely affect waahi tapu or waahi taonga;*
*- Maintain or enhance the ecological and habitat values of waterbodies and their margins;*
*- Maintain or enhance the water quality and ecological values of sites of mahinga kai (food gathering); and*
*- Promote public access along rivers and streams, where appropriate.*

*Policy B1.2.1*
*Ensure all activities in townships have appropriate systems for water supply, and effluent and stormwater treatment and disposal to avoid adverse effects on the quality of ground water or surface waterbodies.*

*Policy B1.2.2*
*Ensure land rezoned to a Living or Business zone can be serviced with a water supply and effluent and stormwater disposal without adversely affecting groundwater or surface waterbodies.*

*Policy B1.2.5*
*Require any sewage treatment and disposal to be reticulated in the townships of Castle Hill, Doyleston, Lake Coleridge Village, Leeston, Lincoln, Prebbleton, Rolleston, Southbridge, Springston, Tai Tapu and West Melton.*

The Plan Change area does not encompass high quality versatile soils[5] and relates to land that is currently zoned Living 3. Therefore, the proposal will not create a shortage of land or soil resources.

The subject land does not feature, and therefore will not adversely affect, any water resources, sites of sensitive cultural value, ecological values or access to rivers or streams.

The site will be able to be adequately serviced, noting that subdivision will not be able to occur until such time as adequate infrastructure provision is confirmed to Council satisfaction.

102. Overall, it is considered that the proposed Plan Change is generally consistent with the objectives and policies of the Selwyn District Plan, particularly those seeking to provide pleasant living environments with high amenity. The proposal is not consistent with

[5] Selwyn District Council Baseline Assessment – Versatile Soils (DW015), Dec 2018.

Objective B4.3.3 and Policy 4.3.1 which seek to ensure that new development is contained within the Regional Policy Statement priority areas, however the National Policy Statement on Urban Development resolves that policy tension, as discussed below. Overall, it is considered that the resultant character, amenity and environmental effects of the proposal are consistent with those sought in the District Plan for Rolleston. Given this, it is considered that the proposal is an appropriate means of achieving the outcomes sought by the objectives and policies of the District Plan.

## Assessment of Efficiency and Effectiveness of the Plan Change

103. In assessing the benefits and costs of the Plan Change, three options have been considered:

- Leave the area zoned Living 3
- Rezone the entire site as proposed
- Apply for resource consent(s) for subdivision and development under the current zoning to otherwise achieve an extension to the existing Rolleston residential environment.
- Apply for multiple plan changes in other locations around Rolleston to otherwise achieve an equivalent extension to the existing Rolleston residential environment.

104. **Tables 2-5** which follow provide an assessment of these options.

**Table 2: Benefits and Costs of Option 1 – Leave the area zoned Living 3**

| Benefits/Advantages | Costs/Disadvantages |
|---|---|
| • Maintains the existing character and amenity of the area.<br>• No time or costs arising from a plan change process.<br>• No additional demands on infrastructure.<br>• Caters for demand for rural-residential activity. | • Does not meet market demand for residential sites in Rolleston.<br>• Inefficient use of the land resource as zoned rural residential activity neither provides for productive rural activity/use or efficient residential development and use. |

**Table 3: Benefits and Costs of Option 2 – Rezone the site (the proposal)**

| Benefits/Advantages | Costs/Disadvantages |
|---|---|
| • Increasing the availability of allotments within Rolleston township.<br>• Economic benefit to Council from larger rating base through additional properties being added upon subdivision.<br>• Economic benefit to the landowner from development of the property.<br>• Provision of high quality residential amenity for future residents.<br>• Additional supply of housing will assist in avoiding price rises resulting from otherwise suppressed housing supply. | • Change in character and amenity of the site from rural residential to urban.<br>• Increase in traffic generated in and around Rolleston township.<br>• Additional infrastructure capacity required, to be provided at developer's cost.<br>• Loss of low productivity rural residential land.<br>• Potential displaced demand for rural residential housing that needs to be met elsewhere. |

**Table 4: Benefits and Costs of Option 3 – Apply for resource consents**

| Benefits/Advantages | Costs/Disadvantages |
|---|---|
| • Council has the ability to more fully assess the proposal, in light of more detailed information required as part of a subdivision consent application.<br>• Council has the ability to place stricter controls on the development through consent conditions than may be possible through a plan change.<br>• If granted, would allow for a greater number of allotments, with associated efficiency of land development. | • Existing and future purchasers would need to obtain consent if they were to alter uses beyond what is permitted in the District Plan or already consented.<br>• Restricted timeframe in which land has to be developed and houses built, leading to potential economic costs for landowner/developer.<br>• Less flexibility in being able to develop the land.<br>• Possibly higher costs to develop land through the placing of tighter controls on the development by way of strict conditions on a consent.<br>• High difficulty of obtaining resource for non-complying status subdivisions.<br>• Change in character and amenity of the site from rural residential to urban.<br>• Increase in traffic generated in and around Rolleston township.<br>• Additional infrastructure capacity required, to be provided at developer's cost.<br>• Loss of low productivity rural residential land. |

**Table 5: Benefits and Costs of Option 4 – Apply for multiple/ discrete plan changes in alternative locations**

| Benefits/Advantages | Costs/Disadvantages |
|---|---|
| • As for Option 2 (see Table 3)<br>• Distribution of growth to other locations. | • As for Option 2 (see Table 3)<br>• Reduced economies of scale (for smaller scale or discrete plan changes)<br>• Fragmented / ad hoc development (for multiple/smaller scale proposals yielding an equivalent supply of housing). |

105. The above assessment indicates that the costs of options 3 and 4 outweigh the benefits. Numerically the benefits of option 1 outweigh the costs, however the lost opportunity to provide for additional residential housing capacity carries considerable weight.

106. Option 2, the proposal, has benefits that outweigh the costs.

## Effectiveness

107. Beyond the rezoning of the subject land, no new provisions are proposed by the Plan Change. Rather, it is intended that existing Living Z and Business 1 Zone provisions apply to the subject land. New provisions are restricted to the introduction of Outline Development Plans for the Plan Change areas.

108. Option 2 is considered to be the most effective means of achieving the objective of the proposal, being to provide for an extension of the adjoining existing urban residential area of Rolleston (with provision for some associated local business services) in a manner that adds significantly to development capacity and provides for increased competition and choice in residential land markets.

## Efficiency

109. In considering efficiency, it is necessary to refer again to the cost/benefits of the three options outlined in the tables above.

110. These assessments indicated that for Options 1 and 2, the benefits are greater as compared to the alternative option of obtaining resource consents, which had costs or disadvantages outweighing benefits.

111. While Option 1 has benefits outweighing the costs, it is an inefficient (and highly ineffective) means of achieving residential zoning across the site, though it would continue to achieve the objectives of the District Plan.

112. Taking into account the costs and benefits, Option 2, rezoning the Plan Change areas, is considered to be the most efficient means of achieving the objectives of the proposal. The proposed provisions, encapsulating minimal changes to the District Plan, is also considered to be the most efficient means of achieving the objective of the Plan Change proposal.

## Risks of Acting or Not Acting

113. Given the relatively recent rezoning and subdivision consenting of land in Rolleston and the rezoning of the subject land for rural-residential purposes, the relevant issues associated with the rezoning and development of land in this general and specific location are well understood. Accounting for the background information to and assessments for those developments, and the technical assessments accompanying this Plan Change application, there is minimal uncertain or missing information in relation to this proposal. It is therefore considered that there are no notable risks of acting or not acting.

## Overall Assessment

114. Based on the above assessment, it is concluded that the Proposed Plan Change is the more appropriate method for achieving the objective of the proposal than the alternatives also considered above.

115. It is concluded that the economic, social and environmental benefits of the Proposed Plan Change outweigh the potential costs. On this basis, the proposed rezoning is considered to be an appropriate, efficient and effective means of achieving the purpose of the Resource Management Act.

# Statutory Framework

## Sections 74 & 75 of the RMA

116. Section 74 of the RMA prescribes that the District Council must prepare and change a district plan in accordance with its functions under s31 and the provisions of Part 2.

117. The District Council must also have regard to an evaluation report prepared in accordance with s32.

118. Section 74(2) requires the District Council to also have regard to proposed regional plans, management plans, the Historic Places Register, regulations or the Plans of adjoining territorial authorities to the extent that these may be relevant.

119. It is noted that the proposal does not involve any cross territorial issues, any matters of historical reference (on the Historic Places Register) or matters addressed by management plans or strategies prepared under other Acts. With respect to Regional Plans, these are identified and addressed further below.

120. Section 74(2A) also requires the Council to take into account relevant planning documents recognised by an iwi authority, to the extent that its content has a bearing on resource management issues.

## Section 31 – Functions of Council

121. Any plan change must assist the Council to carry out its functions so as to achieve the purpose of the Act. The functions of a territorial authority are set out in s31 of the Act and include:

- establishing, implementing and reviewing objectives, policies, and methods to achieve integrated management of the effects of the use and development of land; and

- controlling actual or potential effects of the use and development of land.

122. The requested plan change accords with these stated functions. The proposal provides for the use and development of land for residential activities as an extension of the existing residential zone to the east, with only such amendments as are necessary to recognise the site and the proposed ODPs. The proposed ODPs provide the methods for Council to manage potential effects of this activity and demonstrates an integrated management approach.

## Section 75 – Contents of District Plans

123. Section 75 requires a District Plan to state objectives for the District, policies to implement the objectives and rules to then implement the policies.

124. The proposal does not introduce any new, or alter any existing, objectives or policies.

125. Section 75 requires a District Plan to not be inconsistent with Regional Plans. These are identified and discussed in paragraphs further below.

126. Section 75(3)(a), (b) and (c) also requires a District Plan to give effect to any National Policy Statement, the New Zealand Coastal Policy Statement and the Regional Policy Statement. These are discussed as follows:

## National Policy Statements (NPS) and New Zealand Coastal Policy Statement

127. The Selwyn District Plan is required under Section 74(1)(ea) of the Resource Management Act to prepare or change its district plan in accordance with National Policy Statements (NPS), and the New Zealand Coastal Policy Statement.

128. The New Zealand Coastal Policy Statement is not relevant to the site, given the large distance between the site and the coastal environment.

129. With regard to the NPS for Renewable Electricity Generation 2011, the proposal does not involve nor is it located in the proximity of a renewable electricity generation activity. Similarly, the Plan Change site is not located in close proximity to any main electricity transmission lines nor is there a substation within the site, meaning the NPS for Electricity Transmission 2008 is not relevant. Stormwater and waste water discharges will be dealt with at a future consenting stage, however no practices or effects are anticipated that would be inconsistent with the NPS for Freshwater Management 2020.

130. Noting the above, the National Policy Statement for Urban Development 2020 (NPS-UD) which took effect on 20 August 2020 is of principal relevance to this plan change.

131. The objectives and policies of that NPS:

- seek a well-functioning urban environment (Objective 1), as defined by Policy 1;

- recognise that urban environments, including their amenity values, develop and change over time (Objective 4);

- state that local authority decisions on urban development area integrated with infrastructure planning and funding decisions and strategic over the medium term and long term and responsive, particularly in relation to proposal that would supply significant development capacity (Objective 6).

- state that planning decisions must contribute to well-functioning urban environments (Policy 1). Policy 1 defines a well-functioning urban environment as an urban environment that, among other matters less relevant to this application, provides for good accessibility for all people between housing, jobs, community services, natural spaces, and open space.

- state that local authorities, at all times, provide at least sufficient development capacity to meet expected demand for housing and for business land over the short term, medium term and long term (Policy 2).

- state that when making planning decisions that affect urban environments, decision-makers have particular regard to matters including: that the planned urban built form in those RMA planning documents that have given effect to this NPS may involve significant changes in an area, including detracting from amenity values appreciated by some people but improve amenity values appreciated by other people, communities and future generations (Policy 6);

- state in relation to car parking, territorial authorities do not set minimum car parking rate requirements, other than for accessible car parks (Policy 11).

132. With regard to the term urban environment, the NPS-UD defines an 'urban environment' as being an area of land that is or is intended to be predominantly urban in character; and is or is intended to be part of a housing and labour market of at least 10,000 people. The Rolleston population is greater than 10,000 people currently, with the 2019 census indicating a population of approximately 21,910[6]. In any event, discussions with Selwyn District Council planners[7] have however indicated that Rolleston is considered to be part of the Greater Christchurch urban area, and therefore part of the "urban environment". In support of that, Mr Rhodes has confirmed that under the National Policy Statement for Urban Development Capacity (now superseded by NPS-UD) and in the development of the Capacity Assessments and the Future Development Strategy (Our Space), the Greater Christchurch Partnership took the view that the Greater Christchurch area would be the 'urban environment' as a whole to ensure the work and the responses the NPS-UDC were co-ordinated. Given that urban environment is defined in the NPS-UD as meaning any area of land (*regardless of size, and irrespective of local authority or statistical boundaries*), the continuing definition of urban environment as encompassing all of Greater Christchurch is considered to be appropriate.

133. The proposed Plan Change is generally consistent with the objectives and policies of the NPS-UD, noting that the proposal will retain a relatively compact urban shape and well-functioning urban environment, with an extension of an existing zone into an area. The site is able to be serviced adequately and will allow for both land use and transport efficiencies.

134. Policy 8 of the NPS-UD is particularly notable for the proposed Plan Change. That policy states:

*Local authority decisions affecting urban environments are responsive to plan changes that would add significantly to development capacity and contribute to well-functioning urban environments, even if the development capacity is:*
*(a) unanticipated by RMA planning documents; or*
*(b) out-of-sequence with planned land release.*

135. The proposed development is largely unanticipated by the Selwyn District Plan and RPS. The proposed Plan Change is however considered to add significantly to development capacity. As stated above, it will contribute to a well-functioning urban environment.

136. In regards to development capacity, the contribution will be significant. As noted in the economic assessment in **Appendix G**, the current estimated population of Rolleston is 21,910 or 7,825 households assuming an average of 2.8 persons per household and

[6] Refer Appendix G.
[7] By email, Ben Rhodes, 6 August 2020.

therefore the enablement of up to 2,100 additional dwellings by the proposed Plan Change represents up to 27% of the existing dwellings. Alternatively, accounting for the projection of 26,927 persons or 9,616 households within Rolleston in the year 2029/2030, the proposal represents up to 22% of the total dwellings in the District at that time.

137. Selwyn District Council staff have also provided information on 'theoretical' development capacity within the recently zoned areas of Rolleston township relative to actual development[8]. This information is presented in **Table 5** below and indicates that of the 7151 theoretical dwellings provided for within the existing residential zoned ODP areas at Rolleston, 6308 allotments have been issued subdivision consent approval (i.e. a residual of only 843 allotments). Whilst the number of allotments with section 224c certification, or dwellings with building consent is less, this is to be expected given the lag in constructing / titling subdivisions and subsequent building development. Ultimately though, this confirms in numerical and percentage terms that the current supply of *land* for residential growth at Rolleston has been largely developed already.

138. Therefore, when considered in relative terms (to the metrics in Table 5), it is clear that the proposal to provide for up to 2,100 allotments will 'add significantly to development capacity' for the Rolleston township.

**Table 5: Theoretical development capacity vs. actual development for existing zoned ODPs**

| Rolleston ODP Area | Theoretical Dwellings (ODP gross area x 10hh/ha) | Lots with Subdivision Consent Approval | Lots with s224c Approval | Approved Building Consents for a Dwelling |
|---|---|---|---|---|
| 1 | 623 | 704 | 697 | 641 |
| 2 | *(information not supplied / available)* | | | |
| 3 | 484 | 508 | 393 | 463 |
| 4 | 108 | 0 | 0 | 0 |
| 5 | *(information not supplied / available)* | | | |
| 6 | 1100 | 1002 | 944 | 887 |
| 7 | 69 | 69 | 53 | 26 |
| 8 | 330 | 538 | 375 | 304 |
| 9 | 245 | 61 | 45 | 65 |
| 10 | 279 | 339 | 191 | 118 |
| 11 | 1510 | 1300 | 1005 | 663 |
| 12 | 560 | 250 | 195 | 184 |
| 13 | 360 | 61 | 61 | 50 |

[8] Theoretical capacity is based on the gross land area of the ODP Areas listed and a 10 households / hectare density. Actual development accounts for allotments that have obtained subdivision consent approval, section 224c certification, and building consent approvals.

| | | | | |
|---|---|---|---|---|
| HASHA SF | 400 | 480 | 484 | 470 |
| HASHA Ackland | 900 | 960 | 283 | 169 |
| Holmes | 96 | 0 | 0 | 0 |
| Skellerup | 51 | 0 | 0 | 0 |
| Coles | 36 | 36 | 36 | 5 |
| **TOTAL** | **7151** | **6308** | **4762** | **4045** |
| **Percentage of theoretical total of 7151** | | **88%** | **67%** | **57%** |

139. Accounting for the above, **Table 6** below provides an assessment of the proposal against the relevant objectives and policies in the NPS-UD.

**Table 6: Assessment of the proposal against the provisions of the NPS-UD 2020**

| NPS-UD Provision | Comment / Assessment |
|---|---|
| *Objective 1: New Zealand has well-functioning urban environments that enable all people and communities to provide for their social, economic, and cultural wellbeing, and for their health and safety, now and into the future.* | The proposed Plan Change supports this objective, through delivery of a well-functioning urban environment (within the context of the subject land, and within the wider Rolleston and Greater Christchurch context)- as is set out in respect of policy 1 below. The enablement of up to 2100 households will clearly 'enable' people and communities to provide for their social, economic, and cultural wellbeing, and for their health and safety, through enhanced housing supply and choice. |
| *Objective 2: Planning decisions improve housing affordability by supporting competitive land and development markets.* | As noted in the economic assessment (**Appendix G**), the proposed Plan Change will help address constraints in the residential land supply markets, increase supply and competition, and help address housing affordability within the Selwyn District and Greater Christchurch in a manner consistent with Objective 2. |
| *Objective 3: Regional policy statements and district plans enable more people to live in, and more businesses and community services to be located in, areas of an urban environment in which one or more of the following apply:*<br>*a. the area is in or near a centre zone or other area with many employment opportunities*<br>*b. the area is well-serviced by existing or planned public transport*<br>*c. there is high demand for housing or for business land in the area, relative to other areas within the urban environment.* | This objective supports enablement of residential growth in this location, noting the subject land is<br>a. near an area with many employment opportunities (the established and developing Rolleston town and industrial centres, rural Canterbury, and Christchurch city).<br>b. not well-serviced by existing public transport or planned public transport presently (noting this is contingent on a residential population that can sustain it), but proposes road networks and connections that would enable existing/nearby bus services to route through the sites.<br>c. there is high demand for housing in the area, relative to other areas within the urban environment, as evident from Table 5 and the economic assessment (Appendix G). |

| | |
|---|---|
| *Objective 4: New Zealand's urban environments, including their amenity values, develop and change over time in response to the diverse and changing needs of people, communities, and future generations.* | The proposed change from rural-residential to urban residential is in response to the diverse and changing needs of people, communities, and future generations (for the proposed form/density of housing in this location) in a manner consistent with this objective. |
| *Objective 6: Local authority decisions on urban development that affect urban environments are:*<br>*a. integrated with infrastructure planning and funding decisions; and*<br>*b. strategic over the medium term and long term; and*<br>*c. responsive, particularly in relation to proposals that would supply significant development capacity.* | The infrastructure assessment and ITA have demonstrated that the proposal can be effectively integrated with infrastructure planning, funding and delivery.<br>The proposal would clearly 'supply significant development capacity', and on that basis this objective seeks 'responsive' decision making. This creates some tension with the requirement to be strategic over a medium and long term, however given the attributes of the site, the absence of any significant effects or risks, the adjacency to the existing urban area, and the existing Living 3 zoning applying to the land it is considered that enablement of this proposal would not be inconsistent with this aspect of the objective. . |
| *Objective 8: New Zealand's urban environments:*<br>*a. support reductions in greenhouse gas emissions; and*<br>*b. are resilient to the current and future effects of climate change.* | The proposed provision for alternative transport modes, connectivity and accessibility, and the potential for servicing by public transport supports reductions in greenhouse gas emissions.<br>As noted earlier, resilience to climate change is achieved through: the site's distance from coastal and low lying areas susceptible to sea-level rise and storm surges; the land's resilience to heavy rainfall events/frequency (see Appendix A), and the potential for building and landscape design to address increased mean temperatures or amplification of heat extremes. |
| *Policy 1: Planning decisions contribute to well-functioning urban environments, which are urban environments that, as a minimum:*<br>*a. have or enable a variety of homes that:*<br>*(i) meet the needs, in terms of type, price, and location, of different households; and*<br>*(ii) enable Māori to express their cultural traditions and norms; and*<br>*b. have or enable a variety of sites that are suitable for different business sectors in terms of location and site size; and*<br>*c. have good accessibility for all people between housing, jobs, community services, natural spaces, and open spaces, including by way of public or active transport; and*<br>*d. support, and limit as much as possible adverse impacts on, the competitive operation of land and development markets; and*<br>*e. support reductions in greenhouse gas emissions; and*<br>*f. are resilient to the likely current and future effects of climate change.* | The proposal will contribute to well-functioning urban environments at a localised, township, and regional scale, noting it will, as a minimum:<br>a. Have and enable a variety of homes that meet the needs, in terms of type, price, and location, of different households. This is achieved through the Living Z provisions which provide for this variety and the choice afforded through the supply of up to 2,100 households. The proposal will enable Māori to express their cultural traditions and norms, to the extent relevant to the site context.<br>b. Provide access to suitably located and sized business sectors. Local retail facilities are proposed for residents within the Plan Change site; the Rolleston town centre and industrial zones is accessible by various transport modes; and the wider offerings of Christchurch city are accessible where required.<br>c. Provide good accessibility for all people between housing, jobs, community services, natural spaces, and open spaces, including by way of public or active transport noting the preceding point and the findings in the transport assessment.<br>d. Support, and limit as much as possible adverse impacts on, the competitive operation of land and development markets (refer Appendix G). |

| | |
|---|---|
| | e. Support reductions in greenhouse gas emissions, through provision for alternative transport modes, connectivity and accessibility, and the potential for servicing by public transport supports.<br><br>f. Achieve resilience to the likely current and future effects of climate change, as described above, through: the site's distance from coastal and low lying areas susceptible to sea-level rise and storm surges; the land's resilience to heavy rainfall events/frequency (see Appendix A), and the potential for building and landscape design to address increased mean temperatures or amplification of heat extremes. |
| *Policy 2: Tier 1, 2, and 3 local authorities, at all times, provide at least sufficient development capacity to meet expected demand for housing and for business land over the short term, medium term, and long term.* | In order to be sufficient to meet expected demand for housing, development capacity must be: *'plan-enabled (see clause 3.4(1)); and infrastructure-ready (see clause 3.4(3)); and feasible and reasonably expected to be realised (see clause 3.26); and meet the expected demand plus the appropriate competitiveness margin (see clause 3.22)'*. Moreover, Policy 2 requires sufficient development capacity is provided *'at all times' to 'at least'* meet expected demand over the short term, medium term, and long term.<br><br>The proposed enablement of up to 2,100 households that can be readily serviced with infrastructure would be consistent with this policy. |
| *Policy 6: When making planning decisions that affect urban environments, decision-makers have particular regard to the following matters:*<br><br>*a. the planned urban built form anticipated by those RMA planning documents that have given effect to this National Policy Statement*<br><br>*b. that the planned urban built form in those RMA planning documents may involve significant changes to an area, and those changes:*<br><br>*(i) may detract from amenity values appreciated by some people but improve amenity values appreciated by other people, communities, and future generations, including by providing increased and varied housing densities and types; and*<br><br>*(ii) are not, of themselves, an adverse effect*<br><br>*c. the benefits of urban development that are consistent with well-functioning urban environments (as described in Policy 1)*<br><br>*d. any relevant contribution that will be made to meeting the requirements of this National Policy Statement to provide or realise development capacity*<br><br>*e. the likely current and future effects of climate change.* | a. No RMA planning documents have yet given effect to this National Policy Statement in a way that can guide urban built form. However, it is relevant to note that the operative District Plan contemplates residential intensification and development of the land (relative to its current rural use) through the operative Living 3 zoning.<br><br>b. The assessments in Appendix E conclude that the proposal will not result in any significant effects on amenity values. However, to the extent that the appreciation of the status quo by some may be diminished by the proposal, this policy recognises the potential for change and that this is not necessarily an adverse effect.<br><br>c. The proposal will deliver the benefits of urban development that are consistent with well-functioning urban environments (as described above in respect of Policy 1)<br><br>d. The proposal will clearly contribute significantly to meeting the requirements of this National Policy Statement *'to provide or realise development capacity'*.<br><br>e. As set out above for other NPS-UD objectives and policies, the proposal accounts for the likely current and future effects of climate change. |
| *Policy 8: Local authority decisions affecting urban environments are responsive to plan changes that would add significantly to development capacity and contribute to well-functioning urban environments, even if the development capacity is:*<br><br>*a. unanticipated by RMA planning documents; or*<br><br>*b. out-of-sequence with planned land release.* | As set out above (and irrespective of the absence of criteria yet within the CRPS), the plan change will clearly add significantly to development capacity. And, as set out above, it will contribute to well-functioning urban environments. Accordingly, the policy supports the proposal, notwithstanding it being: unanticipated by RMA planning documents; or out-of-sequence with planned land release. |

140. For the reasons expressed earlier in this assessment and in **Table 6** above, the proposal is considered to 'contribute to well-functioning urban environments' and achieve consistency with the relevant provisions of the NPS-UD.

## Canterbury Regional Policy Statement

141. The Selwyn District Plan is required under Section 73(4) of the Resource Management Act to give effect to the Canterbury Regional Policy Statement 2013 (RPS). Section 74(2) of the Act also requires territorial authorities to have regard to any proposed regional policy statement when preparing or changing a district plan.

142. The relevant objectives and policies of the CRPS are primarily encompassed by Chapters 5 and 6 of the CRPS, relating to land-use and infrastructure and the recovery and rebuilding of Greater Christchurch. Of lesser relevance is Chapter 15. Chapter 15 addresses soils and the maintenance of soil quality. Given the rural-residential zoning of the site and its low soil versatility, the proposal is considered to be not inconsistent with the objectives and policies of Chapter 15.

143. Turning to Chapter 5 (and noting that only those objectives and policies applying to the Entire Region are relevant to this application), Objective 5.2.1 addresses the location, design and function of development. It seeks that development be:

    a. consolidated in and around existing urban areas as the primary focus;

    b. that the overall quality of the natural environment is maintained and, where appropriate, enhanced;

    c. that economic development is encouraged in appropriate locations;

    d. adverse effects on significant infrastructure are avoided; and

    e. conflicts between incompatible activities are avoided.

144. The site does not sit within an existing urban area, though it sits on the fringe of urban Rolleston. The proposal is considered to generally maintain the quality of the environment in so far as the land is currently zoned for rural-residential development and its proposed change to urban residential land use will be consistent with activity on the eastern side of Dunns Crossing Road (see **Appendix E**). Accounting for the existing zoning of the land, the proposal will not result in any significant displacement of rural activity. The proposal will not affect significant infrastructure. Access to the site is able to be safely accommodated as set out in the ITA in **Appendix D.** To the extent that there may be incompatibility with other activities nearby, the assessment of this matter in **Appendix H** has confirmed that such effects can be avoided with the buffers proposed in the ODPs. The proposal is considered to be not contrary to this objective.

145. In respect of Policy 5.3.7 Strategic land transport network and roads and as addressed in the ITA in **Appendix D**, the proposed development will not impact upon the ability of any State Highway to fulfil its current or future strategic transport requirements.

146. With regard to Chapter 6, Objective 6.2.1 Recovery framework, the objective seeks to enable recovery, rebuilding and development within Greater Christchurch through a land use and infrastructure framework that achieves various things, notably including "avoids urban development outside of existing urban areas or greenfield priority areas for development, unless expressly provided for in the CRPS". Clause 7 of that objective includes maintaining the character and amenity of rural areas and settlements, clause 9 seeks to integrate strategic and other infrastructure and services with land use development. Clause 10 seeks to achieve development that does not adversely affect the efficient operation, use, development, appropriate upgrade and future planning of strategic infrastructure and freight hubs.

147. Objective 6.2.2 Urban form and settlement pattern seeks to achieve consideration and intensification of urban areas and avoids unplanned expansion of urban areas.

148. Policy 6.3.1 Development within the Greater Christchurch area seeks to give effect to the urban form identified in Map A. That form indicates that the site sits just outside the Urban Area. Clause 4 of that policy seeks to ensure new urban activities only occur within existing urban areas or identified greenfield priority areas as shown on Map A, unless they are otherwise expressly provided for in the CRPS.

149. Policy 6.3.5 Integration of land use and infrastructure seeks that land use development be integrated with infrastructure, including by only providing for new development that does not affect the operation, use, development, upgrading and safety of strategic infrastructure.

150. The strong messaging from this body of objectives and policies is that urban development is to occur inside the urban area within Greater Christchurch. The proposal then is inconsistent with those objectives and policies seeking to avoid urban development outside the urban area. However, as noted above, NPS-UD Policy 8 provides for inconsistency with this requirement.

151. In considering the particulars of these provisions above, it is otherwise noted that:

    a. With regard Objective 6.2.1, the proposal will protect the environmental qualities set out in that objective and provide for a reasonably consolidated and integrated urban form that is able to be fully serviced and integrates, via the proposed ODPs, with the adjoining residential zones.

    b. The site is not located in a sensitive landscape, nor will any sensitive indigenous vegetation be affected. Water quality can be maintained at the time of detailed design through engineering solutions and regional plan/discharge consent requirements.

    c. The landscape and visual assessment attached in **Appendix E** confirms that any associated effects will be avoided or mitigated.

    d. With regard to transport objectives and policies in Chapter 6, the Plan Change site is well located relative to the roading network, with provision for pedestrian and cycle connections to the wider township. Although the Plan Change will provide for an extension of the township to the west, the site will not result in long travel distances, noting that the town centre and its associated commercial

activities and amenities and industrial/business land at IZone and IPort are relatively close the Plan Change site. The attached Transport Assessment has confirmed the suitability of the adjoining road network for the vehicle movements anticipated and an integrated transport assessment has been undertaken in support of the proposal.

152. Overall, the development is considered to be inconsistent with those provisions of the Regional Policy Statement that require new residential zones to be located within identified greenfield priority areas, but otherwise generally consistent with the Regional Policy Statement.

## Mahaanui – Iwi Management Plan 2013

153. The Mahaanui Iwi Management Plan (IMP) sets out Ngāi Tahu's objectives, issues and policies for natural resource and environmental management within the area bounded by the Hurunui River in the north and the Ashburton River in the south. Under Section 74(2A) of the Resource Management Act, a territorial authority must take into account any such plan to the extent that it has a bearing on the resource management issues of the district. The IMP is primarily a tool for the Rūnanga in the area it covers; the plan also provides guidance to territorial authorities and others. The IMP sets out the broad issues as well as the specifics for particular areas. These matters are considered below, as they are relevant to this proposed Plan Change. It is noted that the IMP does not identify any specific cultural values associated with the subject land that might be adversely impacted by its development.

*Ranginui*

154. The relevant matters identified in IMP are discharges to air and the protection of night time darkness. The proposed Plan Change does not contain controls on these matters. The main discharge to air that could occur through this proposal is the establishment of log burners or similar within individual houses, as well as discharges of dust to air during the development of the site. Such discharges are controlled by Environment Canterbury through the Regional Air Plan. Controls over night time lighting are not proposed, and therefore some light pollution in a manner that conflicts with the aspirations of the IMP may eventuate. However, given the plan change site adjoins an established urban area (with associated light pollution), such effects are not considered to be significant.

*Wai Māori*

155. Freshwater is of considerable cultural significance to Rūnanga. The main matters of concern relate to water quality and quantity and mixing waters from different waterbodies. With the reticulation of effluent disposal from new dwellings the potential from adverse impacts on groundwater quality are limited. The site will also be connected to a Council water supply, which is more efficient way to service the development than through a separate well or wells. Stormwater generated by the new roads will be treated and disposed of through swales or proprietary treatment devices and soakage pits, ensuring that no untreated stormwater will reach groundwater or surface water bodies. Further, roof stormwater (generally considered clean) will be disposed of straight to ground where ground conditions allow for this (as referred to in **Appendix A**). In respect of surface water bodies on the site, there are no natural water bodies and otherwise water races on the site will be protected by District Plan setback requirements. All of these aspects of the development combine to ensure that there will be minimum adverse impact on the freshwater quality or quantity within this locality.

*Papatūānuku*

156. The use of land and how it is developed is of importance to Rūnanga. This section identifies matters such as the urban planning, the subdivision and development of land, stormwater, waste management, and discharges to land. The potential effects of the proposal on the environment have been discussed in the assessment of effects above. That assessment concludes that there will minimal adverse impacts on the quality of the natural environment

as no waste or contamination will be discharged in a manner that will compromise the mauri of surface or groundwater.

*Tāne Mahuta*

157. This section addresses the significance of indigenous biodiversity and mahinga kai to Rūnanga. The application site is not located in a known mahinga kai area. The subject land has been used for farming purposes for many years. There are no notable indigenous plantings within the site. The proposed Plan Change does not have specific planting requirements, however indigenous planting within greenspaces, stormwater management areas, and road reserves will be confirmed at the time of subdivision and development. It is also anticipated that over time, as the area is developed for residential use, that further plantings, both exotic and native, will occur.

*Ngā tūtohu whenua*

158. There are no known wāhi tapu, wāhi taonga or mahinga kai sites within the application site or close by.

*Te Waihora*

159. The application site sits within the catchment of Te Waihora. The main matters of concern within this area relate to the management of water and waterways within the Te Waihora catchment, and the subsequent impact that can have on the water quality of Te Waihora and its environment. The proposal does not involve an activity that could adversely impact on the lake and its environmental and cultural values.

*Summary*

160. It is considered that overall, the proposal will not have an adverse impact on the cultural values of iwi as set out within IMP.

## Part II of the Resource Management Act 1991

161. The purpose of the Resource Management Act is set out in Section 5 of the Act, being the sustainable management of natural and physical resources. This purpose is subject to Sections 6, 7 and 8 of the Act which set out that matters that are to be taken into consideration in achieving the purpose.

162. Section 6 identifies the matters of national importance that must be recognised and provided for when exercising a function under the Act. None of the listed matters in section are relevant to this site. As discussed above, in relation to section 6 and section 8 matters there are no known wāhi tapu, wāhi taonga or mahinga kai sites or items of historic heritage within the application site or close by.

163. In terms of section 7, the matter of most relevance to the residential zoning and further development of this site is maintenance and enhancement of the quality of the environment. The quality of environment and amenity values are anticipated to be high, with existing District Plan rules prescribing density standards and associated built form controls to ensure a suitable standard of development and amenity. As noted earlier, this proposal effectively shifts the existing urban/rural interface from Dunns Crossing Road to the western boundaries of the plan change site. Accordingly, whilst the environment and amenity values of this interface (and the site itself) will change, these qualities will be maintained when considered in a wider context.

164. An overall assessment of the proposal to rezone the land for Living Z and Business 1 zone purposes is considered to achieve the purpose of the Resource Management Act. The proposal provides for the social well-being of residents of Selwyn District and the Greater Christchurch area by providing an efficient residential development form to increase residential housing capacity at Rolleston.

# Appendix A

# Infrastructure Assessment

# Infrastructure Report

**ROLLESTON WEST RESIDENTIAL LTD**
**ROLLESTON WEST PLAN CHANGE**
**PROJECT 14720**

**ISSUE FINAL – 12 NOVEMBER 2020**

INOVO PROJECTS

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## QUALITY ASSURANCE

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|---|---|---|---|---|
| PREPARED BY | TIM MCLEOD | SENIOR CIVIL ENGINEER | | 9 NOVEMBER 2020 |
| REVIEWED & APPROVED BY | PETER MCAULEY | DIRECTOR | | 12 NOVEMBER 2020 |

# 1. Introduction

## 1.1. Purpose

Inovo Projects Ltd has been engaged by Rolleston West Residential Ltd to complete an Infrastructure Assessment for proposed predominantly residential developments on the western side of the township of Rolleston, at #385 Burnham School Road (Holmes Block) and a second site at on the west side of Dunns Crossing Road centrally located between Brookside Road and Selwyn Road (Skellerup Block), in support of a Plan Change application for development of approximately 2,100 residential lots across the two sites.

The purpose of this report is to provide information on;

- Existing infrastructure around the site
- Proposed infrastructure for the development
- Conformance to national standards, Selwyn District Council's (SDC) policies and best practices relating to subdivision development, in particular:
  - Waterways, Wetlands and Drainage Guide (Christchurch City Council)
  - Selwyn District Council's *Engineering Code of Practice* (SDC ECOP)
  - NZS4404:2010 Land Development and Subdivision Infrastructure

## 1.2. Limitations

This report may not be reproduced, in whole or in part, without our prior written approval. This report has been prepared for the purpose stated in the report and may be relied upon for that purpose only. Assumptions made in the preparation of the report are as expressly stated in the report or set out below.

Where information has been supplied to us for the purpose of the report by another party, this information is believed to be reliable but we can accept no responsibility if this should prove not to be so.

# 2. Site Overview

## 2.1. Site Description

The Rolleston West Plan Change site is existing farmland of approximately 160 ha in two blocks. The plan change covers two separate parcels known as the "Holmes Block" (approx. 87.53ha) and the "Skellerup Block" (approx. 72.69 ha).

### 2.1.1. Holmes Block

The first block is commonly called the Holmes Block and is a rectangular section of land of 87.53 ha bounded by State Highway 1 to the northwest, Dunns Crossing Road to the northeast, Burnham School Road to the southeast and the Council owned utilities site to the southwest. The land is currently zoned Living 3 in the Selwyn District Operative Plan for which there is already an Outline Development Plan (ODP) indicating patterns of urban growth.

The site is immediately adjacent to existing Living "Z" zone over Dunns Crossing Road to the northeast with a Living 2 zone being immediately opposite on the east-southeast side of Burnham School Road. The site also bounds the Outer Plains rural zone to the north, west and south directions.

The site is typically gently sloping (1:200) from northwest to southeast, that is from State Highway 1 to Burnham School Road. There is a small water race that currently enters the property from the State Highway 1 approximately 175 metres east from the western boundary. The race then runs perpendicular to the slope and into the block for approximately 310 metres from where it turns to the southwest at about 90 degrees to the boundary and exits the block to the neighbouring Council's land. There are no other water bodies over the land

The site has been used for farming purposes for the last 50 years and is currently covered in variety of irrigated pasture. There are some pine shelter belts but otherwise there is no other vegetation within the Block itself. Along entire frontage of both Dunns Crossing Road and Burnham School Road berm however there are attractive native plantings approximately 3 metres wide.

### 2.1.2. Skellerup Block

The second block of land under the plan change application known as the Skellerup Block is essentially a rectangular section of land of 72.69 ha to the west of Dunns Crossing Road centrally located between Brookside Road to the North and Selwyn Road to the south. The land is currently zoned Living 3 in the Selwyn District Operative Plan for which there is already an Outline Development Plan (ODP) indicating patterns of urban growth. The land is bounded by a combination of Living "Z" and Inner Plain rural zoned land to the north east immediately over Dunns Crossing Road, and by Outer Plains rural land to the northwest, southwest and south east.

The site is typically gently sloping (1:200) from northwest to southeast. There are no water bodies over the land. The site has been used for farming purposes for the last 50 years and is currently covered in variety of irrigated pasture. There are some pine shelter belts but otherwise there is no other vegetation within the Block itself. Along entire frontage of the Dunns Crossing Road berm however there are attractive native plantings approximately 3 metres wide.

## 2.2. Ground Conditions

A geotechnical investigation and assessment of suitability for subdivision has been carried out by Coffey Services (NZ) Limited as described in their report titled *Rolleston West Plan Change Geotechnical Assessment Report* (Ref 773-CHCGE281253) dated November 2020.

The ground model for the site is described as river alluvium deposits typically consisting of sandy gravel / gravelly silt (grading to sandy gravel) to greater than 20m depth.

### 2.3. Groundwater & Bores

The Environment Canterbury (ECan) GIS database shows 1 irrigation well within the Holmes Block and 2 within the Skellerup block. The productive water supply wells range in depth from 60 to 99m. There are no domestic or water supply wells located within the subject sites.

The nearest community supply well (M36/0085) described on the ECan database is approximately 500m up gradient from the Holmes block. No other community supply wells are within 1000m of the site. The site does not fall within a theoretical Community Drinking Water Supply Protection Zone.

There is an existing well (BX23/0830) located at 28 McLenaghan Road some 500m east of the northeast corner of the Skellerup Block. This well is nominated for SDC Water Treatment Plant but has not been developed yet.

The highest measured depth to groundwater in wells near the site varies between 15 and 20m below ground level.

### 2.4. Existing Infrastructure

There is no existing SDC infrastructure located within the two subject sites. However, existing infrastructure to the neighbouring residential subdivisions to the east can be extended to the proposed development.

An existing Ø300mm sewer rising main is located within Burnham School Road which conveys wastewater from the pump station located at the corner of Burnham School Road and Brookside Road, and pumps directly to the 'The Pines' Wastewater Treatment Plant (WWTP) to the southwest along Burnham School Road. Further discussion of sewer infrastructure is found in Section 4.

There is an existing Ø110mm water supply main in Burnham School Road and Ø150mm main in Dunns Crossing Road adjacent to the Holmes block. There is a Ø200mm water main in Dunns Crossing Road opposite the northeast corner of the Skellerup Block, with a Ø100mm connection eastwards across to Brenley Drive. Further discussion of water supply is found in Section 5.

### 2.5. Drainage Features

Both blocks are gently sloping at 1:180 to 1:200 gradient to the south-southeast. The ground surface is slightly undulating with shallow flood channels crossing the sites as is typical of the Canterbury Plains.

A section of the Paparua Stockwater Race network crosses the northwest corner of the Holmes Block and then southwards along the western boundary before passing under Burnham School Road.

# 3. Stormwater

## 3.1. Existing Stormwater Management

Discharge of stormwater to ground is common practice in the Rolleston area due to free-draining nature of the underlying gravels. As such, Rolleston has little stormwater reticulation network as most stormwater is discharged directly to ground via soakage pits and basins. Recent subdivisions to the east of the proposed rezoning have utilised soakage to ground for stormwater management.

## 3.2. Stormwater Disposal

Geotechnical investigations for the rezoning sites confirm the sites have good drainage characteristics and that discharge to ground is feasible.

Individual sites will discharge primary runoff from rooves and hardstand areas directly to ground via on-site soak pits. The soak pits will be constructed as part of building consent process at the house building stage. Soakholes for house sites will be sized to deal with storms up to the 10% AEP 1 hour event.

Runoff from hardstand areas and roads will be collected and treated before discharging into ground via soakpits or infiltration trenches. Where kerb and channel is used then pit and pipe network is used to convey stormwater to soakpits or infiltration basins / trenches. As with similar residential subdivisions in Rolleston, it is proposed to provide treatment swales along road edges which then discharge into ground via soakpits. Soakpits for road drainage will be sized for up to 2% AEP events plus runoff from residential lots once the on-site soakpit is inundated. All drainage infrastructure and soakpits associated with future roads will be constructed as part of any future subdivision and will be vested in SDC.

In general, the first flush stormwater runoff (i.e., first 15 to 25mm of any storm) is more polluted than the stormwater runoff from the remainder of the storm event. The first flush is generally treated using treatment systems which provide higher levels of contaminant removal than the treatment systems required for subsequent stormwater runoff. This first flush can be treated through a swale or infiltration basin or proprietary stormwater treatment devices such as hydrodynamic separators. Stormwater runoff from large rainfall events which exceed the first flush capacity can be discharged directly to ground using rapid infiltration trenches or soakpits.

Flows in excess of the capacity of the primary system can be directed to the roads which will act as secondary flow paths to safely convey stormwater through the developments.

Consent or a certificate of compliance for stormwater discharge to ground from the plan change sites will be obtained from Environment Canterbury (ECan) at the subdivision consent stage. Any consents required from ECan will be transferred to SDC as required.

It is expected that all stormwater will be able to be permitted to discharge to ground and that from a stormwater perspective, the plan change can be supported with areas set-aside for stormwater treatment and attenuation as outlined above.

## 3.3. Flood Management

Detailed model results showing the extent and flood depth are available to view on the SDC's website. The map shows the extent and depth of potential flooding during a 200-year ARI* or 0.5% AEP flood resulting from heavy rainfall. **Figure 1** below shows the predicted flooding for the subject sites.

As is typical of the Canterbury Plains, overland flow generated by continuous heavy rain or thunderstorms that the land cannot absorb becomes concentrated in shallow channels that cross the plains. The flood modelling indicates channels crossing or originating within the subject sites and continuing over the south boundary of both blocks. The predicted floodwater depth is generally less than 0.4m.

In general, ground levels for residential lots will be set above internal road levels so the roads act as secondary flow paths to safely convey floodwaters to the downslope side of the site.

Construction of a potential noise bund along the SH1 boundary to the Holmes Block will partially cut-off overland flow from up-slope. Flow cut off by the potential noise bund would be directed along roadside drains.

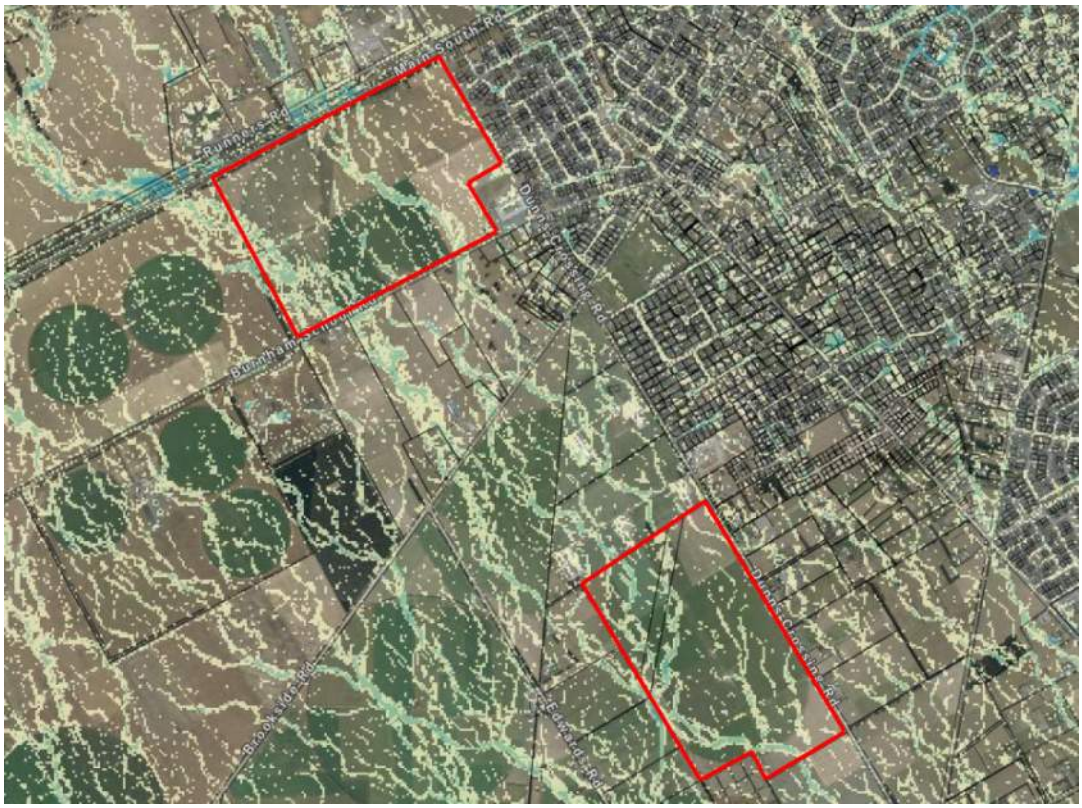


*Figure 1 – Flood Modelling from SDC Flooding Map*

A flood risk assessment will be carried out at subdivision consent application stage as required by Section 106 of the Resource Management Act. Overland flow from upstream catchments will be considered to ensure that any potential adverse stormwater effects can be appropriately mitigated and minimum floor level rules set at the time of subdivision and / or residential development.

# 4. Wastewater

## 4.1. Reticulation

Only approximately half of the Holmes block can be serviced by gravity sewer connecting to the existing gravity network at the intersection of Dunns Crossing Road / Burnham School Road. This relies on extending the Ø225 at 1:250 grade from Dunn's Crossing Road along Burnham School Road, up the west boundary of the school, and then zig-zagging across as grade and minimum cover allows. The southwest half of the site would require either gravity to a new pump station at Burnham School Road or utilise local pressure sewer discharging into the gravity network. It is anticipated that a new pump station to service the Holmes Block will be required, and as one option potentially discharging into the existing Ø300mm rising main in Burnham School Road to convey wastewater directly to The Pines Wastewater Treatment Plant (WWTP).

The Skellerup Block cannot currently be serviced by extending the existing SDC gravity sewer network south along Dunns Crossing Road due to the site being at a lower elevation. The Skellerup block will require a pump or lift station to discharge either into the existing gravity network, the existing rising main in Selwyn Road, or a new dedicated rising main constructed to The Pines WWTP.

Analysis by WSP indicates capacity constraints in the existing trunk sewer from 232 Dunns Crossing Road to Goulds Road Pump station via Carlyle Lane, East Maddisons Road, Oak Tree Lane and Goulds Road. Upgrades to the existing gravity sewer network could be required.

A new sewer pump station located further south along Dunns Crossing Road is anticipated to service the Skellerup Block as well as future residential development to the east of Dunns Crossing Road. This pump station could discharge into the existing Ø630mm PE rising main in Selwyn Road to the south or via new dedicated rising main to The Pines WWTP. The final location of a new sewer pump station and rising main able to service the Skellerup Block will be determined during subdivision design in consultation with SDC.

## 4.2. Network Capacity

Refer to the Wastewater Network Capacity Assessment prepared by WSP attached as Appendix A for an assessment of the capacity of the rising main network to The Pines WWTP.

Modelling analysis by WSP indicates that the existing Ø225mm gravity main in Burnham School Road and Burnham School Road Pump Station has capacity for the additional flows from the Holmes Block, with possible upgrades required to the gravity network to prevent surcharging during wet weather flows. Modelling analysis of a pumped discharge into the Ø300 uPVC sewer rising main in Burnham School Road indicates that the addition of the Holmes Block will not cause any issues with pumped discharge from the Burnham School Road and George Holmes Road pump stations which also use this line.

Modelling analysis by WSP indicates that the existing Ø630mm gravity main in Selwyn Road has capacity for the additional flows from the Skellerup Block, although it would increase the incidence of surcharging in the gravity network draining to the Selwyn Road Pump Station. WSP noted that ongoing development in Prebbleton, Lincoln and South Rolleston will trigger the requirement for capacity upgrades to the Selwyn Road Pump Station in the future.

An alternative solution is to construct a dedicated rising main from a new sewer station in Dunns Crossing Road directly to The Pines WWTP.

From a wastewater perspective, the plan change can be supported with new infrastructure servicing the plan change area as outlined above.

# 5. Potable Water

## 5.1. Reticulation

The Rolleston township reticulated supply extends along Burnham School Road (Ø110mm main) and Dunns Crossing Road (Ø150mm main) south and east of the Holmes block. The watermain extends along the east side of Dunns Crossing Road heading south to just opposite the northeast corner of the Skellerup Block, changing from Ø150 to Ø200mm main just south of Boulez Mews. There is a Ø100mm cross connection across to Jean Archie Drive and then to 28 McLenaghan Drive where a public water supply well is still to be commissioned.

The SDC 5Waters Activity Management Plan Volume 2 – Water (2018) indicates the Ø200mm main is proposed to continue south along Dunns Crossing Road to Selwyn road, and along Selwyn Road to connect with existing Ø200mm main at the intersection of East Maddison's Road and Selwyn Road.

The existing reticulation can be extended into each of the plan change blocks along proposed spine roads with minor upgrading of the existing network. Additional connections to other parts of the Rolleston township reticulation network to the east to increase network connectivity and resilience will be determined at the subdivision design stage.

The internal pipework within the development will be designed to accommodate peak demand including provision for fire-fighting demand in accordance with SDC's *Engineering Code of Practice* and SNZ/PAS 4509:2008 *Fire Service Code of Practice*.

## 5.2. Network Capacity

Refer to the Water Supply Network Capacity Assessment prepared by WSP attached as Appendix B for an assessment of the upgrades required to the SDC water supply network to service the plan change area.

Upgrade options considered by WSP included upgrading the existing water supply mains to each of the plan change sites or development of a new supply bore(s) in the proposed development area. WSP noted that a future potable water supply bore will become available at 28 McLenaghan Road to the east of the Skellerup block sometime in the future, but that the current estimated yield will not be enough to accommodate the new developments. A potential new well site could be developed within or near the proposed development areas to reduce the need for upgrades of existing pipelines and to improve the resilience of the water supply network to the west side of Rolleston township.

From a water supply perspective, the plan change can be supported with upgrades or extension of existing infrastructure to service the plan change area as outlined above.

# 6. Power / Telecommunications

## 6.1. Power

The Rolleston Zone Substation is located at the corner of Burnham School Road and Dunns Crossing road. 11kV underground cables as well as 11 & 33 kV overhead network cables are located within Burnham School Road and Dunns Crossing road which can be extended to provide sufficient power to the development.

Full appraisal of the network extension requirements will be carried out by the network provider once the Plan Change approval has been obtained.

Power will be provided to all allotments to utility company and industry standards. All network and reticulation cabling will be installed underground. Transformer kiosk sites will be located on separate lots at locations approved by the utility company and SDC.

## 6.2. Streetlighting

Streetlighting will be provided to roading and reserves in accordance SDC engineering standards. The applicant will provide a streetlight style consistent with styles used elsewhere in Rolleston.

## 6.3. Telecommunications

Telecommunications will be provided to all sites in the form of fibre optic network installed to utility company and industry standards. The existing fibre network in Dunns Crossing Road can be extended to the subject sites and distributed to individual allotments. All network and reticulation cabling will be installed underground.

# 7. Roading

## 7.1. Road Layout

The proposed primary roading layout is shown on the ODP plans attached to the planning application. There are several proposed connections onto Dunns Crossing Road and Burnham School Road. Possible future connections into neighbouring land surrounding the ODP sites are indicated.

The proposed secondary roading patterns have been indicatively shown on the ODP plans attached to the planning application. Tertiary roads to further subdivide the main roading patterns will be determined during the subdivision design stage in consultation with SDC.

All road corridors will have 13m-23m legal width. Rights of way will be between 3.5m and 6.5m, dependant on the number of users and length of ROW.

## 7.2. Road Cross Section

Standard “SDC Low Profile” kerb and channel will be used in all roads in the subdivision, with cutdowns where appropriate for pedestrian crossings and ROW’s.

Asphalt footpaths are proposed in the roading network in accordance with SDC Engineering Code of Practice and in keeping with other recent subdivisions in Rolleston. Footpath layout and links to green spaces will be discussed further with SDC at the engineering approval stage.

## 7.3. Road Stormwater Drainage

Stormwater runoff within road corridors will be conveyed via kerb and channel into appropriately spaced sumps or roadside swales. All sumps will have trapped and/or inverted outlets, and connected to the piped stormwater network or conveyance swales. The road corridor will be used as overland flow paths to direct stormwater runoff when the drainage network is at full capacity.

# 8. Earthworks

## 8.1. Bulk Earthworks

The topography of the existing site is generally sloping to the south/southeast at an average gradient of 1:200 and with height difference of approximately 4.5m and 7m total elevation change for the Holmes and Skellerup blocks respectively (refer to LiDAR contour plans included in Appendix C)

Bulk earthwork design will be determined by providing overland flow paths along roads and achieving a minimum grade of from the top of kerb to the rear of the sections fronting the road. The design philosophy for the setting of earthwork levels will be determined by the following criteria:

1. Road gradients not to exceed 1 in 20, not to be less than 1:450 where possible
2. Cut/fill balance where applicable
3. Overland flow paths for the subdivision are to follow the road layout, with the overall site overland flows not being different to the current situation.

To avoid carting material off-site earthworks will be designed to achieve a cut/fill balance across the site. Any filling operations exceeding 300mm depth will be carried out in accordance with NZS4431:1989 *Code of Practice for Earthfill for Residential Development*. It is envisaged that material won from site, will be sufficient to use as structural engineered fill.

All earthworks on residential lots and roads will be carried out in accordance with principles outlined on the Environment Canterbury's *Erosion Sediment Control Toolbox* to minimising the adverse effects of erosion and sedimentation during construction.

# 9. Summary & Conclusion

Primary stormwater runoff from residential allotments will be discharged directly to ground. Soakpits on individual sites will be constructed as part of the building consent process. Drainage and soakpits associated with roads will be constructed as part of any future subdivision and vested in SDC. The development will be designed to ensure that secondary flow will safely drain from the sections via the roading networks.

The majority of new sites can be serviced by gravity sewer network discharging to new pump stations to be developed to cater for each block. The Holmes Block pump station, as an option, could discharge into the existing Ø300mm rising main in Burnham School Road. It is anticipated that a new pump station would be developed further south along Dunns Crossing Road to service the Skellerup Block as well as land to the east. This pump station could discharge into the existing Ø630mm rising main in Selwyn Road or via a new rising main directly to The Pines Wastewater Treatment Plant.

Water reticulation will be an extension of the existing SDC water reticulation network bordering the site. Extension of the existing main in Dunns Crossing Road to connect to the existing network in Selwyn Road may be required to ensure adequate water supply. Additional connections to other parts of the SDC network to the east will be determined at the subdivision stage to increase network connectivity and resilience.

Existing electricity and fibre broadband networks in the neighbouring developments can be extended to service the proposed plan change areas. Electricity and telecommunications will be provided to all sites to utility company and industry standards. All cables within the development sites will be installed underground and kiosks will be constructed on separate individual lots.

From an infrastructure perspective, the plan change can be supported by either the extension of existing infrastructure from neighbouring subdivisions or the provision of new water supply and wastewater infrastructure to service the development areas.

# APPENDIX A | WASTEWATER CAPACITY ASSESSMENT

# Memorandum

| | |
|---|---|
| To | Tim Carter, Bruce Van Duyn |
| Copy | Sue Harrison, Murray England |
| From | Charlotte Mills |
| Office | Christchurch |
| Date | 10 November 2020 |
| File/Ref | 3-C2210.00 |
| Subject | Rolleston West Plan Change Wastewater Capacity Assessment |

## 1 Summary

WSP was engaged by Rolleston West Residential Ltd. to complete a wastewater network capacity assessment for two developments in Rolleston. The Holmes Block will be of approximately 87.5 ha, with up to 1,150 lots proposed and the Skellerup Block will be 72.7 ha with up to 950 lots.

The developments connect to separate parts of the trunk network and do not impact on each other. Our assessment has considered two options for each development:

1. Gravity connection to the gravity network
2. A pumped connection to a pressure main.

Our assessment has found that connection of the developments to the gravity network is predicted to cause overflows in wet weather unless pipe upgrades are constructed. Their connection to the trunk pressure mains are predicted to have less negative impacts. For each development there is also an option to construct a new pipeline from the development directly to the Pines wastewater treatment plant. Therefore, in our professional opinion, there are viable wastewater options to allow re-zoning of this land for residential use.

WSP
Christchurch
12 Moorhouse Avenue
Christchurch 8011
New Zealand
+64 3 363 5400
wsp.com/nz



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# 2 Assumptions

## 2.1 General

- The existing 2019 wastewater model was used, which was modelled in InfoWorks ICM v6.0.9 (WSP model reference: *chpc044:40000/SDC Wastewater Models*). This is the most up-to-date version of the model, used for the Resilience Master Planning project completed for SDC in 2019. During the Resilience Study bulk population updates were applied so model matched SDC's 2019 population estimates, and the new Prebbleton pump station was added to the model, which diverts Prebbleton flows away from Lincoln directly to the Selwyn Road Pump Station (PS). An overview of the system is presented in Figure 1.

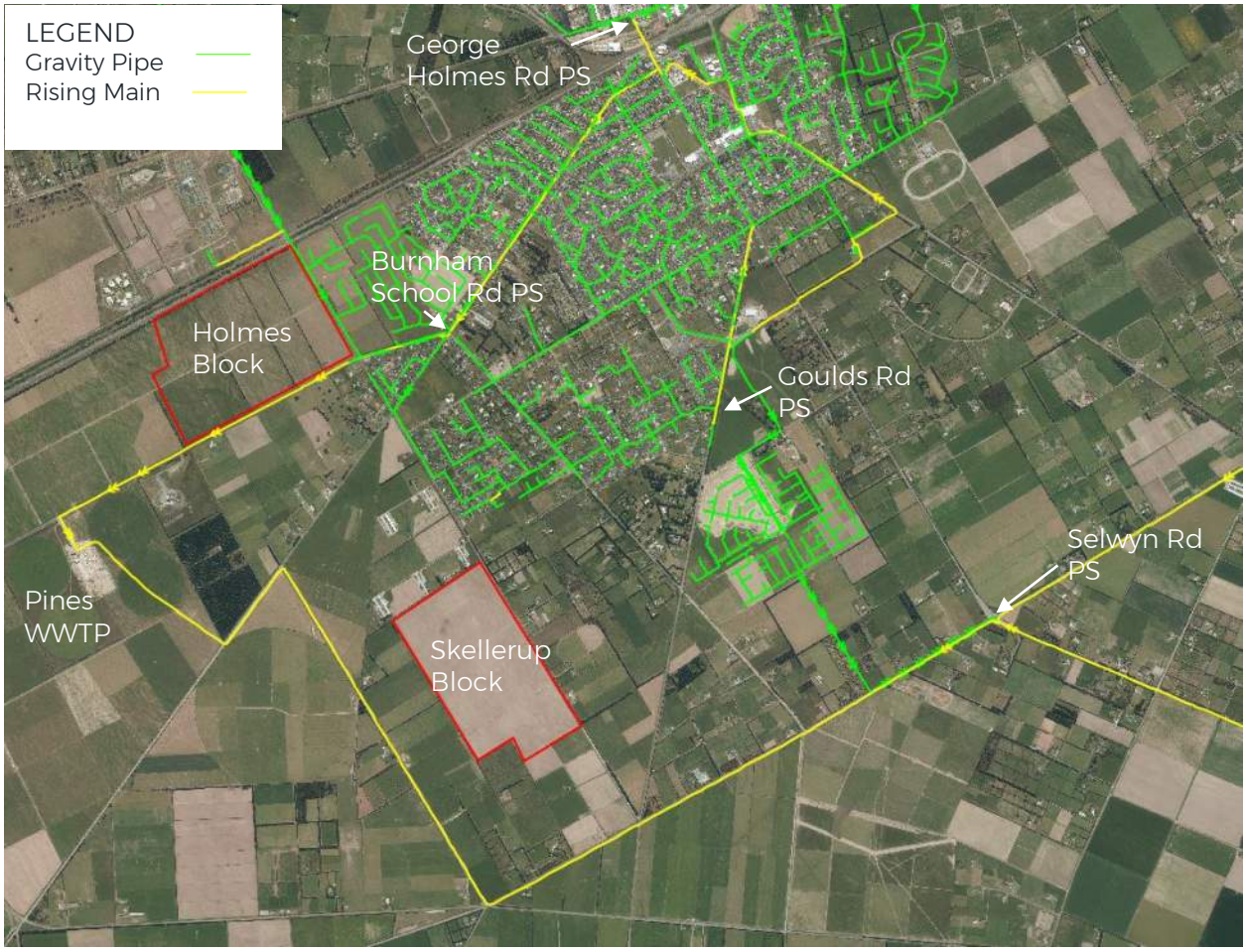



*Figure 1: Wastewater System Overview*

- Apart from the updates discussed above, the model asset data has not had an extensive update since the model was first built in 2016, as such it does not include infrastructure for recent subdivisions within the Lincoln, Prebbleton and Rolleston townships. However, as this assessment will focus on the trunk infrastructure capacity this does not impact the confidence in the model results for this assessment.

- To conservatively represent flow conditions the highest observed rate of groundwater ingress to the wastewater collection system was assumed. This high groundwater was observed in June 2014, affecting the communities of Prebbleton, Lincoln and Springston and was applied in the model as a constant baseflow.

- The model has been run with 1 in 5-year ARI 12-hour design event to replicate wet weather flow (WWF), as this was previously determined to be the critical storm duration for the ESSS system. To truly understand the impact of rainfall, a variety of rainfall events would need to be considered. However, there are many variables to consider, including

but not limited to, the annual exceedance probability (AEP), intensity, duration and timing of the event (in relation to flows in the wastewater system). Comprehensive modelling of a variety of design rainfall events has not been conducted as part of this query.

## 2.2 Scenario Specific

- Flows from the plan change area were calculated using the following assumptions:
  - Up to 1150 lots will be developed at the Holmes Block and up to 950 lots will be developed at the Skellerup Block (email from Bruce Van Duyn on 3 November 2020);
  - Population per lot is 2.7 (SDC's Engineering Code of Practice);
  - Consumption rate is 220 l/h/d (SDC's Engineering Code of Practice);
  - The peak to average flow rate for dry weather is 2.5 (SDC's Engineering Code of Practice);
  - The peaking factor for wet weather on peak dry weather is 2 (SDC's Engineering Code of Practice).

Table 2-1 below summarises the potential flows from the developed plan change area.

*Table 2-1: Calculated Flows for the Plan Change Block*

| Plan Change Block | Proposed No. of Lots | Population | Calculated ADWF (L/s) | Calculated PWWF (L/s) |
|---|---|---|---|---|
| Holmes | 1150 | 3105 | 7.9 | 39.5 |
| Skellerup | 950 | 2565 | 6.5 | 32.7 |

# 3 Wastewater Servicing Options

There are three easily identified options to service each block:

Holmes Block

1. Connect to gravity network on Dunns Crossing Road. The flows would then be conveyed via Burnham School Road PS directly to the Pines WWTP in a common rising main it shares with George Holmes Road PS.
2. Pump into common rising main on Burnham School Road
3. Construct new pipeline to take the developments flows directly to the Pines WWTP

Skellerup Block

1. Connect to gravity network on Dunns Crossing Road. The flows would then be conveyed via Goulds Road PS and Selwyn Road PS to the Pines WWTP.
2. Pump into rising main on Selwyn Road
3. Construct new pipeline to take the developments flows directly to the Pines WWTP

# 4 Modelling Methodology

For each block options 1 and 2 were modelled.  Option 3 for each block appears viable at this stage, as they are located close to the Pines WWTP and does not require modelling.

The following methodology was undertaken:

1 The existing 2019 model, with no amendments was used as the Base scenario.
2 Two new scenarios were created, for both dry weather and wet weather flow comparisons, and two new sub-catchments representing the developments were included in both.
3 The dry weather scenario was updated to include the developments population to allow the impact of the diurnal flow from the developments to be assessed.
4 The wet weather scenario was run the with the maximum flow applied as a constant flow. No contributing area or population for the plan change area was added as these are accounted for in the flow applied.
5 Simulations were run to assess the impact of the development on the existing network during dry and wet weather.

# 5 Modelling Results

The predicted impact of the two connection options is presented for each development below.

## 5.1 Holmes Block

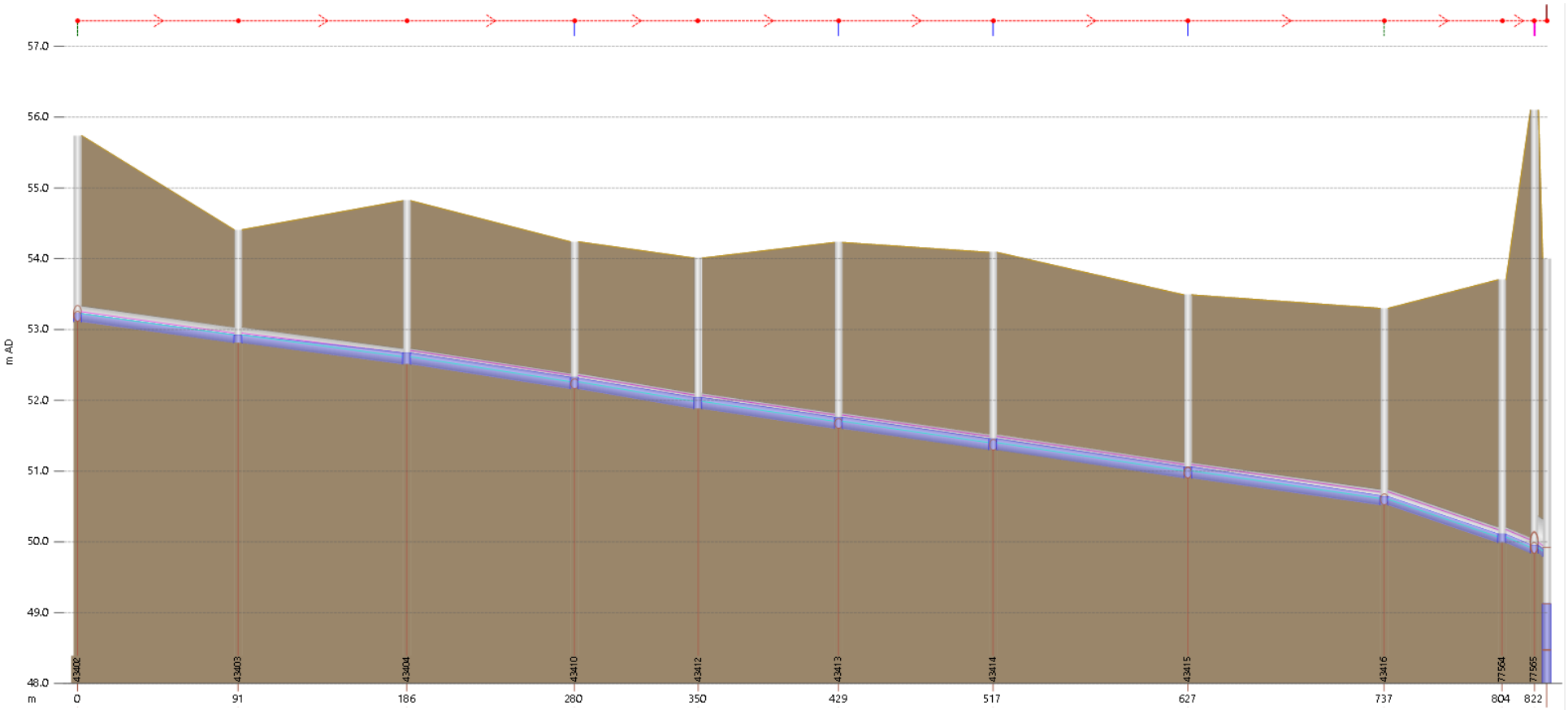
### *5.1.1 Option 1 – Gravity connection*

#### 5.1.1.1 Dry Weather Results

No issues are predicted in the gravity network downstream of the connection point (manhole Asset ID 550881), refer to Figure 2. Burnham School Road PS also is predicted to have capacity for dry weather flow from the Holmes Block.

#### 5.1.1.1 Wet Weather Results

During wet weather flow the gravity network is predicted to surcharge and a manhole overflow is predicted at (manhole Asset ID 550880) due to the flows from the Holmes Block, refer to Figure 3. However, Burnham School Road PS is predicted to have capacity for the wet weather flow. Therefore, upgrading approximately 640 m of pipe would be an option to allow connection of the development.

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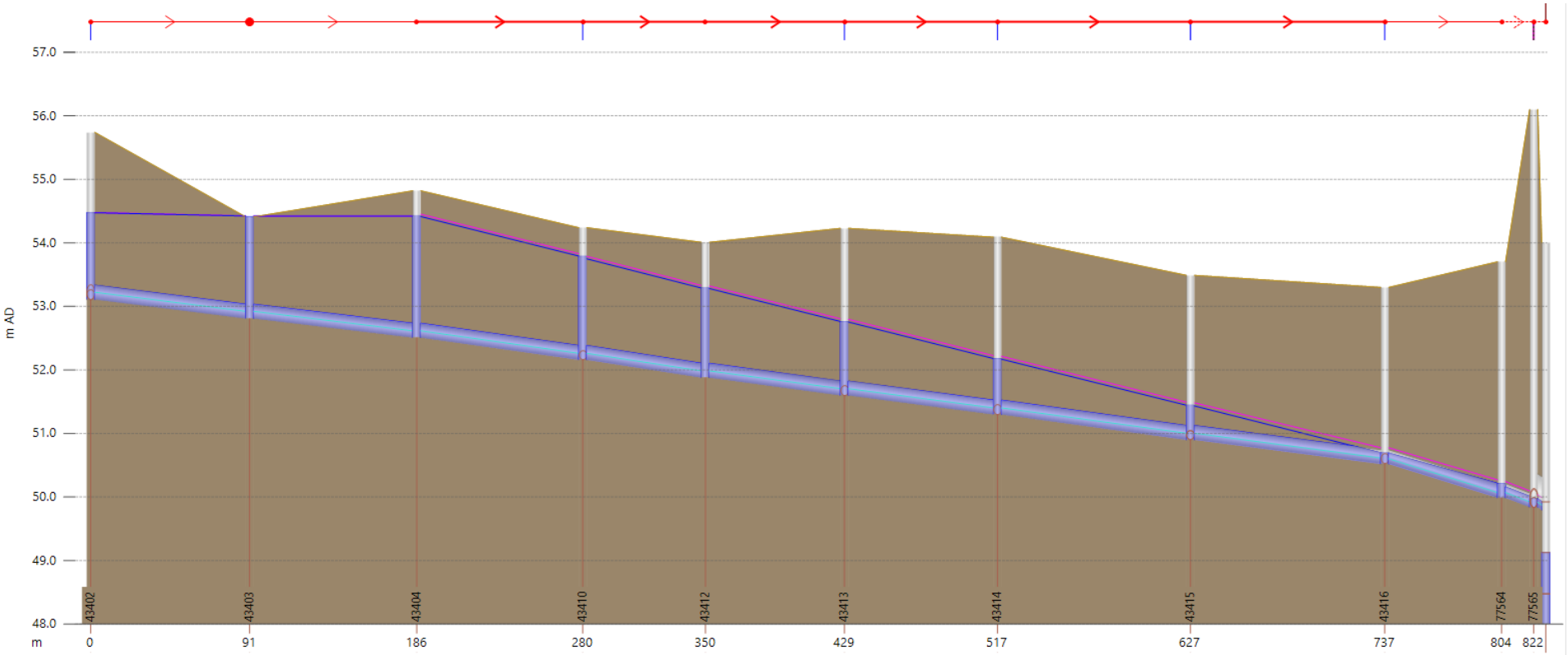
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| width (mm) | | 225 | 225 | 225 | 225 | 225 | 225 | 225 | 225 | 225 | 225 | - |
| US flow (l/s) | | 14.78 | 14.19 | 25.33 | 24.94 | 24.79 | 24.77 | 24.61 | 24.62 | 24.52 | 24.50 | - |
| r.pfc (l/s) | | 30 | 29 | 31 | 33 | 31 | 30 | 31 | 30 | 46 | 46 | - |
| Node | 43402 | 43403 | 43404 | 43410 | 43412 | 43413 | 43414 | 43415 | 43416 | 77564 | - | - |
| ground (m AD) | 55.740 | 54.410 | 54.820 | 54.240 | 54.010 | 54.230 | 54.090 | 53.490 | 53.300 | 53.703 | - | - |
| Ch floor lev (m AD) | 53.110 | 52.810 | 52.510 | 52.160 | 51.880 | 51.600 | 51.300 | 50.900 | 50.520 | 49.988 | - | - |

*Figure 2: Long section at PDWF in the from manhole Asset ID 550879 to Burnham School Road PS. Predicted levels in the current system without the Holmes development is shown by the light blue line.*




| Link | 43402.1 | 43403.1 | 43404.2 | 43410.1 | 43412.2 | 43413.1 | 43414.2 | 43415.1 | 43416.2 | - |
|---|---|---|---|---|---|---|---|---|---|---|
| width (mm) | 225 | 225 | 225 | 225 | 225 | 225 | 225 | 225 | 225 | 225 |
| US flow (l/s) | 11.45 | 2.74 | 41.96 | 41.56 | 41.52 | 41.51 | 41.51 | 41.67 | 41.67 | - |
| r.pfc (l/s) | 30 | 29 | 31 | 33 | 31 | 30 | 31 | 30 | 46 | 46 |

| Node | 43402 | 43403 | 43404 | 43410 | 43412 | 43413 | 43414 | 43415 | 43416 | 77564 | - |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ground (m AD) | 55.740 | 54.410 | 54.820 | 54.240 | 54.010 | 54.230 | 54.090 | 53.490 | 53.300 | 53.703 | - |
| Ch floor lev (m AD) | 53.110 | 52.810 | 52.510 | 52.160 | 51.880 | 51.600 | 51.300 | 50.900 | 50.520 | 49.988 | - |

*Figure 3: Long section at PWWF in the from manhole Asset ID 550879 to Burnham School Road PS. Predicted levels in the current system without the Holmes development is shown by the light blue line.*

#### *5.1.2 Option 2 – Connection to Pressure Main*

Connection to the pressure main on Burnham School Road has been assessed in the model. Burnham School Road and George Holmes Road pump stations also use this pressure main so the impact on their flowrate is reported. As there is very little wet weather response in the catchments of these two pump stations and the pump stations are not running frequently there is no difference between the dry and wet weather results.

##### 5.1.2.1 Dry Weather and Wet Weather Results

Burnham School Road PS peak flow rate drops from 94 l/s to 75 l/s, when it pumps at the same time as the Holmes development. However, the predicted peak flow into the station is 20 l/s so the reduction in pump flow rate does not cause an issue.

George Holmes Road PS peak flow rate drops from 63 l/s to 50 l/s, when it pumps at the same time as the Holmes development. However, the predicted peak flow into the station is 10 l/s so the reduction in pump flow rate does not cause an issue. It is important to note the industrial flow information has not been updated since 2016 so the modelled flowrate may be underpredicted.

### 5.2 Skellerup Block

#### *5.2.1 Option 1 – Gravity connection*

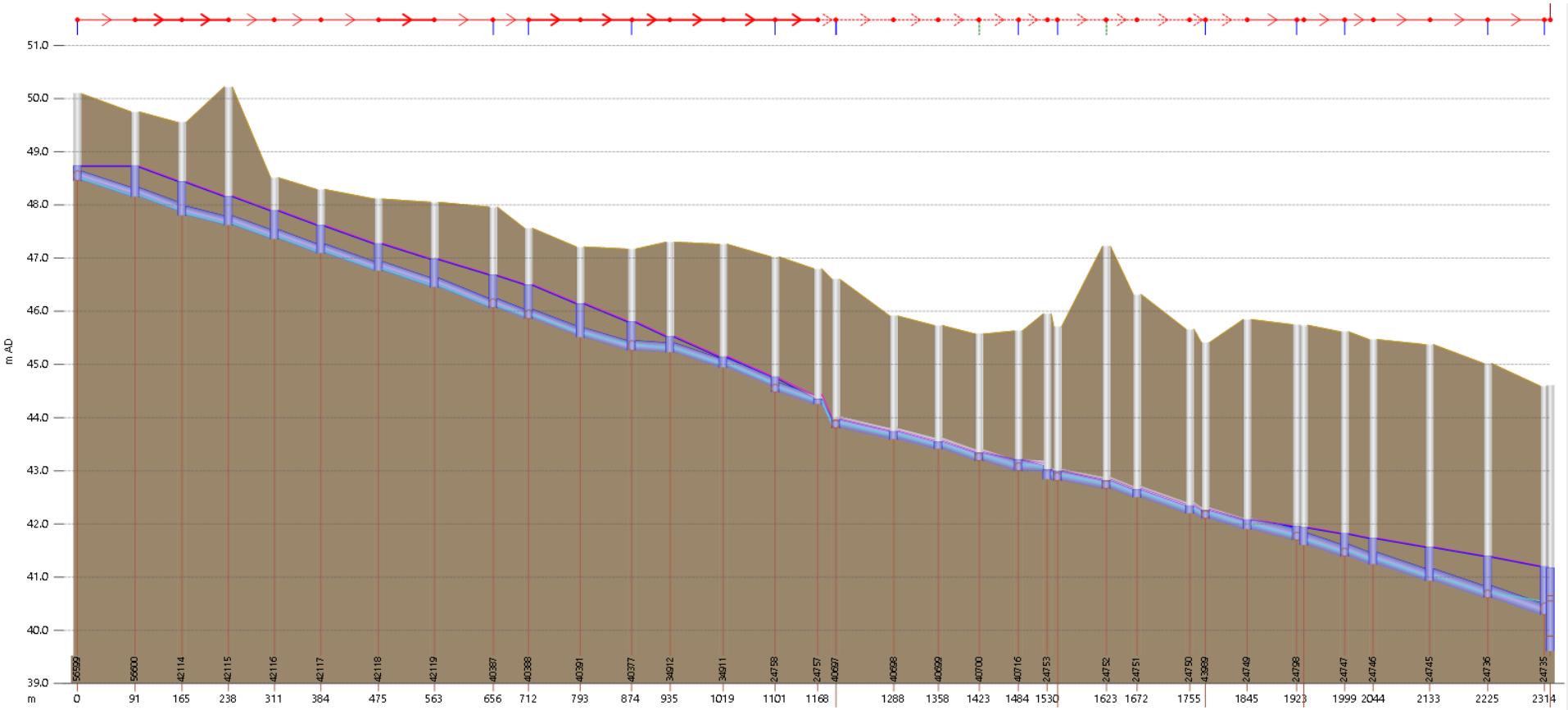
##### 5.2.1.1 Dry Weather Results

During dry weather flow the gravity network is predicted to surcharge downstream of the connection point (manhole Asset ID 550940), but no overflows are predicted due to the flows from the Skellerup Block, refer to Figure 4. Goulds Road PS does not have sufficient capacity for the dry weather flow.

##### 5.2.1.2 Wet Weather

During wet weather flow the gravity network is predicted to surcharge and a manhole overflow is predicted at (manhole Asset ID 550940) due to the flows from the Skellerup Block, refer to Figure 5. Goulds Road PS does not have sufficient capacity for the wet weather flow.

Therefore, upgrading approximately 2200 m of gravity pipe and the upgrade of Goulds Road PS and rising main would be required to allow connection of the development. Whether further upgrades of the system are required after the upgrade of Goulds Road PS has not been assessed at this time.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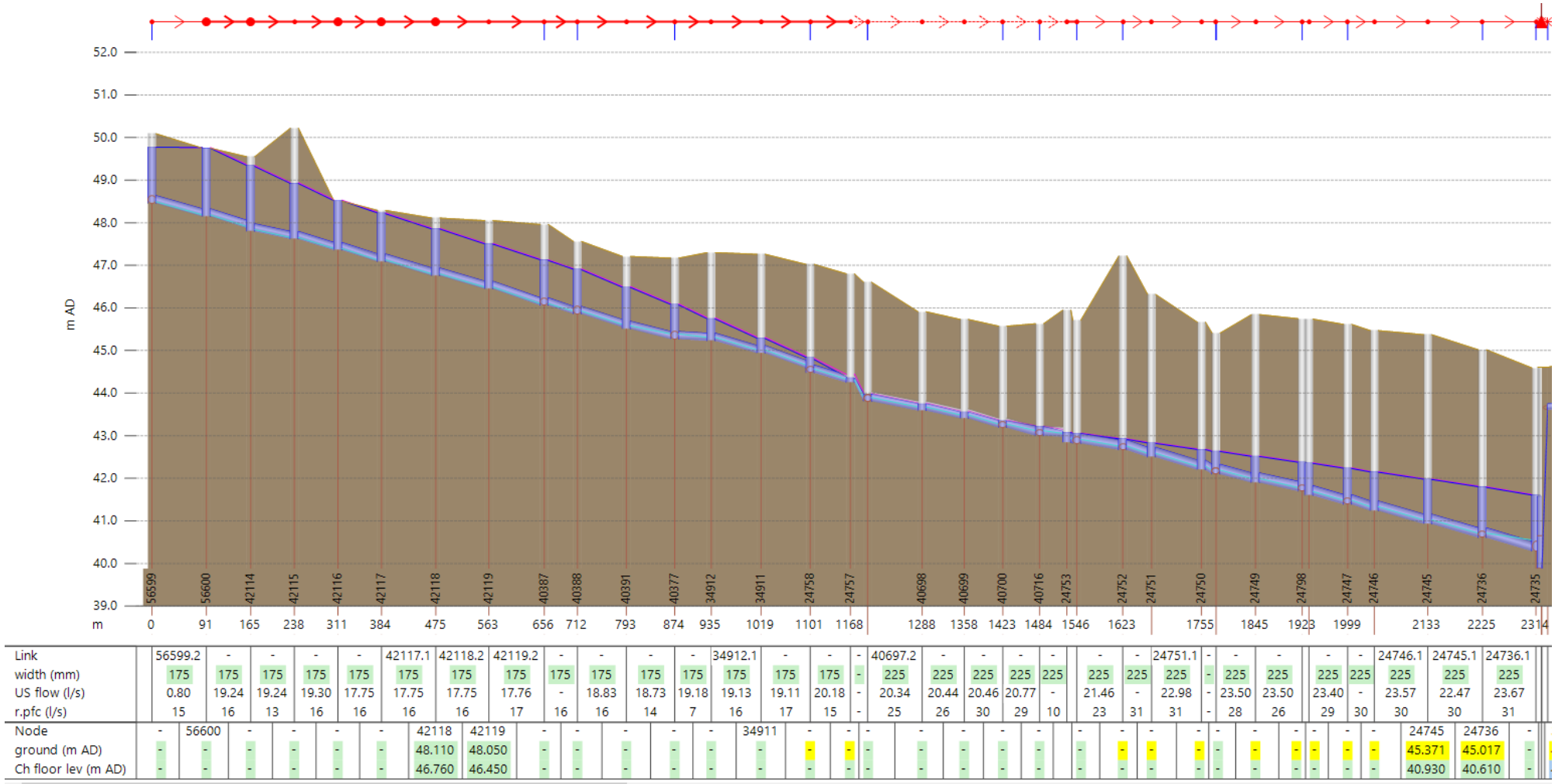
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### *5.2.2 Option 2 – Connection to Pressure Main*

Connection to the pressure main on Selwyn Road has been assessed in the model. Selwyn Road PS also uses this pressure main so the impact of its flowrate is reported. Selwyn Road PS receives flow from Lincoln and Prebbleton, which have a response to rainfall so the wet weather results are different to the dry weather results.

#### 5.2.2.1 Dry Weather

Selwyn Road duty pump peak flow rate drops from 244 l/s to 238 l/s, when it pumps at the same time as the Skellerup development. However, the predicted peak flow into the station is slightly above this flowrate but there is sufficient volume in the pump station that the peak wet well level does not change significantly.

#### 5.2.2.2 Wet Weather

Selwyn Road PS peak flowrate drops from 370 l/s to 356 l/s, when it pumps at the same time as the Skellerup development. Peak flow into the station is slightly above this flowrate and the peak water level in the wet well is predicted to increase by 300 mm. Surcharging in the gravity network is already predicted due to the wet well level so this is increased but the water level is still 3 m below ground level. However, with the ongoing development happening in Prebbleton, Lincoln and South Rolleston Selwyn Road PS will require a capacity upgrade in the future.

# 6 Conclusions

Our assessment has found that connection of the two developments to the gravity network is predicted to cause overflows in wet weather unless pipe upgrades are constructed. Their connection to the trunk pressure mains are predicted to have less negative impacts. However, the alternative option to service the two developments with two new separate pipelines that go directly to the Pines WWTP is worth considering further.

# 7 Limitations

- This assessment has not considered whether the Pines WWTP has capacity to accept flow from the developments.
- Industrial flow information has not been updated since 2016 so the modelled flowrate to George Holmes Road PS may be underpredicted.

| Prepared by: | Reviewed by: | Approved for Release by: |
|---|---|---|
| | | |
| **Charlotte Mills** | **David Ripley** | **Sue Harrison** |
| Principal Environmental Engineer | Team Leader - Water | Project Director |

# APPENDIX B | WATER SUPPLY CAPACITY ASSESSMENT

# Memorandum

| | |
|---|---|
| To | Tim Carter, Bruce Van Duyn |
| Copy | Sue Harrison, Murray England |
| From | Belen Rada Mora |
| Office | Christchurch |
| Date | 12 November 2020 |
| File/Ref | 3-C2210.00 |
| Subject | Rolleston West Plan Change Water Supply Assessment |

# 1 Summary

WSP was engaged by Rolleston West Residential Ltd. to assess the water supply network capacity and options to support the land-use plan change at the Holmes and Skellerup blocks in Rolleston. The developments are approximately 160 ha in total and allow for up to 2,100 lots. This assessment has aligned with the Selwyn District Council (SDC) objectives as part of their Master Planning when proposing upgrades to the network.

Subject to the recommendations in this memorandum, there are no water supply constraints which would impede rezoning of this land for residential use.

# 2 Assumptions

The two developments were added to the demand in the 2020 peak day model. The demand assumptions are as follows:

- Holmes Block Development: 87.5 ha will be developed with up to 1,150 lots;
- Skellerup Block Development: 72.7 ha will be developed with up to 950 lots;
- Rolleston domestic peak day water demand is 2,906 L/property/day as indicated in 2020 Master Planning project for SDC;
- Leakage rate is 88 L/property/day as indicated in SDC Water Balance report in 2019 by Thomas Consultants.
- Connection to network as shown in Figure 2-1 below:
    - Holmes connected to the DN 150 uPVC main on Burnham School Road (intersection between Burnham School Rd and Dunns Crossing Rd)
    - Skellerup Block Development connected to the DN 200 uPVC main on Dunns Crossing Rd

WSP
Christchurch
12 Moorhouse Avenue
Christchurch 8011
New Zealand
+64 3 363 5400
wsp.com/nz



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*Figure 2-1: Connections of new development into Rolleston Water Supply network*

Table 2.1 below summarises the Water Supply demand at the proposed developments:

Table 2.1 Water Supply Demand at the Proposed Developments

| Area | Properties | Demand (L/prop/day) | Peak Factor | Leakage (L/prop/day) | Average Demand (L/s) | Peak Demand (L/s) |
|---|---|---|---|---|---|---|
| *Holmes Block* | 1,150 | 2,906 | 1.64 | 88 | 39.85 | 64.61 |
| *Skellerup Block* | 950 | 2,906 | 1.64 | 88 | 32.92 | 53.37 |

- A summary of the water source current capacity in Rolleston is provided in Table 2.2.

Table 2.2 Rolleston Water Resource - Current Capacity

| Sites Available | Well | Capacity (L/s) |
|---|---|---|
| *Izone* | 1 | 63 |
| | 2 | 55 (throttled) |
| | 3 | 60 |
| | 4 | 60 |
| *Moore Street* | *1* | 55 |
| | *2* | 50 |
| *Overbury* | *1* | 42 |
| *Helpet* | *1* | 60 |
| | *2* | 40 |

# 3 Water Supply Infrastructure Recommendations

## 3.1 Impact of Holmes and Skellerup Developments on Current Network

The hydraulic assessment for the current Rolleston supply is show in Figure 3-1 and Figure 3-2.

Both developments would be supplied from existing well sites such as Izone, Helpet and Moore Street, with new wells planned to accommodate future demand at these preferred sites as well new well sites proposed for McLenaghan Road and Dalwood Crescent. It is important to mention that current and future well capacity is available to service the developments.

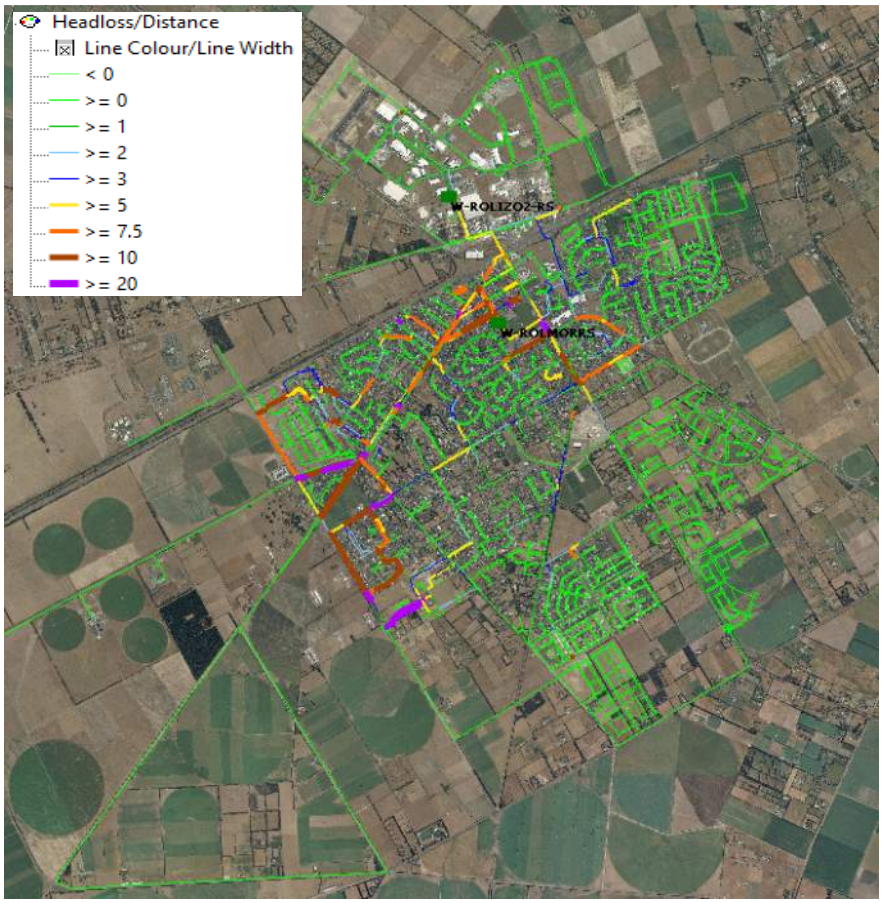



*Figure 3-1: Headlosses (m/km) in Rolleston Water Supply network*

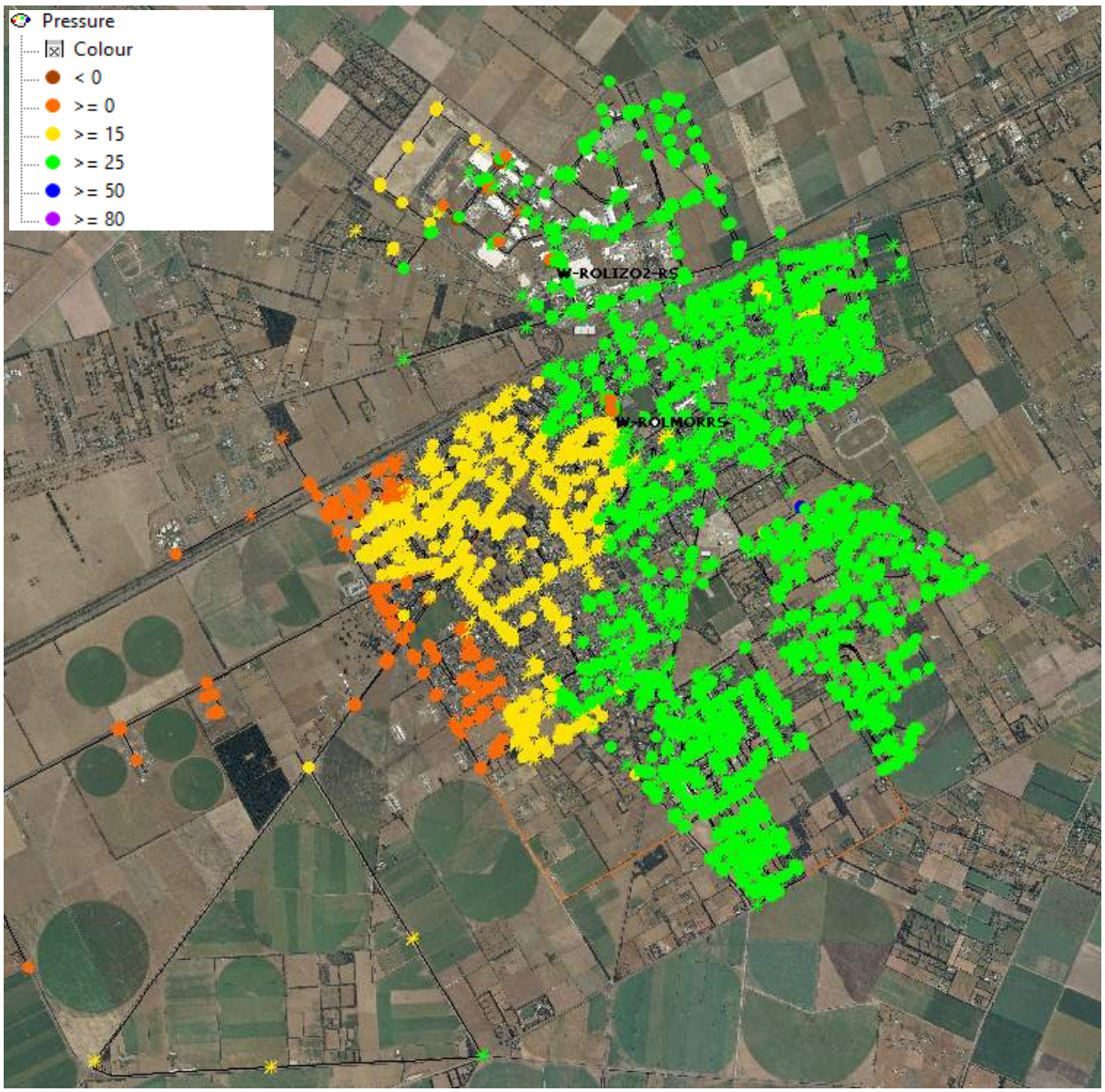



*Figure 3-2: Minimum pressure (m) in Rolleston Water Supply network*

Figure 3-1 and Figure 3-2 highlight low levels of service (LoS) in some areas of the network once the Holmes and Skellerup developments are connected to the network. This is because the existing pipes are required to deliver a higher flow than designed for, resulting in low pressure and high headlosses in parts of the network.

Two options were considered to improve the LoS when supplying the new developments:

- Option 1: Local pipe upgrades and utilise the current available sources
- Option 2: New wells located

## 3.2 Option 1: Local Upgrades

A high-level hydraulic assessment was carried out to ensure the network can deliver levels of service to the developments.

This option involves supplying water from the east side of the network, where there is enough well capacity to meet the demand. Infrastructure upgrades would be required along Burnham School Road, Brookside Road, Dunns Crossing Road, and Selwyn Road.

Figure 3-3 shows the network upgrades required to meet LoS with both developments connected to the network:

- Pipe upgrades along Brookside Rd and Burham School Rd. This helps supplying the Holmes Block development from the East side of the network.

- New pipe network along Selwyn Rd and Dunns Crossing Rd, connecting the Skellerup Block development to the east side of the network.

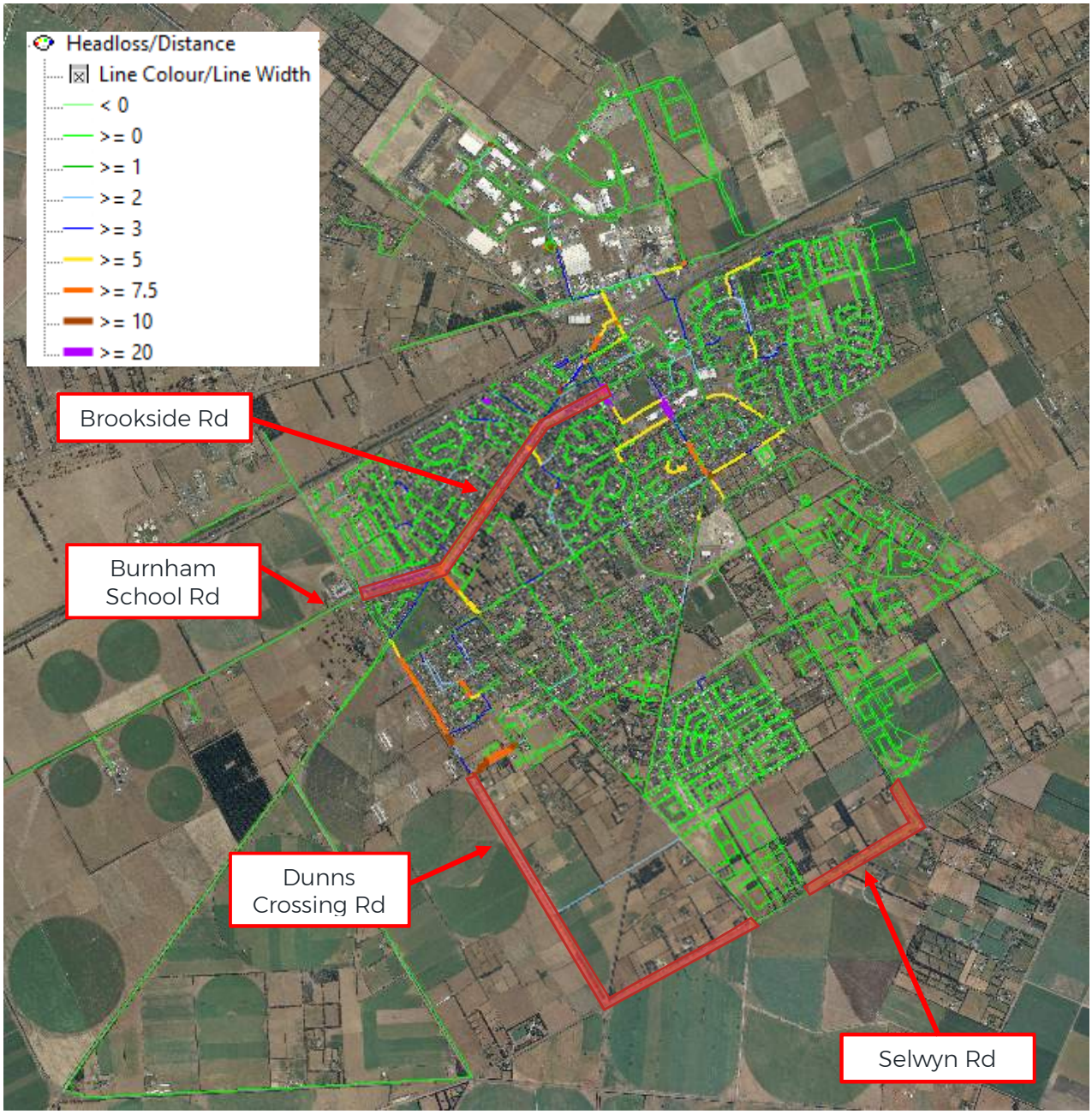



*Figure 3-3: Headlosses (m/km) in Rolleston Water Supply network after upgrades are in place*

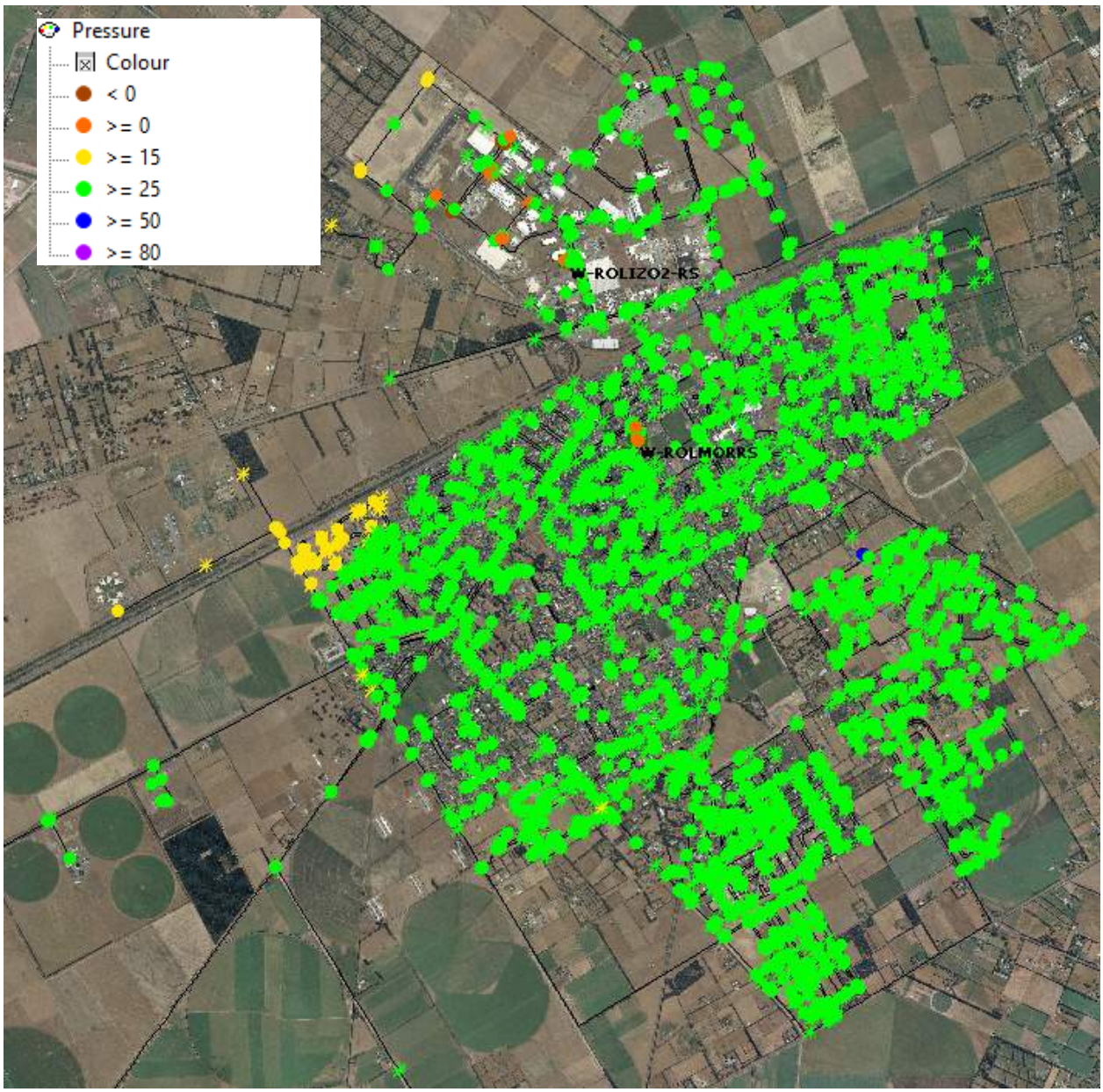



*Figure 3-4: Minimum pressure (m) in Rolleston Water Supply Network after upgrades are in place*

## 3.3 Option 2: Install New Well within the west side of the Rolleston network

SDC are currently reviewing and updating the water supply master plan which considers new well sites and trunk mains to service the development areas and improve network resilience. WSP understands that a future well will be available at McLenaghan Road. The current estimated yield will not be enough to accommodate the new developments. However, there could be potential for a new well site to be developed within the local development area, reducing the need for some pipe upgrades.

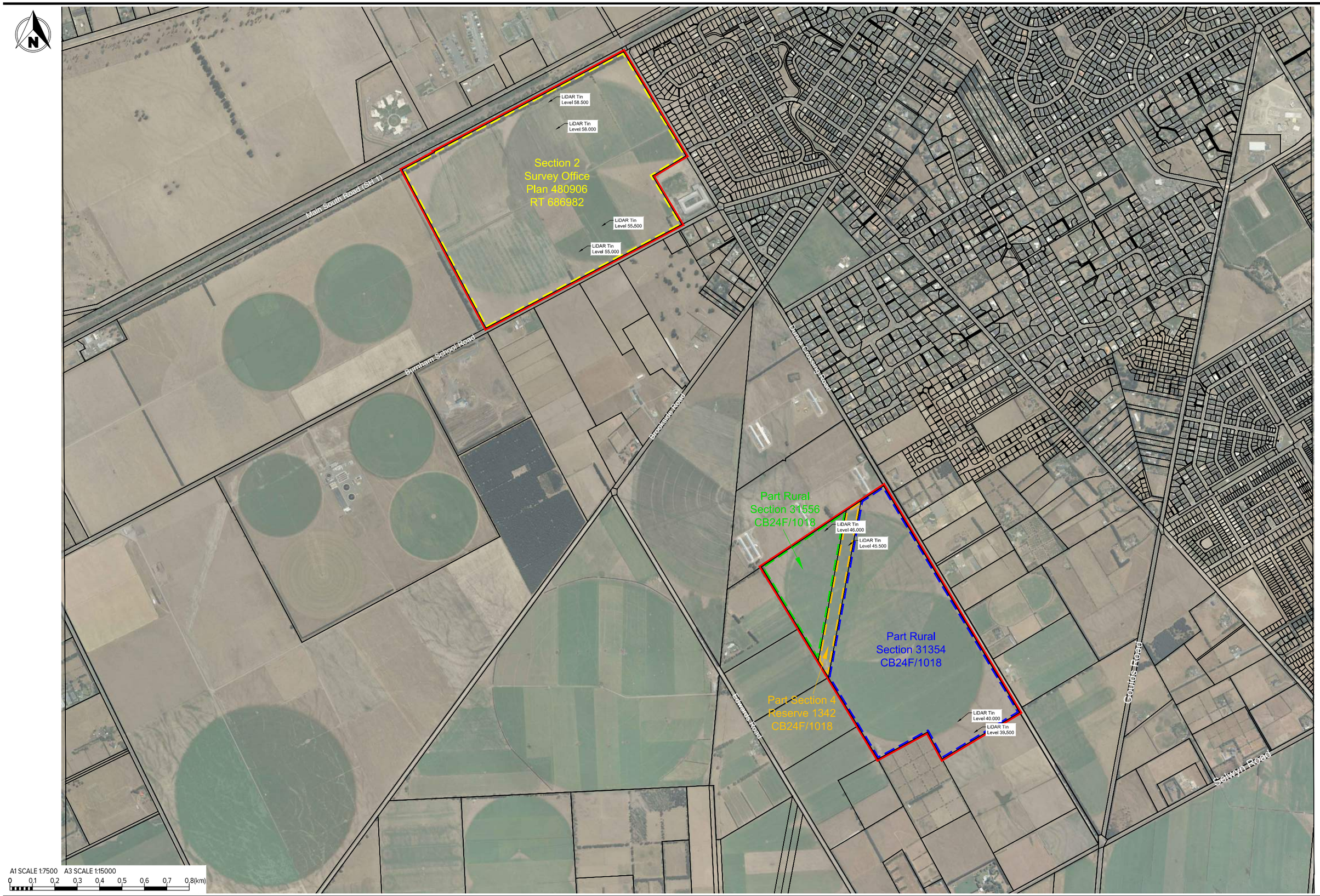
# 4 Limitations

This memorandum had the following limitations:

- This assessment has only considered the existing water supply network operation with the additional demand from the proposed development. It does not account for any future neighbouring developments and their impact on the water supply network.
- This assessment has not considered any Fire Flow requirements.
- This assessment has not considered the localised pipework within the development. The internal development pipework will need to be designed accordingly to accommodate peak day / hour demand.

| Prepared by: | Reviewed by: | Approved for Release by: |
|---|---|---|
| | | |
| **Belen Rada**, Engineer - Water | **Estelle Boivin**, Principal Hydraulic Modeller | **Dan Johnson**, Project Director |

# APPENDIX C | LiDAR CONTOUR PLANS

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Date 03.11.20

Client **ROLLESTON WEST RESIDENTIAL LIMITED**

Project **ROLLESTON WEST PLAN CHANGE**

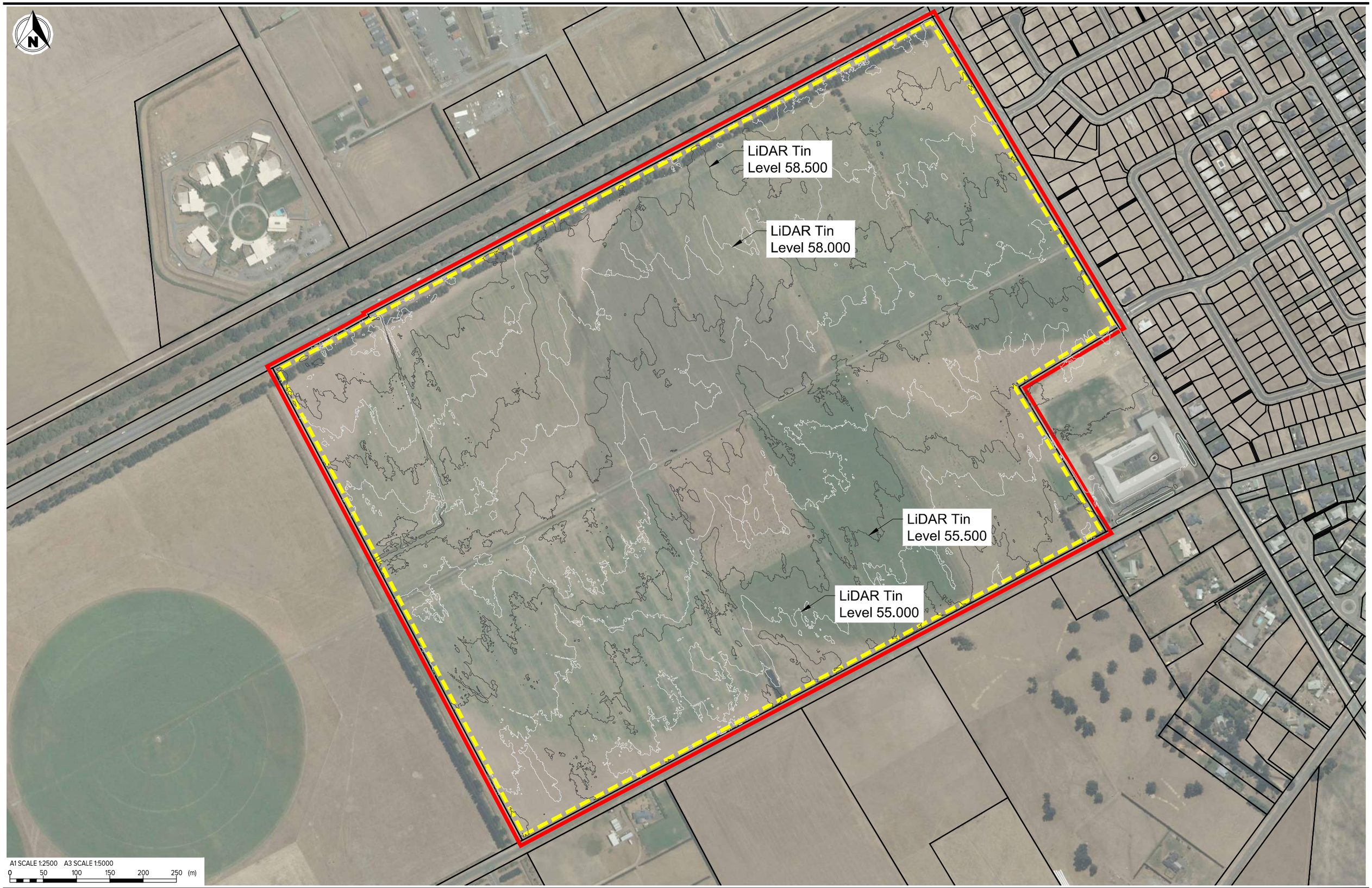
Drawing Title **EXISTING TITLES**

Status **FOR INFORMATION**
NOT FOR CONSTRUCTION

Drawing No. **14720-E-200**

Rev A

FILE: O:\1. Projects\DS14700\14720 - Rolleston West Plan Change\05 Information Management\01 Survey\07 CAD\14720-E-200 Base Plan.dwg PLOTTED: 12/11/2020 11:45:35 am BY: Tim McLeod

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Client: **ROLLESTON WEST RESIDENTIAL LIMITED**

Project: **ROLLESTON WEST PLAN CHANGE**

Drawing Title: **HOLMES BLOCK LIDAR CONTOURS**

Status: **FOR INFORMATION**
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Drawing No. **14720-E-201**
Rev A

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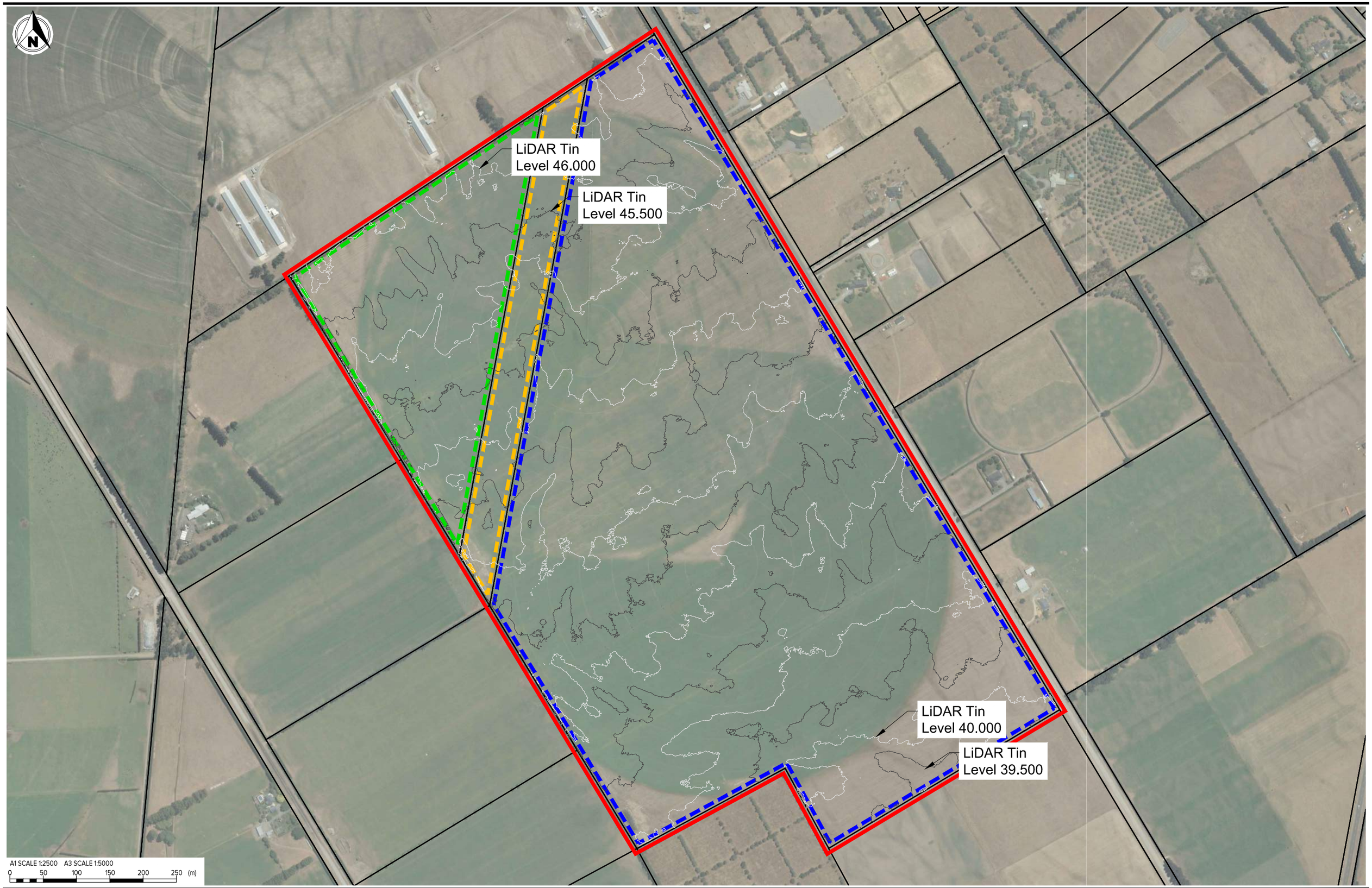


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Date 03.11.20

Client **ROLLESTON WEST RESIDENTIAL LIMITED**

Project **ROLLESTON WEST PLAN CHANGE**

Drawing Title **SKELLERUP BLOCK LIDAR CONTOURS**

Status **FOR INFORMATION**
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Drawing No. **14720-E-202**
Rev A

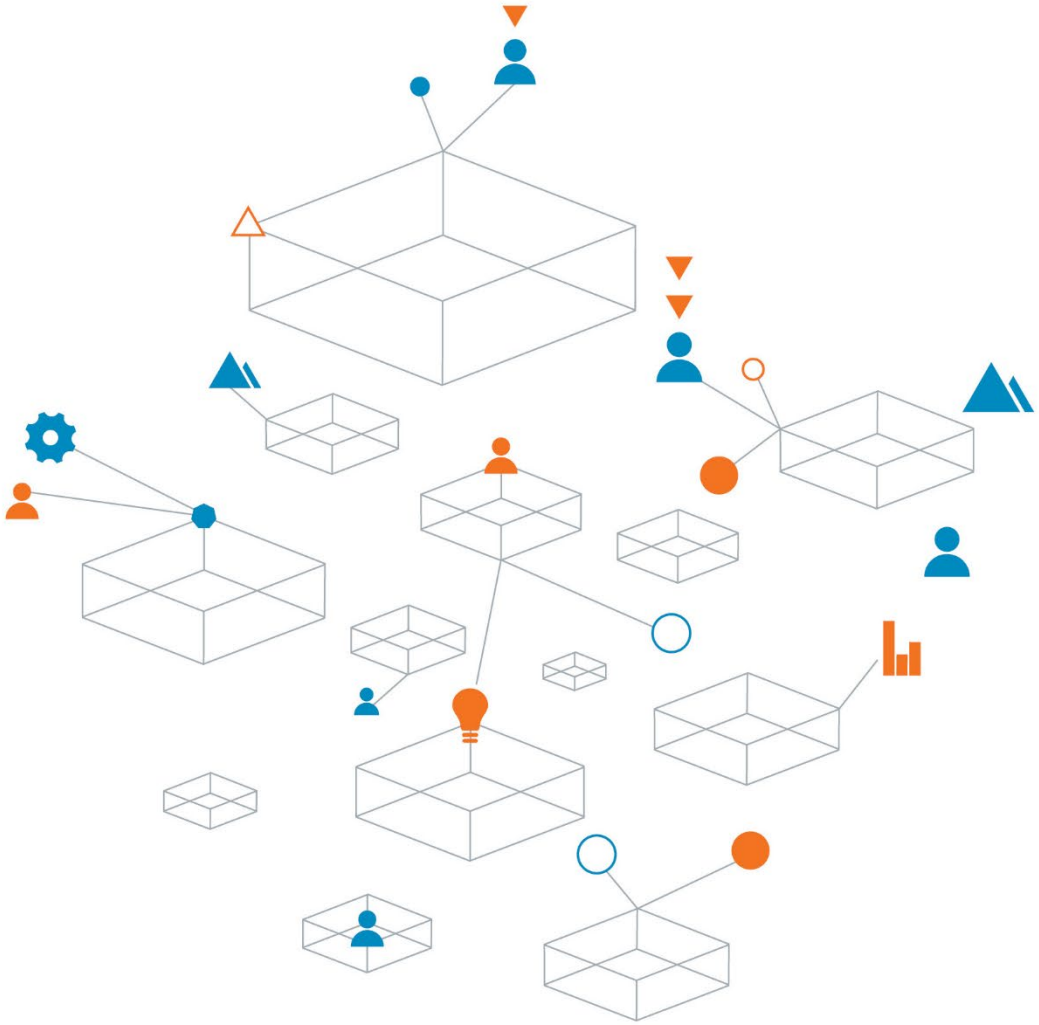
FILE: O:\1. Projects\DS14700\14720 - Rolleston West Plan Change\05 Information Management\01 Survey\07 CAD\14720-E-200 Base Plan.dwg PLOTTED: 12/11/2020 11:24:24 am BY: Tim McLeod

# Appendix B

# Geotechnical Assessment

# Rolleston West Residential Ltd
# Rolleston West Plan Change
## 773-CHCGE281253
Geotechnical Assessment Report

9 November 2020



Trust is the cornerstone of all our projects

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1/254 Montreal Street
Christchurch Central City
8013 New Zealand

t: +64 3 374 9600
f: +64 3 374 9601
coffey.com

9 November 2020

Our ref: 773-CHCGE281253

Rolleston West Residential Ltd
ASB House, 166 Cashel Street
Christchurch Central

Attention: Tim Carter / Bruce Van Duyn

**Executive Summary: Rolleston West – Geotechnical Assessment to support a Plan Change application**

Rolleston West Residential Ltd has engaged Coffey Services (NZ) Limited to carry out a geotechnical investigation and assessment of suitability for the proposed Plan Change and future subdivision of the Holmes and Skellerup Blocks in Rolleston, Canterbury. The purpose of this report is to support a Plan Change application for the construction of approximately 2,100 new residential Lots at the site.

The site investigations and preliminary liquefaction assessment indicates that the site is TC1-like. Other geotechnical hazards (erosion, slippage and inundation) are considered low to very low risk with appropriate future engineering design.

Our assessment has considered the items required by Section 106 of the RMA and in our opinion the site is considered geotechnically suitable for Plan Change and future subdivision. Further investigations and design will need to be carried out at the subdivision consent stage.

If you have any queries, please contact the undersigned.

For and on behalf of Coffey

**Chris Thompson**
**BSc (Tech)**
Associate Engineering Geologist

# Rolleston West Plan Change

Prepared for
Rolleston West Residential Ltd
ASB House, 166 Cashel Street
Christchurch Central

Prepared by
Coffey Services (NZ) Limited
1/254 Montreal Street
Christchurch Central City
8013 New Zealand
t: +64 3 374 9600  f: +64 3 374 9601
NZBN 9429033691923

9 November 2020

773-CHCGE281253

## Quality information

## Revision history

| Revision | Description | Date | Originator | Reviewer | Approver |
|---|---|---|---|---|---|
| V1 | GAR | 09/11/2020 | CT | RB | CT |
| V0 | GAR | 05/11/2020 | CT | RB | CT |

## Distribution

| Report Status | No. of copies | Format | Distributed to | Date |
|---|---|---|---|---|
| Final | 1 | PDF | Bruce Van Duyn – Rolleston West Residential | 09/11/2020 |

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## Tables


Table 1: Holmes Hub Block existing investigation data

Table 2: Skellerup Block existing investigation data

Table 3: Holmes Block ground profile

Table 4: Skellerup Block ground profile


## Appendices


Appendix A - Site Plan

Appendix B - Test Pit logs

# 1. Introduction

Rolleston West Residential Ltd has engaged Coffey Services (NZ) Limited to carry out a geotechnical investigation and assessment of suitability for a proposed Plan Change and future subdivision of the Holmes and Skellerup Blocks, referred to as the "site", in Rolleston, Canterbury. The purpose of this report is to support a Plan Change application for the construction of approximately 2,100 new residential Lots at the site.

Our assessment has considered the items required by Section 106 of the RMA. In our opinion the site is considered geotechnically suitable for subdivision subject to further investigation and design at the subdivision consent stage.

# 2. Scope

A scope of assessment work for the approximately 160 Ha total area of the site was developed and carried out by Coffey, as outlined below:

- Review of previous geotechnical investigations including previous work on the site and surrounding area.
- Site walkovers to assess geotechnical hazards.
- Assessment of the geotechnical hazards at the site per Section 106 of the RMA.
- Geotechnical analyses and reporting.

Coffey have considered the following in the preparation of this report:

- Existing geotechnical investigation data available from the New Zealand Geotechnical Database (NZGD).
- Project correspondence with the wider Plan Change consultants engaged by Rolleston West Residential Ltd.

Reference has also been made to the MBIE Guidance Part D: Subdivisions, to confirm that the requirements outlined in these documents have been incorporated in this report.

# 3. Proposed development

The proposed Plan Change area comprises four land parcels totalling approximately 160 Ha located to the west of Rolleston, bordering the existing township. The Plan Change area is split into two blocks; the Holmes Block, bordered by State Highway 1, Dunns Crossing Road and Burnham School Road and the Skellerup Block, which is located to the west of Dunns Crossing Road.

The Holmes Block has a gentle slope to the southeast. An existing water race is located in the northwestern corner of the site and the West Rolleston Primary School is located in the southeastern corner. The site was used for forestry until the mid 2000's when it was converted to cropland.

The Skellerup Block also has a gentle slope to the south/southeast with a water race located along the western boundary. The site was used for forestry until the mid 2000's when it was converted to cropland.

# 4. Site investigation

The location of the geotechnical investigations carried out on the site to develop the ground models are provided in Figure 1 (in Appendix A) and are summarised below. Investigation logs are presented in Appendix B.

Table 1: Holmes Hub Block existing investigation data

| Reference | Depth of test (metres below ground level) | Termination criteria |
|---|---|---|
| TP H-1 | 1.5 | Target depth |
| TP H-2 | 1.4 | Target depth |
| TP H-3 | 1.4 | Target depth |

Table 2: Skellerup Block existing investigation data

| Reference | Depth of test (metres below ground level) | Termination criteria |
|---|---|---|
| TP S-1 | 1.4 | Target depth |
| TP S-2 | 1.5 | Target depth |
| TP S-3 | 1.4 | Target depth |
| TP_100580 | 2.1 | Effective refusal |

# 5. Site performance

## 5.1. Ground motion

The site is not in an area mapped for ground damage effects as part of the Canterbury Earthquake Sequence response. However, the nearby Rolleston School strong motion sensor recorded the following peak ground accelerations (PGA):

- 4 September 2010: 0.34g
- 22 February 2011: 0.18g
- Later 2011 earthquakes: <0.11g

Based on the above, we consider that the site was “sufficiently tested” to the serviceability limit state (SLS) level of earthquake demand during the 4 September 2010 earthquake of the Canterbury earthquake sequence (CES) using the MBIE[1] and Bradley & Hughes (2012)[2] procedures.

An assessment has been made regarding predicted earthquake-induced deformation that may occur in a design earthquake based on geological setting, site terrain, and the level of “test” previously experienced. It is considered that:

- An SLS earthquake event is likely to cause less damage to that experienced in the 4 September 2010 earthquake and to be similar to the February 2011 earthquake.

[1] Ministry of Business, Innovation and Employment (MBIE), December 2012: Repairing and rebuilding houses affected by the Canterbury earthquakes
[2] Bradley & Hughes (2012) Conditional Peak Ground Accelerations in the Canterbury Earthquakes for Conventional Liquefaction Assessment. Report for DBH (MBIE), April 2012.

- Under ultimate limit state (ULS) conditions, the nature of land and building damage is likely to be similar to that already experienced in the 4 September 2010 earthquake of the CES.

# 6. Ground model

## 6.1. Geology

The geological map[3] of the area indicates that the site is underlain by "Brownish-grey river alluvium (Q2a)."

## 6.2. Groundwater

Based on geotechnical investigations carried out for the nearby Stonebrook development, groundwater was encountered between 10.3m and 13.1mbgl. We consider these groundwater levels to be relatively consistent and representative of the general area.

## 6.3. Subsurface profile

A summary of the ground model for each block is provided below:

Table 3: Holmes Block ground profile

| Description | Strength/ consistency | Thickness (m) | Depth to top of layer (mbgl) |
|---|---|---|---|
| Silt (topsoil) | | 0.2 | 0.0 |
| Sandy Gravel, with minor silt lenses | Dense to very dense | >30 | 0.2 |

Table 4: Skellerup Block ground profile

| Description | Strength/ consistency | Thickness (m) | Depth to top of layer (mbgl) |
|---|---|---|---|
| Silt (topsoil) | | 0.2 to 0.4 | 0.0 |
| Sandy Gravel / gravelly Silt (grading to sandy Gravel) | Dense to very dense | >30 | 0.2 to 0.4 |

## 6.4. Site sub-soil class

In accordance with NZS1170.5, Section 3.1.3, a subsoil classification of "Class D – Deep or soft soil sites" can be assumed for the site.

[3] Forsyth, P.J.; Barrell, D.J.A.; Jongens, R. (compilers) 2008: Geology of the Christchurch area: scale 1:250,000. Lower Hutt: GNS Science. Institute of Geological & Nuclear Sciences 1:250,000 geological map 16. 67 p. + 1 folded map

# 7. Geotechnical hazard assessment

## 7.1. Erosion

The site has relatively flat topography and is bounded by newly developed residential areas as well as grassed paddock land. Provided appropriate stormwater systems are installed as part of the development, there will be few viable sources of erosion at this site.

## 7.2. Falling debris

As there are no slopes or exposed hills or rock faces surrounding the site, there are no sources of falling debris at the site, or for the surrounding area.

## 7.3. Subsidence

### 7.3.1. Liquefaction induced settlement

Saturated, loose, uniform fine grained alluvial soils are subject to seismic (liquefaction-induced) settlement during a significant earthquake. Liquefaction typically affects saturated, loose granular soils ranging from sandy silts to sands, but seismic shaking can also result in strength losses in fine-grained, cohesive soils. Liquefaction does not occur in dense, well-graded alluvial gravel soils that are present at this site.

Due to the dense nature of the gravel encountered, and the depth to groundwater (expected to be below 10m bgl), liquefaction risk is considered to be negligible for this project.

### 7.3.2. Static settlement

Settlement is a crucial factor that can cause structure serviceability issues. Static load-induced settlement typically occurs in low-lying areas underlain by soft, compressible soils as a result of increased overburden loads. As the site is underlain by dense river gravels, static settlement is not deemed a hazard for the site provided any earthworks are carried out to the relevant standards.

## 7.4. Slippage

We have not observed any sources of land instability on the site and due to the flat site topography, we consider the risk of slope failure to be very low. The appropriate design of batter slopes near waterways will mitigate this risk further.

## 7.5. Inundation

In relation to stormwater inundation, we recommend that drainage design and management at the site be addressed by specialist consultants as it is beyond the scope of this report. We expect that with appropriate stormwater and flood control systems, the risk of inundation will be low.

# 8. Conclusions

We consider that the site is suitable for development subject to further investigation and design at the subdivision consent stage. Based on the mapped geology and on-site testing carried out to date, the site is considered TC1-like.

Additional geotechnical investigation will be required to refine the ground model and address any geotechnical risks for the proposed Lots once a subdivision plan has been further developed.

# 9. Limitations

This report has been prepared solely for the use of our client, Rolleston West Residential Ltd, their professional advisers and Selwyn District Council (SDC) in relation to the specific project described herein. No liability is accepted in respect of its use for any other purpose or by any other person or entity.

It is recommended that all other parties seek professional geotechnical advice to satisfy themselves as to its on-going suitability for their intended use.

As subsurface information has been obtained from discrete investigation locations, which by their nature only provide information about a relatively small volume of subsoils, there may be special conditions pertaining to this site which have not been disclosed by the investigation and which have not been taken into account in the report. If variations in the subsoils occur from those described or assumed to exist, then the matter should be referred to us immediately.

Please also refer to the enclosed *Important Information about Your Coffey Report*.

# 10. Closure

If you have queries or require further clarification regarding aspects of this report, please contact the undersigned.

For and on behalf of Coffey

Prepared by

**Chris Thompson**
**BSc (Tech)**
Associate Engineering Geologist

Reviewed by

**Richmond Beetham**
**BSc MSc Eng BE CMEngNZ CPEng PEngGeol**
Principal Geotechnical Engineer

# Important information about your **Coffey** Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

## Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

## Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

## Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

## Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

## Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

## Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other project design professionals who are affected by the report. Have Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

## Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

## Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Coffey for information relating to geoenvironmental issues.

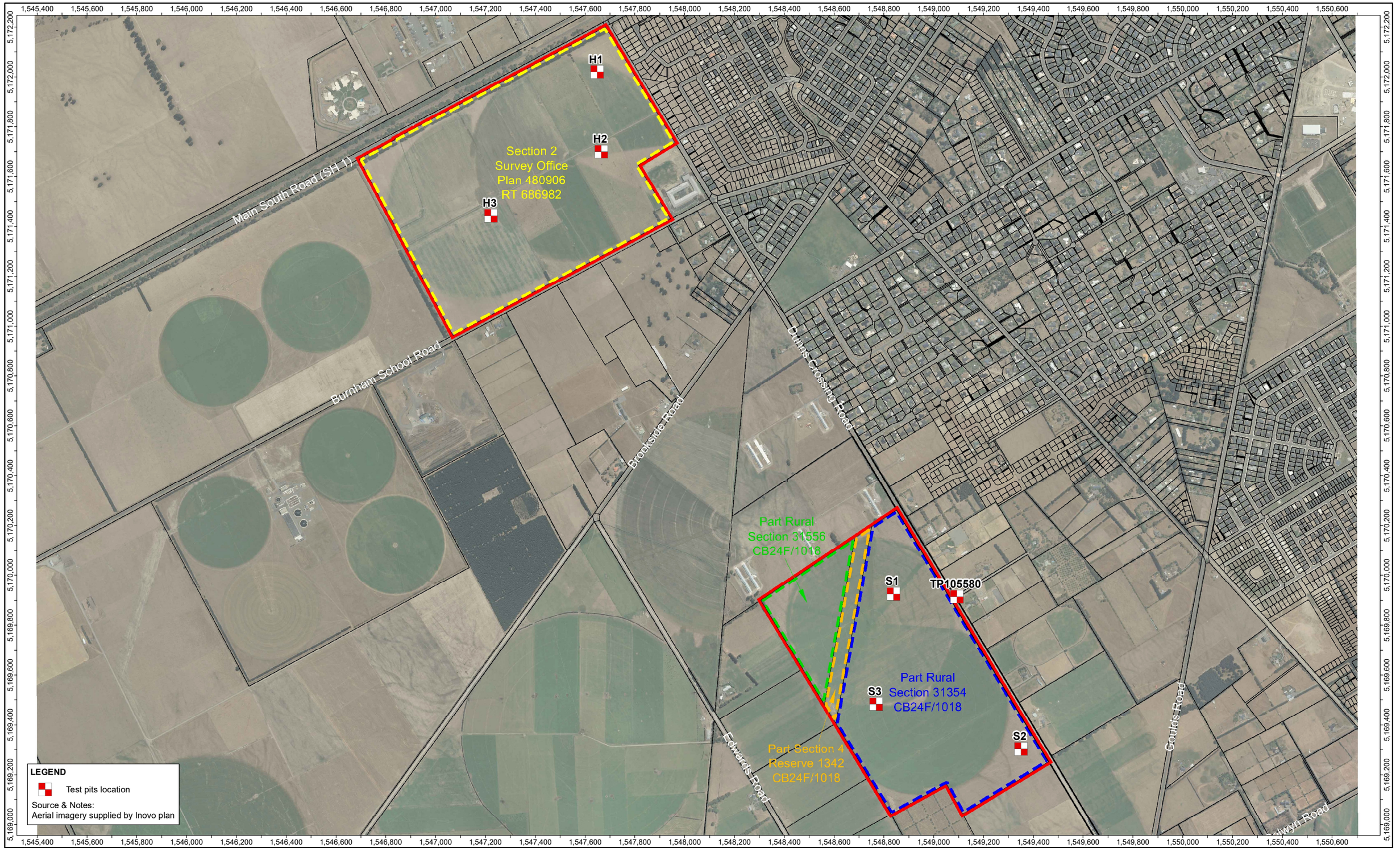
## Rely on Coffey for additional assistance

Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

## Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

# Appendix A - Site Plan

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| project: | ROLLESTON WEST PLAN CHANGE |
| title: | SITE INVESTIGATION PLAN |
| project no: | 773-CHCGE281253 |
| figure no: | 01 |
| rev: | A |

MXD ref: 281253_01_GIS001_1

# Appendix B - Test Pit logs

# Open Excavation Log

Test Pit No. **TP H-1**

**Connell Wagner Limited**
195 Hereford St. (PO Box 1061
Christchurch New Zealand
Telephone: +64 3 366 0821
Facsimile: +64 3 379 6955

| | | | |
|---|---|---|---|
| Client: Selwyn Plantation Board Ltd | Location (measured using hand held GPS): 1547696 , 5172033 | | Date: 12/09/2008 |
| Project: SPBL Rolleston Plan Change | Logged By: CG | Weather Conditions: cloudy & dry | Job Number: 36951-001 |

| Water | Depth (m) | Soil Symbol | FACE 1 — SOIL DESCRIPTION: Colour, structure, weathering, subordinate/ main / minor COMPONENTS. |
|---|---|---|---|
| | 0 | | Grass over sandy TOPSOIL, brown, moist. |
| | 0 – 1.5 | | Sandy GRAVEL with cobbles and minor boulders. Mid brown, medium to coarse grained, rounded, gap graded, near horizontal long-axis pebble alignment. Moist. |
| | 1.5 | | End of Test Pit at 1.5m (Target Depth) |

| Water | Depth (m) | Soil Symbol | FACE 2 — SOIL DESCRIPTION: Colour, structure, weathering, subordinate/ main / minor COMPONENTS. |
|---|---|---|---|
| | 0.5 | | |
| | 1 | | |
| | 1.5 | | |
| | 2 | | |
| | 2.5 | | |

Undrained Shear Strength (kPa) ●
Measured Using a Hand Held Shear Vane[1]
25 50 75 100 125 150

Scala Penetrometer Test[2] ×
(Blows/ 150mm)
2 4 6 8 10 12

Test Description
1 - Hand held shear vane test in accordance with BS1377:1990
2 - Scala Penetrometer Test in accordance with NZS4402:1986 for the first three meters

Notes
Groundwater not encountered
Soak test undertaken and reported separately

Pit dimensions
1.0m
2.2m

Connell Wagner

# Open Excavation Log

Test Pit No. **TP H-2**

**Connell Wagner Limited**
195 Hereford St. (PO Box 1061
Christchurch New Zealand

Telephone: +64 3 366 0821
Facsimile: +64 3 379 6955

| | | | |
|---|---|---|---|
| Client: Selwyn Plantation Board Ltd | Location (measured using hand held GPS): 1547734, 5171797 | | Date: 12/09/2008 |
| Project: SPBL Rolleston Plan Change | Logged By: CG | Weather Conditions: cloudy & dry | Job Number: 36951-001 |

| Water | Depth (m) | Soil Symbol | FACE 1 — SOIL DESCRIPTION: Colour, structure, weathering, subordinate/ main / minor COMPONENTS. |
|---|---|---|---|
| | 0 | | Grass over silty TOPSOIL, brown, moist. |
| | 0.5 | | Sandy GRAVEL with cobbles and minor boulders. Mid brown, medium to coarse grained, rounded, gap graded, near horizontal long-axis pebble alignment. Moist. |
| | 1 | | |
| | 1.5 | | End of Test pit at 1.4m (Target depth) |
| | 2 | | |
| | 2.5 | | |

| Water | Depth (m) | Soil Symbol | FACE 2 — SOIL DESCRIPTION: Colour, structure, weathering, subordinate/ main / minor COMPONENTS. |
|---|---|---|---|
| | 0 | | |
| | 0.5 | | |
| | 1 | | |
| | 1.5 | | |
| | 2 | | |
| | 2.5 | | |

Undrained Shear Strength (kPa) ●
Measured Using a Hand Held Shear Vane[1]
25 50 75 100 125 150

Scala Penetrometer Test[2] ×
(Blows/ 150mm)
2 4 6 8 10 12

Test Description
1 - Hand held shear vane test in accordance with BS1377:1990
2 - Scala Penetrometer Test in accordance with NZS4402:1986 for the first three meters

Notes
Groundwater not encountered
Soak test undertaken and reported separately

Pit dimensions
1.0m
2.0m

# Open Excavation Log

Test Pit No. **TP H-3**

**Connell Wagner Limited**
195 Hereford St. (PO Box 1061
Christchurch New Zealand
Telephone: +64 3 366 0821
Facsimile: +64 3 379 6955

| | | | |
|---|---|---|---|
| Client: Selwyn Plantation Board Ltd | Location (measured using hand held GPS): 1547283, 5171554 | | Date: 12/09/2008 |
| Project: SPBL Rolleston Plan Change | Logged By: CG | Weather Conditions: cloudy & dry | Job Number: 36951-001 |

| Water | Depth (m) | Soil Symbol | FACE 1 — SOIL DESCRIPTION: Colour, structure, weathering, subordinate/ main / minor COMPONENTS. |
|---|---|---|---|
| | 0 | | Grass over silty TOPSOIL, brown, moist. |
| | 0.5 | | Sandy GRAVEL with cobbles and minor boulders. Mid brown, medium to coarse grained, rounded, gap graded, near horizontal long-axis pebble alignment. Moist. |
| | 1 | | |
| | 1.5 | | End of Test pit at 1.4m (Target depth) |
| | 2 | | |
| | 2.5 | | |

| Water | Depth (m) | Soil Symbol | FACE 2 — SOIL DESCRIPTION: Colour, structure, weathering, subordinate/ main / minor COMPONENTS. |
|---|---|---|---|
| | 0 | | |
| | 0.5 | | |
| | 1 | | |
| | 1.5 | | |
| | 2 | | |
| | 2.5 | | |

Undrained Shear Strength (kPa) ●
Measured Using a Hand Held Shear Vane[1]
25 50 75 100 125 150

Scala Penetrometer Test[2] ×
(Blows/ 150mm)
2 4 6 8 10 12

Test Description
1 - Hand held shear vane test in accordance with BS1377:1990
2 - Scala Penetrometer Test in accordance with NZS4402:1986 for the first three meters

Notes
Groundwater not encountered
Soak test undertaken and reported separately

Pit dimensions
1.0m
2.1m

Connell Wagner

# Open Excavation Log

Test Pit No. **TP S-1**

**Connell Wagner Limited**
195 Hereford St. (PO Box 1061
Christchurch New Zealand
Telephone: +64 3 366 0821
Facsimile: +64 3 379 6955

| | | | |
|---|---|---|---|
| Client: Selwyn Plantation Board Ltd | Location (measured using hand held GPS): 1548839, 5169926 | | Date: 12/09/2008 |
| Project: SPBL Rolleston Plan Change | Logged By: CG | Weather Conditions: cloudy & dry | Job Number: 36951-001 |

| Water | Depth (m) | Soil Symbol | FACE 1 — SOIL DESCRIPTION: Colour, structure, weathering, subordinate/ main / minor COMPONENTS. |
|---|---|---|---|
| | 0 | | Grass over silty TOPSOIL, brown, moist with large tree roots. |
| | 0.5 | | Gravelly SILT with cobbles and minor clay and boulders. Light brown, cohesive. Gravel is medium to coarse grained, rounded, gap graded, near horizontal long-axis pebble alignment. Moist. Large tree roots in the upper part. |
| | 1 | | |
| | 1.5 | | End of Test pit at 1.4m (Target depth) |
| | 2 | | |
| | 2.5 | | |

| Water | Depth (m) | Soil Symbol | FACE 2 — SOIL DESCRIPTION: Colour, structure, weathering, subordinate/ main / minor COMPONENTS. |
|---|---|---|---|
| | 0 | | |
| | 0.5 | | |
| | 1 | | |
| | 1.5 | | |
| | 2 | | |
| | 2.5 | | |

Undrained Shear Strength (kPa) ●
Measured Using a Hand Held Shear Vane[1]
25 50 75 100 125 150

Scala Penetrometer Test[2] ×
(Blows/ 150mm)
2 4 6 8 10 12

Test Description
1 - Hand held shear vane test in accordance with BS1377:1990
2 - Scala Penetrometer Test in accordance with NZS4402:1986 for the first three meters

Notes
Groundwater not encountered
Soak test undertaken and reported separately

Pit dimensions
1.0m
2.0m

# Open Excavation Log

Test Pit No. **TP S-2**

**Connell Wagner Limited**
195 Hereford St. (PO Box 1061
Christchurch New Zealand
Telephone: +64 3 366 0821
Facsimile: +64 3 379 6955

| | | | |
|---|---|---|---|
| Client: Selwyn Plantation Board Ltd | Location (measured using hand held GPS): 1549448, 5169261 | | Date: 12/09/2008 |
| Project: SPBL Rolleston Plan Change | Logged By: CG | Weather Conditions: cloudy & dry | Job Number: 36951-001 |

Undrained Shear Strength (kPa) ●
Measured Using a Hand Held Shear Vane[1]
25 50 75 100 125 150
Scala Penetrometer Test[2] ×
(Blows/ 150mm)
2 4 6 8 10 12

| Water | Depth (m) | Soil Symbol | FACE 1 — SOIL DESCRIPTION: Colour, structure, weathering, subordinate/ main / minor COMPONENTS. |
|---|---|---|---|
| | 0 | | Grass over silty TOPSOIL, with large tree roots up to 60mm diameter, brown, moist. |
| | 0.5 | | Gravelly SILT with boulders and minor clay. Light brown, cohesive. Gravel is medium to coarse grained, rounded, gap graded, near horizontal long-axis pebble alignment. Moist. Large tree roots in the upper part. |
| | 1 | | |
| | 1.5 | | End of Test pit at 1.5m (Target depth) |
| | 2 | | |
| | 2.5 | | |

| Water | Depth (m) | Soil Symbol | FACE 2 — SOIL DESCRIPTION: Colour, structure, weathering, subordinate/ main / minor COMPONENTS. |
|---|---|---|---|
| | 0 | | |
| | 0.5 | | |
| | 1 | | |
| | 1.5 | | |
| | 2 | | |
| | 2.5 | | |

Test Description
1 - Hand held shear vane test in accordance with BS1377:1990
2 - Scala Penetrometer Test in accordance with NZS4402:1986 for the first three meters

Notes
Groundwater not encountered
Soak test undertaken and reported separately

Pit dimensions
1.0m
1.9m

Connell Wagner

**Connell Wagner Limited**
195 Hereford St. (PO Box 1061
Christchurch New Zealand

Telephone: +64 3 366 0821
Facsimile: +64 3 379 6955

# Open Excavation Log

Test Pit No. **TP S-3**

| | | | |
|---|---|---|---|
| Client: Selwyn Plantation Board Ltd | Location (measured using hand held GPS): 1548668, 5169475 | | Date: 12/09/2008 |
| Project: SPBL Rolleston Plan Change | Logged By: CG | Weather Conditions: cloudy & dry | Job Number: 36951-001 |

| Water | Depth (m) | Soil Symbol | FACE 1 — SOIL DESCRIPTION: Colour, structure, weathering, subordinate/ main / minor COMPONENTS. |
|---|---|---|---|
| | 0 | | Grass over silty TOPSOIL, with large tree roots up to 60mm diameter, brown, moist. |
| | 0.5 | | Silty Sandy GRAVEL with minor cobbles yellowish brown, rounded, gap graded, near horizontal long-axis pebble alignment. Sand is angular. Moist. Large tree roots in the upper part. |
| | 1 | | |
| | 1.5 | | End of Test pit at 1.4m (Target depth) |
| | 2 | | |
| | 2.5 | | |

| Water | Depth (m) | Soil Symbol | FACE 2 — SOIL DESCRIPTION: Colour, structure, weathering, subordinate/ main / minor COMPONENTS. |
|---|---|---|---|
| | 0 | | |
| | 0.5 | | |
| | 1 | | |
| | 1.5 | | |
| | 2 | | |
| | 2.5 | | |

Undrained Shear Strength (kPa) ●
Measured Using a Hand Held Shear Vane[1]
25 50 75 100 125 150

Scala Penetrometer Test[2] ×
(Blows/ 150mm)
2 4 6 8 10 12

Test Description
1 - Hand held shear vane test in accordance with BS1377:1990
2 - Scala Penetrometer Test in accordance with NZS4402:1986 for the first three meters

Notes
Groundwater not encountered
Soak test undertaken and reported separately

Pit dimensions
1.0m
2.0m

NZGD ID: TP_100580

Soil&Rock Consultants
For well-grounded solutions

CLIENT: Myall & Thurlow Consultants Ltd

PROJECT: Geotechnical Investigation, Dunns Crossing Subdivision, Rolleston

Auger Hole No: TP15

Sheet 1 of 1

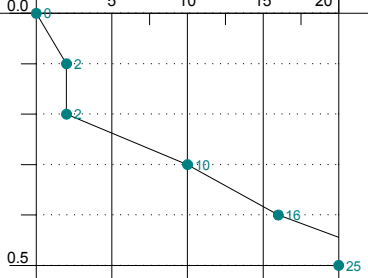
| | | | | | |
|---|---|---|---|---|---|
| Drill Type: | 6 Tonne Excavator | Project No: | C17231 | Logged By: | MG |
| Drilled By: | R A Shearing Contractors Ltd | Coordinates: | 1549094 E, 5169931 N | Reviewed By: | TK |
| Date Started: | 12/10/17 | Ground Elevation: | 42m | Surface Conditions: | Near Level, Grass |
| Date Finished: | 13/10/17 | Water Level: | Groundwater not encountered | Shear Vane Number: | N/A |

| STRATIGRAPHY | DEPTH (m) | GRAPHIC LOG | Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use" |
|---|---|---|---|
| TOPSOIL | 0.0 | | SILT, trace fine sand, dark brown. Very soft to soft, moist, non-plastic. (TOPSOIL) |
| ALLUVIAL DEPOSITS | 0.5 | | Silty fine to coarse sub-rounded to rounded GRAVEL, light brownish grey. Dense to very dense, moist. (ALLUVIAL DEPOSITS) |
| | 1.0 | | Fine to coarse sandy fine to coarse sub-rounded to rounded GRAVEL, brownish grey. Dense to very dense, moist to wet. |
| | | | Wet. |
| | 1.5 | | Trace sub-rounded to rounded boulder. |
| | 2.0 | | END OF BORE. 2.10 METRES. TOO DENSE TO EXCAVATE |
| | 2.5 | | |
| | 3.0 | | |

WATER LEVEL (m)

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

(Blows per 100mm Increment)




Comments

HAND AUGER WITH SCALA CHCH LOG C17231_TP01-TP20_12-11-2017_DRAFT.GPJ S+R_2012-AGS - REVISED.GDT 8/11/17

Unit 11, 114 Sawyers Arms Road, Christchurch 8542. Phone 03 352 4519

www.soilandrock.co.nz

NZGD ID: TP_100580

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# Appendix C

# Preliminary Site Investigation (PSI) Report

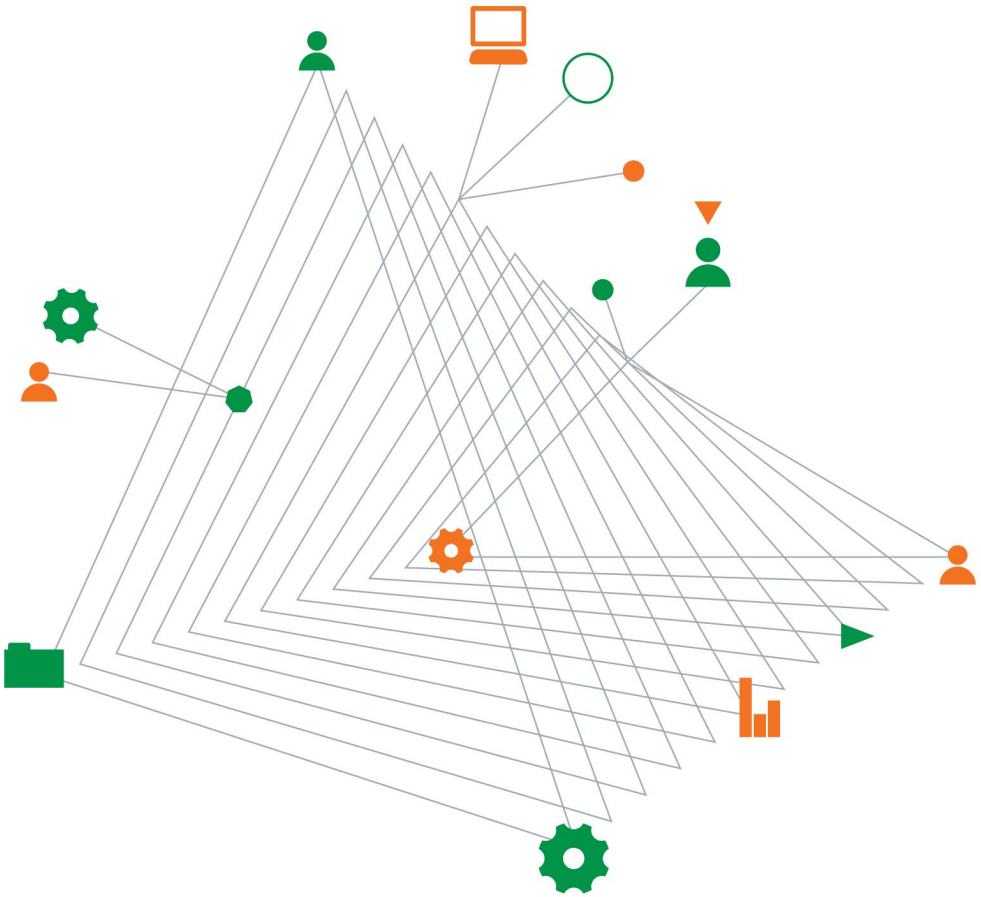
coffey
A TETRA TECH COMPANY

**Rolleston West Residential Ltd**

**Rolleston West Plan Change**

# Preliminary Site Investigation

9 November 2020



Experience
comes to life
when it is
powered by
expertise

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# Preliminary Site Investigation - Rolleston West Plan Change

Prepared for
Rolleston West Residential Ltd

Prepared by
Coffey Services (NZ) Limited
1/254 Montreal Street
Christchurch Central City
8013 New Zealand
t: +64 3 374 9600 f: +64 3 374 9601

NZBN: 9429033691923

9 November 2020

773-CHCGE281253

## Quality information

### Revision history

| Revision | Description | Date | Originator | Reviewer | Approver |
|---|---|---|---|---|---|
| V1 | Final | 9/11/2020 | Alistair Brown | Ray Mayor | David Tully |
| v0 draft | Original Draft | 4/11/2020 | Alistair Brown | Ray Mayor | David Tully |

### Distribution

| Report Status | No. of copies | Format | Distributed to | Date |
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| Final | 1 | PDF | Rolleston West Residential Ltd | 9/11/2020 |

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Important information about your Coffey Report

## Tables

Table 1: Site information

Table 2: Identified actual or potential HAIL activities

## Figures

Figure 1: Site investigation plan

## Appendices

Appendix A – Selected historical aerial photographs

# 1. Introduction

Coffey Services (NZ) Limited (Coffey) has been commissioned by Rolleston West Residential Ltd ('the client') to conduct a Preliminary Site Investigation (PSI) to support the proposed Rolleston West Plan Change and future subdivision for the properties located off Dunns Crossing Road, Rolleston, Canterbury.

The proposed Plan Change area comprises two land parcels (the "site", Figure 1) herein referred to as Holmes Block and Skellerup Block located on the western side of the Rolleston Township.

The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) (NESCS) Regulations apply to selected activities on sites where an activity or industry on the Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL) is, has, or is more likely than not to have occurred. The purpose of this PSI was to assess the potential for contaminants to have been deposited at the site as a result of current and/or historical activities undertaken within or in the immediate vicinity of the site and accordingly determine if any further investigation work is required under the NES.

This PSI report has been reviewed by a Suitably Qualified and Experienced Practitioner (SQEP), as required by the NES.

## 1.1. Objectives

The objectives of this PSI were to:

- Identify potentially contaminating (HAIL) activities or potential sources of contamination that might have occurred or exist at the site.
- Confirm the suitability of the land for subdivision and provide recommendations regarding additional works required prior to any future development.

## 1.2. Scope of works

The scope of work was undertaken in general accordance with the staged process defined by the Ministry for Environment (MfE) Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils (revised 2011) and the findings are presented in accordance with the MfE Contaminated Land Management Guideline No.1: Reporting on Contaminated Sites in New Zealand (revised 2011). Both the above documents are incorporated by reference into the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES).

In summary, the following scope of works was undertaken:

- Review of Environment Canterbury's Listed Land-Use Register (LLUR) for the site.
- Review of published geological maps and the Coffey database to appraise likely soil and groundwater conditions at the site.
- Review of selected publicly available aerial photographs or other accessible historical photographs.
- Site walkover, focussed on areas with structures or visible land disturbance to consider land contamination indicators (e.g. visual evidence of waste dumping/material spills, chemical storage and/or usage areas, anomalous die-back in vegetation, ground staining).

- Preparation of this PSI report. As required by the NESCS, this report was reviewed and approved by a suitably qualified and experienced practitioner (SQEP).

# 2. Site information

## 2.1. Site description

The Holmes and Skellerup Blocks are both rectangular in shape with predominately flat topography, situated approximately 2 km south-west of the central Rolleston township and approximately 24 km south-west of Christchurch's central business district. Details of the two blocks are listed in Table 1 and their locations are shown on Figure 1.

Holmes Block is bordered by agricultural land-use south-west, Main South Road north-west, Dunns Crossing Road and West Rolleston School north-east and Burnham School Road to the south-east.

Skellerup Block is bordered by agricultural land-use north-west, south-west and south-east and Dunns Crossing Road to the north-east.

Table 1: Site information

| Address | Legal Description | Property Area (Hectares) |
|---|---|---|
| Holmes Block - Dunns Crossing Road, Burnham | Section 2 SO 480906 | 87.53 |
| Skellerup Block - Dunns Crossing Road, Rolleston | Part RS 31356, Part Section 4 RES 1342, Part RS 31354 | 72.69 |

## 2.2. Geology and hydrogeology

The geology of the site is shown on the Institute of Geological and Nuclear Sciences (GNS) geological map sheet 21: Christchurch, scale 1:250,000. The map indicates the site is underlain by the Burnham Formation for the Otiran Stage of the Hawera Series. The underlying geology comprises 1-3m thick stratal sets of gravel, intercalated with sand and loess-silt layers.

The nearest surface water body to the site is the Selwyn River located approximately 6 km to the south-west of the site/s. This river flows in a south-east direction eventually feeding into Lake Ellesmere approximately 13 km south-east of the site.

For further information, refer to Coffey's Geotechnical Assessment Report produced in November 2020.

## 2.3. Site history

The following sections summarise the historical activities undertaken within or in the immediate vicinity of the site, as determined from the information sources reviewed during this PSI.

### 2.3.1. Listed land-use register

Environment Canterbury's LLUR was accessed on 4 November 2020, however, it was noted that the LLUR currently has no information about HAIL sites on these land parcels (Holmes and Skellerup Block).

Two investigations were recorded within the Council records for the Holmes Block (Section 2 SO 480906), one preliminary site investigation in 2013 and a detailed site investigation in 2014, however, these investigations related to the West Rolleston Primary School site (corner of Dunns Crossing and Burnham School Roads), which is outside of the proposed site/s area. These investigation reports were not made available during this PSI.

### 2.3.2. Historical aerial photographs

Historical aerial photographs of the site and the surrounding area taken between 1942 and 2019 were sourced from the Local Government Geospatial Alliance's (LGGA) Retrolens and the Canterbury Maps Viewer. A summary of observations made from the review of these photographs is provided below. Copies of selected aerial photographs reviewed are included in Appendix A.

Both sites were in use as agricultural land from the initial 1942 historical aerial images with a single residential structure on the central north-western boundary of the Holmes Block, however, this is no longer present in the 1994 historical aerial image. No structures appear on the Skellerup Block in any of the historical aerial images reviewed. Both the Holmes and Skellerup Blocks appear to have remained in use as agricultural land through all of the historical aerial images reviewed to present day.

The aerial imagery indicated that the site appears to have been used for agricultural purposes since before 1943 and may be impacted by HAIL category A10 (persistent pesticide bulk storage or use).

### 2.3.3. Site walkover

Coffey staff conducted a site walkover of the site on 4 November 2020. A conversation held with the current site owner and on-site observations made during the site walkover of the two properties indicated the following:

<u>Holmes Block</u>

- Ex forestry, converted to crops mid 2000's.
- Crops included lucerne, barley and maize.
- Some young stock grazed.
- No known offal pits or borrow areas.

<u>Skellerup Block</u>

- Ex forestry, converted to crops mid 2000's.
- Crops include kale.
- Some grazing and silage.
- No known offal pits or borrow areas.

No staining or significant plant die off visual evidence of chemical storage was observed on any of the properties during the site walkover.

# 3. Summary

Coffey was contracted by the client to conduct a PSI for the properties (Holmes and Skellerup Block) located off Dunns Crossing Road, Rolleston (the 'site', Figure 1). This investigation has been undertaken to confirm the suitability of the site for plan change and associated subdivision.

Coffey completed a review of Environment Canterbury's LLUR, published geological maps, publicly available historical aerial photographs and completed a site walkover of the site on the 4 November 2020.

On the basis of the information reviewed and collected, Coffey has identified actual or potential HAIL activities to likely have occurred on-site as summarised in Table 2:

Table 2: Identified actual or potential HAIL activities

| Actual/Potential HAIL Activities | Land Use | Information Source | Considered Risk Potential for Contamination to Surrounding Environment |
|---|---|---|---|
| **Persistent pesticide bulk storage or use (HAIL Category A10)** | Use of pesticide and other agrochemicals in agricultural activities | Site walkover observations, historical aerial photographs. | The risk potential to the underlying soil and groundwater is considered **low** due to:<br>• Relatively long period of use (since prior to 1943).<br>• Likely use of non-environmentally persistent chemicals in the paddocks. |

The site walkover and review of site history information indicates the following key potential receptors that may be relevant to the site:

- Earthworks contractors who may come into contact with potentially contaminated soil during any proposed future development works.
- Future occupiers of the properties within the site.

# 4. Recommendations

Due to the likely presence of HAIL activities on the site, the NESCS regulations are considered to apply to the site. Subdividing or changing land use is a permitted activity under section 8(4)(b) of the NESCS if the report on the site states that it is highly unlikely that there will be a risk to human health if the activity is done to the piece of land.

The potential of contamination to soil associated with the identified potential sources of contamination are considered low (refer to Table 2 above), depending on the activity identified. It is considered unlikely that there will be a risk to human health with the proposed plan change and subdivision providing that the potential contaminant source areas listed in Table 2 are assessed.

The site is considered to be suitable for plan change and subdivision, with any consent granted for the site, conditional on a detailed site investigation (DSI) being carried out prior to any earthworks and or building consents being granted.

Coffey recommends soil characterisation samples are taken from across the site to create a detailed site investigation (DSI) prior to earthworks consent being granted to ensure elevated contaminates and excessive use of pesticides are not present.

# 5. Limitations

The findings of this report should be read together with “Important Information ‘About Your Coffey Environmental Report’ (attached).

# 6. References

**Environment Canterbury's listed land-use register**. https://llur.ecan.govt.nz/ (accessed 4 November 2020)

**Institute of Geological and Nuclear Sciences (1992).** Geological Map 1, scale 1:25,000: Geology of the Christchurch Urban Area.

**MfE (2003).** Contaminated Land Management Guideline No. 1: Reporting on Contaminated Sites in New Zealand. Ministry for the Environment, Wellington, New Zealand. (Revised 2011).

**MfE (2004).** Ministry for the Environments Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils. Ministry for the Environment, Wellington, New Zealand. (Revised 2011).

**MfE (2011).** Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

# Important information about your **Coffey** Environmental Report

## Introduction

This report has been prepared by Coffey for you, as Coffey's client, in accordance with our agreed purpose, scope, schedule and budget.

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

The report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. Assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, including budget and timing. The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice.

This interpretation is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment. Coffey may have also relied on data and other information provided by you and other qualified individuals in preparing this report. Coffey has not verified the accuracy or completeness of such data or information except as otherwise stated in the report. For these reasons the report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.

## Your report has been written for a specific purpose

Your report has been developed for a specific purpose as agreed by us and applies only to the site or area investigated. Unless otherwise stated in the report, this report cannot be applied to an adjacent site or area, nor can it be used when the nature of the specific purpose changes from that which we agreed.

For each purpose, a tailored approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible quantify, risks that both recognised and potential contamination pose in the context of the agreed purpose. Such risks may be financial (for example, clean up costs or constraints on site use) and/or physical (for example, potential health risks to users of the site or the general public).

## Limitations of the Report

The work was conducted, and the report has been prepared, in response to an agreed purpose and scope, within time and budgetary constraints, and in reliance on certain data and information made available to Coffey.

The analyses, evaluations, opinions and conclusions presented in this report are based on that purpose and scope, requirements, data or information, and they could change if such requirements or data are inaccurate or incomplete.

This report is valid as of the date of preparation. The condition of the site (including subsurface conditions) and extent or nature of contamination or other environmental hazards can change over time, as a result of either natural processes or human influence. Coffey should be kept appraised of any such events and should be consulted for further investigations if any changes are noted, particularly during construction activities where excavations often reveal subsurface conditions.

In addition, advancements in professional practice regarding contaminated land and changes in applicable statues and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in this report should be verified if you propose to use this report more than 6 months after its date of issue.

The report does not include the evaluation or assessment of potential geotechnical engineering constraints of the site.

## Interpretation of factual data

Environmental site assessments identify actual conditions only at those points where samples are taken and on the date collected. Data derived from indirect field measurements, and sometimes other reports on the site, are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions.

Variations in soil and groundwater conditions may occur between test or sample locations and actual conditions may differ from those inferred to exist. No environmental assessment program, no matter how comprehensive, can reveal all subsurface details and anomalies. Similarly, no professional, no matter how well qualified, can reveal what is hidden by earth, rock or changed through time.

The actual interface between different materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions.

For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of a suitably qualified and experienced environmental consultant through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other unrecognised features encountered on site. Coffey would be pleased to assist with any investigation or advice in such circumstances.

## Recommendations in this report

This report assumes, in accordance with industry practice, that the site conditions recognised through discrete sampling are representative of actual conditions throughout the investigation area. Recommendations are based on the resulting interpretation.

Should further data be obtained that differs from the data on which the report recommendations are based (such as through excavation or other additional assessment), then the recommendations would need to be reviewed and may need to be revised.

## Report for benefit of client

Unless otherwise agreed between us, the report has been prepared for your benefit and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendation and should make their own enquiries and obtain independent advice in relation to such matters.

Coffey assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report.

To avoid misuse of the information presented in your report, we recommend that Coffey be consulted before the report is provided to another party who may not be familiar with the background and the purpose of the report. In particular, an environmental disclosure report for a property vendor may not be suitable for satisfying the needs of that property's purchaser. This report should not be applied for any purpose other than that stated in the report.

## Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, a suitably qualified and experienced environmental consultant should be retained to explain the implications of the report to other professionals referring to the report and then review plans and specifications produced to see how other professionals have incorporated the report findings.

Given Coffey prepared the report and has familiarity with the site, Coffey is well placed to provide such assistance. If another party is engaged to interpret the recommendations of the report, there is a risk that the contents of the report may be misinterpreted and Coffey disowns any responsibility for such misinterpretation.

## Data should not be separated from the report

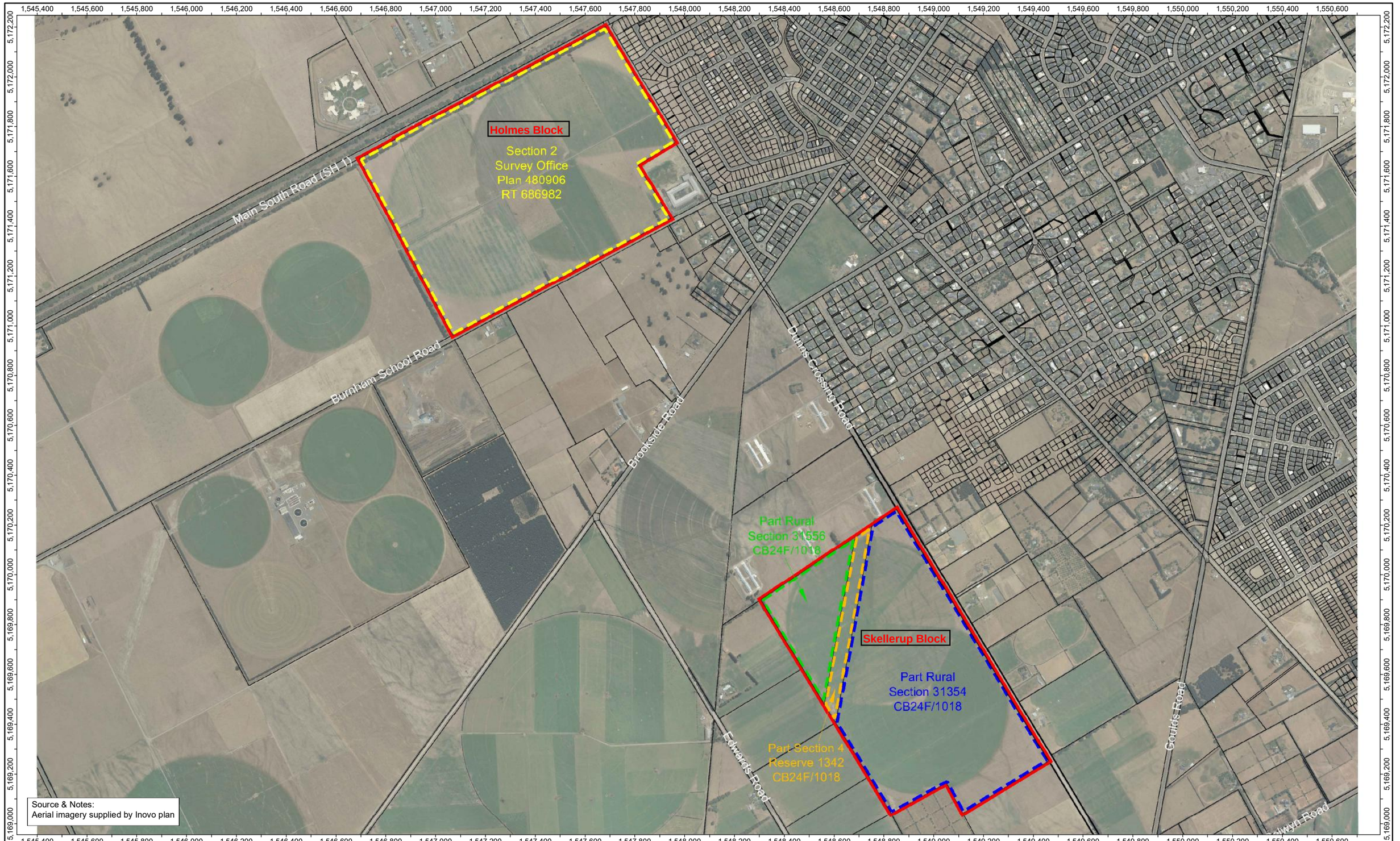
The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists or engineers based on their interpretation of field logs, field testing and laboratory evaluation of samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

This report should be reproduced in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

## Responsibility

Environmental reporting relies on interpretation of factual information using professional judgement and opinion and has a level of uncertainty attached to it, which is much less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. As noted earlier, the recommendations and findings set out in this report should only be regarded as interpretive and should not be taken as accurate and complete information about all environmental media at all depths and locations across the site.

# Figures

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| project: | ROLLESTON WEST PLAN CHANGE | | |
| title: | SITE INVESTIGATION PLAN | | |
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# Appendix A – Selected historical aerial photographs

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1974 Aerial Image

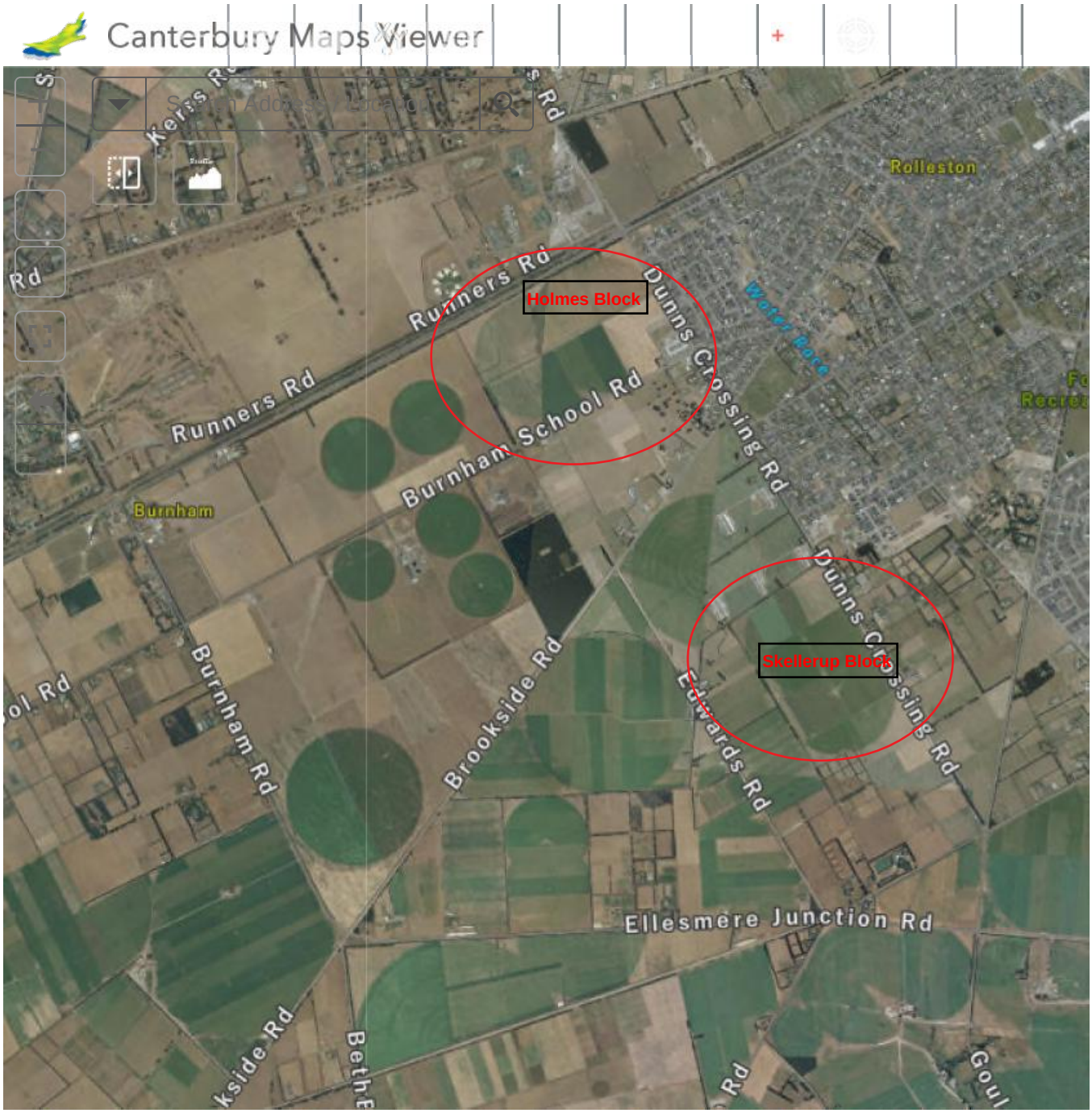
Skellerup Block

Holmes Block

SN 2713 C/5

1994 Aerial Image

2000 Aerial Image
Holmes Block
Skellerup Block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# Appendix D

# Integrated Transport Assessment

Planning. Traffic. Development.

**Integrated Transport Assessment**

**Prepared for**

# ROLLESTON WEST RESIDENTIAL LTD

**Dunns Crossing Road**
**Rolleston**

November 2020

**Integrated Transport Assessment**
**Prepared for**

# Rolleston West Residential Ltd

Dunns Crossing Road
Rolleston

Novo Group Ltd
Level 1, 279 Montreal Street
PO Box 365, Christchurch 8140
P: (03) 365 5570
E: info@novogroup.co.nz
W: www.novogroup.co.nz

| | |
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| Prepared by: | Nick Fuller, Senior Transport Engineer |
| Reviewed by | Rhys Chesterman, Director and Traffic Engineer/Planner |

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# Introduction

1. Rolleston West Residential Ltd has commissioned Novo Group to prepare an Integrated Transport Assessment (ITA) to support the proposed Plan Change for land at Dunns Crossing Road, on the western edge of Rolleston.

2. This report provides an assessment of the transport aspects of the proposed development. It also describes the transport environment in the vicinity of the site and describes the transport related components of the proposal. It has been prepared broadly in accordance with the Integrated Transportation Assessment Guidelines specified in New Zealand Transport Agency Research report 422.

3. The land associated with this proposed Plan Change is illustrated in **Figure 1**, which is two sites on Dunns Crossing Road. The northern site (Holmes Block) is located at the south-western corner of the State Highway 1 / Dunns Crossing Road intersection. It is proposed that the Holmes Block could provide up to 1,150 residential Lots, plus a small Local Centre. The southern site (Skellerup Block) is located approximately 690m north of Selwyn Road and is proposed to accommodate up to 950 residential Lots, plus a small Local Centre.

4. Copies of the Outline Development Plans for these sites are included in **Appendix 1**.

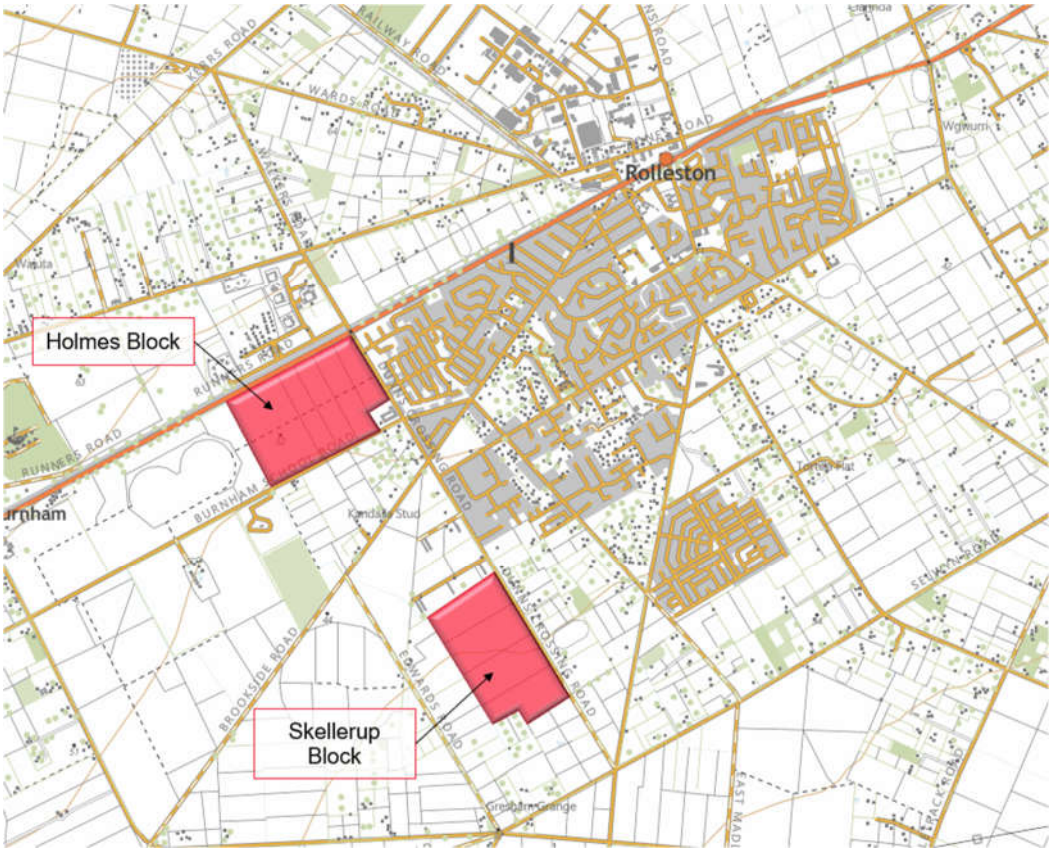



**Figure 1: Site Location**

# Transport Environment

## Road Network

### State Highway 1

5. **Table 1** sets out the transport characteristics of State Highway 1 (SH1) in the vicinity of the application site.

**Table 1: State Highway 1 Road Characteristics**

| Key Feature or Characteristic | Comment |
|---|---|
| Road Classification | State Highway and Arterial Road |
| Cross-Section Description | 3.5m lanes in both directions, plus sealed shoulders. |
| Traffic Volumes | 20,500 vehicles per day[1]. |
| Speed | 100km/hr (although currently a 70km/hr limit at the intersection with Dunns Crossing Road) |
| Cycling, Pedestrian Infrastructure and Public Transport | None |

6. The SH1 / Dunns Crossing Road / Walkers Road intersection is a priority controlled cross-road, with SH1 having the priority. This intersection is currently operating poorly with regards to traffic capacity and it is understood that the NZ Transport Agency (NZTA) and Selwyn District Council (the Council) are committed to upgrading this intersection with the current proposal being a roundabout. The design of this roundabout is understood to be under investigation and it would be constructed within three to four years (to coincide with the opening of an over-bridge of SH1 between Rolleston Drive and Jones Road). There is funding committed for this project, although the final design of the roundabout is not yet known.

7. The NZTA Crash Analysis System (CAS) has been reviewed to identify crashes that have been reported within 100m of this intersection in the most recent five-year period available. **Figure 2** is the collision diagram, and the crashes are summarised below.

   i. SH1 South-West Bound Approach: 1 minor injury and 4 non-injury crashes:

      (a) Head-on when a south-west bound driver hit a vehicle waiting to turn right into Dunns Crossing Road – 1 minor injury crash.

      (b) Merging crash where a driver in the right turn bay changed to the through lane without checking – 2 non-injury crashes.

      (c) Loss of control turning right to Walkers Road – 1 non-injury crash.

      (d) Rear-end when vehicles have stopped for road works – 1 non-injury crash.

[1] From Mobile Road website

ii. Dunns Crossing Road: 1 serious, 4 minor injury and 3 non-injury crashes:

(a) Failure to give-way to traffic – 1 serious injury crash, 4 minor injury crashes and 3 non-injury crashes.

iii. Walkers Road: 2 minor injury and 2 non-injury crashes:

(a) Failure to give-way to through traffic – 2 minor injury crash and 2 non-injury crashes.

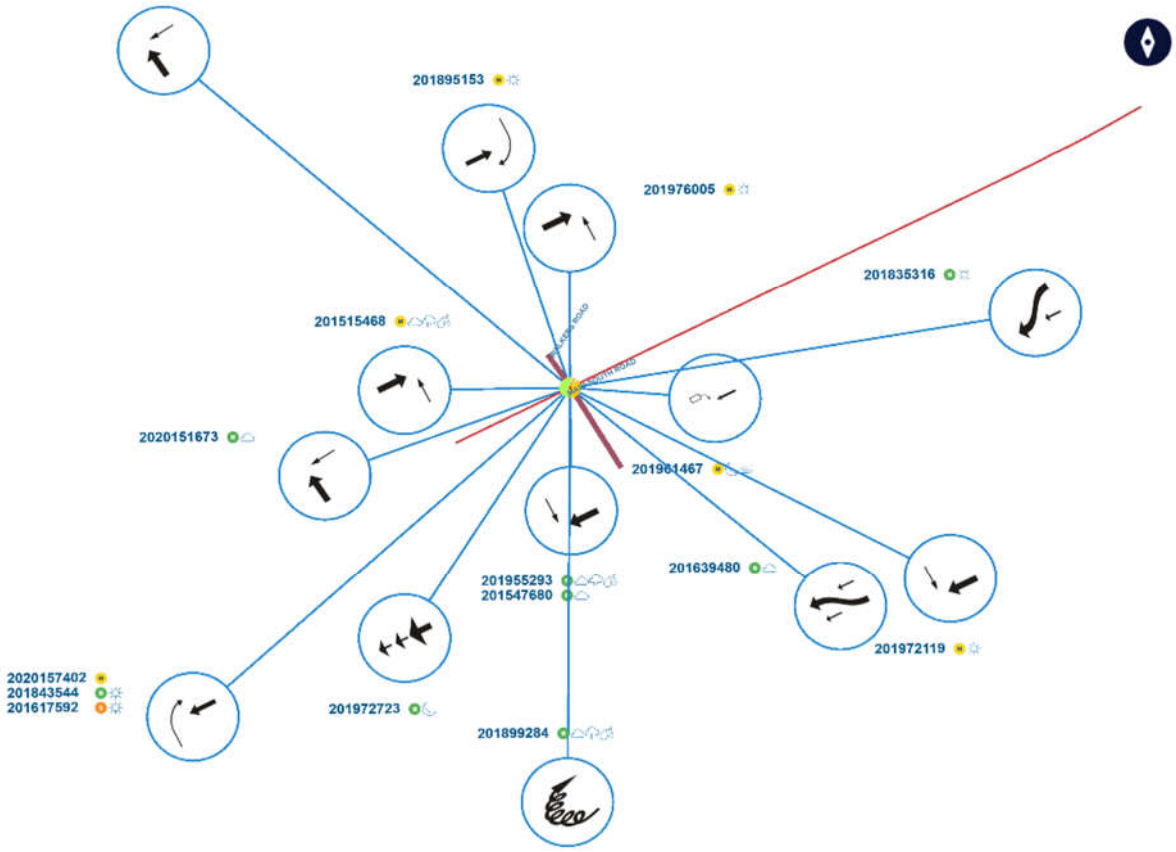



**Figure 2: SH1 / Dunns Crossing Rd / Walkers Rd Collision Diagram**

8. The above identifies that a number of crashes have occurred at the SH1 / Dunns Crossing Road / Walkers Road intersection. These are primarily caused by vehicles on the minor arms failing to give-way to through traffic on SH1 and these crashes would be addressed by the provision of a roundabout, as anticipated to occur at this location.

**Dunns Crossing Road**

9. **Table 2** sets out the transport characteristics of Dunns Crossing Road.

Table 2: Dunns Crossing Rd Characteristics

| Key Feature or Characteristic | Comment |
|---|---|
| Road Classification | Arterial Road between Lowes Road and SH1. Local Road south of Lowes Road. |
| Cross-Section Description | Carriageway width of 8.4m (i.e. two 4.2m wide traffic lanes). |
| Traffic Volumes | 1,600 to 2,500 vehicles per day[2] depending on location. |
| Speed | 60km/hr north of Granite Drive. 50km/hr south of Granite Drive until south of Lowes Road, which is 60km/hr. The rural area south of Lowes Road is 80km/hr. |
| Cycling, Pedestrian Infrastructure and Public Transport | 1.5m wide footpath on the eastern side where the urban development has occurred. No footpaths on the western side, with the exception of immediately adjacent to the West Rolleston Primary School and pre-school (both of which are at the Burnham School Road intersection). There is also a kea crossing of Dunns Crossing Road outside the primary school.<br>No dedicated cycling facilities or public transport are provided. |

## Newman Road

10. **Table 3** sets out the transport details of Newman Road.

Table 3: Newman Rd Characteristics

| Key Feature or Characteristic | Comment |
|---|---|
| Road Classification | Local Road |
| Cross-Section Description | Carriageway width of 8.0m (i.e. two 4.0m wide traffic lanes). |
| Traffic Volumes | 50 to 400 vehicles per day[3] depending on location. |
| Speed | 50km/hr |
| Cycling, Pedestrian Infrastructure and Public Transport | 1.5m wide footpaths are provided on both sides of the road. No dedicated cycling facilities or public transport are provided. |
| Connectivity | Provides a connection to Granite Drive, which in turn links to Brookside Road to /from central Rolleston. |

11. The Dunns Crossing Road / Newman Road intersection is a priority controlled T-intersection, with Dunns Crossing Road having the priority. No crashes have been reported at this intersection in the most recent five-year period available.

## Granite Drive

12. **Table 4** sets out the transport details of Granite Drive.

[2] From Mobile Road website
[3] From Mobile Road website

Table 4: Granite Dr Characteristics

| Key Feature or Characteristic | Comment |
|---|---|
| Road Classification | Local Road |
| Cross-Section Description | Carriageway width of 8.8m (i.e. two 4.4m wide traffic lanes). |
| Traffic Volumes | 900 to 1,600 vehicles per day[4] depending on location. |
| Speed | 50km/hr |
| Cycling, Pedestrian Infrastructure and Public Transport | 1.5m wide footpaths are provided on both sides of the road. No dedicated cycling facilities or public transport are provided. |
| Connectivity | Provides a connection to Brookside Road, which links to /from central Rolleston. |

13. The Dunns Crossing Road / Granite Drive intersection is a priority controlled T-intersection, with Dunns Crossing Road having the priority. No crashes have been reported at this intersection in the most recent five-year period available.

**Burnham School Road**

14. **Table 5** sets out the transport details of Burnham School Road, west of Dunns Crossing Road.

Table 5: Burnham School Rd Characteristics – West of Dunns Crossing Rd

| Key Feature or Characteristic | Comment |
|---|---|
| Road Classification | Local Road |
| Cross-Section Description | Approximately 170m has an urbanised carriageway that is 7.4m wide and includes no-stopping lines both sides of the road. Beyond this, Burnham School Road is rural in character, with a 6.8m wide sealed carriageway. |
| Traffic Volumes | 575 vehicles per day[5]. |
| Speed | 50km/hr for the section leading up to Dunns Crossing Road and 100km/hr west of this. |
| Cycling, Pedestrian Infrastructure and Public Transport | 1.5m wide footpaths are provided on both sides of the road for the urban section only. No dedicated cycling facilities or public transport are provided. |

15. **Table 6** sets out the transport details of Burnham School Road, east of Dunns Crossing Road.

[4] From Mobile Road website
[5] From Mobile Road website

Table 6: Burnham School Rd Characteristics – East of Dunns Crossing Rd

| Key Feature or Characteristic | Comment |
|---|---|
| Road Classification | Local Road |
| Cross-Section Description | Carriageway of approximately 7.0m. |
| Traffic Volumes | 800 vehicles per day[6]. |
| Speed | 50km/hr. |
| Cycling, Pedestrian Infrastructure and Public Transport | 1.5m wide footpaths are provided on both sides of the road. No dedicated cycling facilities or public transport are provided. |

16. The Dunns Crossing Road / Burnham School Road intersection is a priority controlled cross-road, with Dunns Crossing Road having the priority. No crashes have been reported at this intersection in the most recent five-year period available.

17. We understand that Council is investigating a set of traffic signals at this intersection, although we are unaware of the specific design for these signals at this stage.

**Lowes Road**

18. **Table 6** sets out the transport details of Lowes Road.

Table 7: Lowes Rd Characteristics

| Key Feature or Characteristic | Comment |
|---|---|
| Road Classification | Arterial Road |
| Cross-Section Description | Carriageway width of 6.0m (i.e. two 3.0m wide traffic lanes), plus on-street parking on both sides. |
| Traffic Volumes | 1,700 to 4,000 vehicles per day[7] depending on location. |
| Speed | 50km/hr |
| Cycling, Pedestrian Infrastructure and Public Transport | 1.5m wide footpaths are provided on both sides of the road. No dedicated cycling facilities or public transport are provided. |
| Connectivity | Provides a connection to Levi Road, which links toward central Rolleston, plus the Weedons – Ross interchange with SH1. |

19. The Dunns Crossing Road / Lowes Road intersection is a priority controlled T-intersection, with Dunns Crossing Road having the priority. No crashes have been reported at this intersection in the most recent five-year period available.

[6] From Mobile Road website
[7] From Mobile Road website

### Selwyn Road

20. **Table 8** sets out the transport details of Selwyn Road in the vicinity of the sites.

**Table 8: Selwyn Rd Characteristics**

| Key Feature or Characteristic | Comment |
|---|---|
| Road Classification | Local Road, although this becomes an Arterial Road east of Lincoln Rolleston Road. |
| Cross-Section Description | Carriageway width of 6.6m (i.e. two 3.3m wide traffic lanes) |
| Traffic Volumes | 700 to 3,000 vehicles per day[8] depending on location. |
| Speed | 80km/hr |
| Cycling, Pedestrian Infrastructure and Public Transport | None. |
| Connectivity | Provides a connection to Shands Road, which links toward the Christchurch Southern Motorway interchange. |

21. The Dunns Crossing Road intersection in this location is with Goulds Road, which in turn has an intersection with Selwyn Road. This configuration is illustrated in **Figure 3**.

**Figure 3: Dunns Crossing Rd / Goulds Rd / Selwyn Rd Intersection Arrangement**

[8] From Mobile Road website

22. The NZTA CAS database has been reviewed to identify crashes that have been reported within 100m of this intersection in the most recent five-year period available. **Figure 2** is the collision diagram, and the crashes are summarised below.

    i. Goulds Road Northbound Approach: 2 minor injury and 1 non-injury crashes:

        (a) Failure to give-way – 2 minor injury crashes and 1 non-injury crash.

    ii. Goulds Road Southbound Approach: 1 serious injury, 1 minor injury and 2 non-injury crashes:

        (a) Failure to give-way – 1 serious injury crash, 1 minor injury crash and 2 non-injury crash.

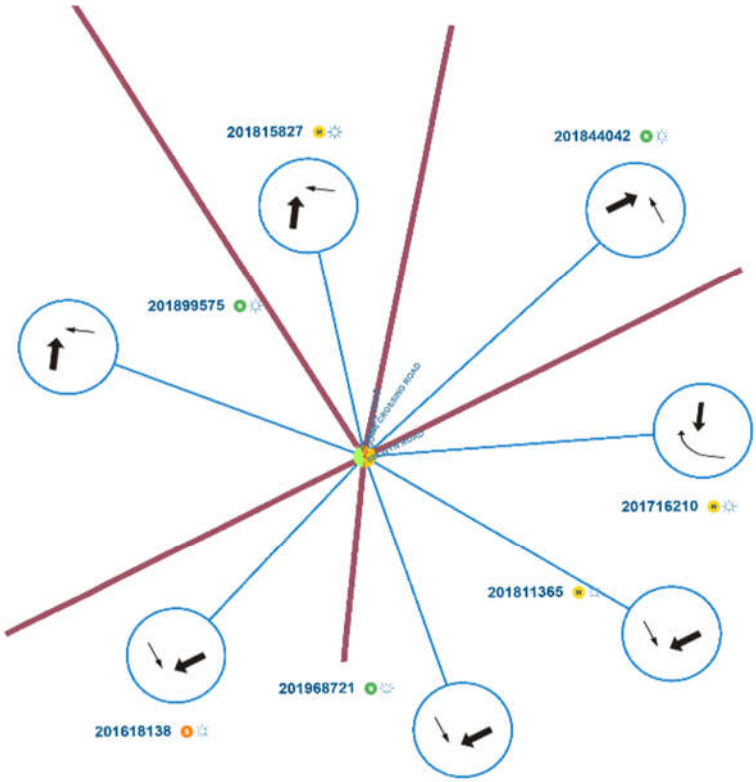



**Figure 4: Dunns Crossing Rd / Goulds Rd / Selwyn Rd Collision Diagram**

23. The above crash review indicates there is a trend in which drivers exiting the Goulds Road approaches are failing to give-way to traffic on Selwyn Road.

# The Proposal

24. The transport components of the two proposed ODP areas are set out in turn in the following sections.

25. Unless otherwise stated, it is proposed to adopt the transport provisions of the Operative District Plan or Proposed District Plan, whichever is relevant at the time.

## Holmes Block

26. The proposed Plan Change would enable up to 1,150 residential lots and a small commercial zone to be established at the application site. A copy of the ODP is included in **Figure 5** and included in more detail in **Appendix 1**.

**Figure 5: Holmes Block ODP**

### Site Layout

*Access Intersections*

27. The ODP proposes a Primary Road access to Dunns Crossing Road, which is indicatively opposite Granite Drive. A Secondary Road access is also proposed to Dunns Crossing Road, which is indicatively opposite Newman Road.

28. A Primary Road access is also proposed to Burnham School Road. This has the potential to link to land further south of this site, should that land ever be developed.

29. The potential intersection layouts to Dunns Crossing Road will be cross-road arrangements. The intersection with Burnham School Road will be a T-intersection.

30. The detailed design and sight distances at the intersections will be confirmed at subdivision stage, although these are anticipated to comply as the road alignments are straight and flat.

31. No direct property access is proposed to Burnham School Road, although direct access is proposed to Dunns Crossing Road to be consistent with the existing development on the opposite side of the road.

*Road Standards*

32. The road cross-sections and intersection spacings within the Plan Change area are proposed to comply with the requirements of the District Plan. It is proposed that the roads identified on the ODP would be constructed as either Local Major or Local Intermediate roads.

*Pedestrian & Cycle Links*

33. Greenlink connections are provided within Outline Development Plan area. These are intended to reduce walking and cycling times within the subdivision, as well as connecting to the proposed commercial area and West Rolleston Primary School.

*Off-Site Transport Improvements*

34. The ODP acknowledges that an intersection upgrade is proposed by Council and NZTA at the SH1 / Dunns Crossing Road / Walkers Road intersection. It is anticipated that the construction of this as a roundabout (as is currently proposed by Council and NZTA) may require some of the Plan Change land and the proposed ODP allows for this eventuality. Ultimately, the details of the intersection design will be determined by Council and NZTA for implementation following rezoning.

**Traffic Generation & Distribution**

*Traffic Generation*

35. The traffic generation is based on an 85$^{th}$ percentile rate of 0.9 vehicles per dwelling in the peak hours and 8.2 vehicles per dwelling per day[9]. Applying this to the proposed 1,150 dwellings leads to the traffic generation set out in **Table 9**. This assumes the following arrival / departure splits from the ITE *Trip Generation* guidebook:

    i. AM Peak – 25% arrivals / 75% departures;

    ii. PM Peak – 63% arrivals / 37% departures: and

    iii. Daily – 50% arrivals / 50% departures.

[9] Based on Outer Suburban dwellings in the NZTA Research Report 453 – *Trips and Parking Related to Land Use*.

Table 9: Holmes Block Traffic Generation

| | Arrivals | Departure | Total |
|---|---|---|---|
| AM Peak | 259 | 776 | 1,035 |
| PM Peak | 652 | 383 | 1,035 |
| Daily | 4,715 | 4,715 | 9,430 |

36. No traffic generation has been assumed for the local centre, as this is intended to be of a scale that would accommodate pass-by trips associated with the dwellings in the proposed subdivision.

*Traffic Distrubution*

37. The distribution of traffic across the accesses to the wider road network is based on the broad catchments within the subdivision to each of these roads. This leads to an assumption that:

    i. Dunns Crossing Road northern access accommodates approximately 35% of the Plan Change traffic;

    ii. Dunns Crossing Road southern access accommodates approximately 40% of the Plan Change traffic; and

    iii. Burnham School Road accommodates approximately 25% of the Plan Change traffic.

38. The above traffic has also been distributed across the wider road network in accordance with information provided from the Rolleston traffic model from 2028. This used data from the residential development coded in that model for the Holmes Block. This distribution is included on the figures included in **Appendix 2**.

## Skellerup Block

39. The proposed Plan Change would enable up to 950 residential lots and a small commercial zone to be established at the application site. A copy of the ODP is included in **Figure 6** and included in more detail in **Appendix 1**.

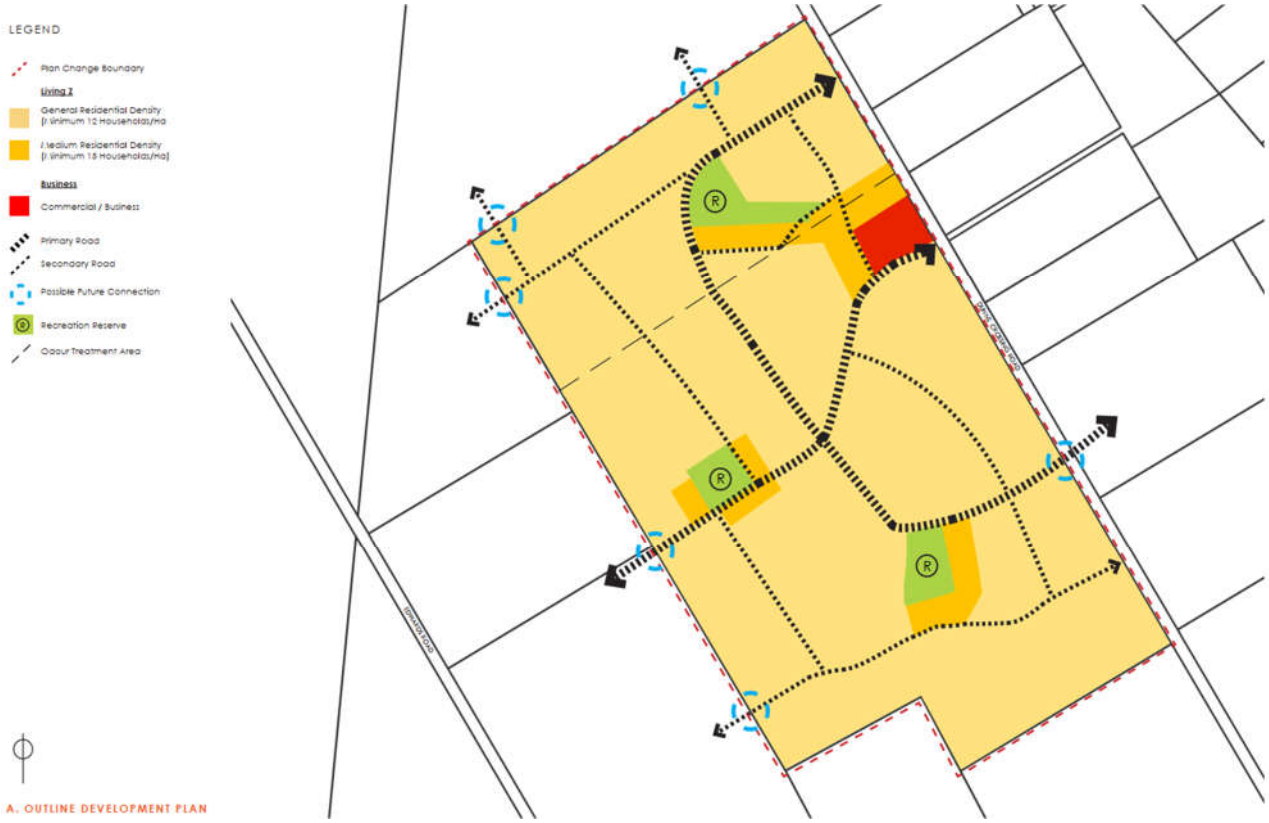



**Figure 6: Skellerup Block ODP**

## Site Layout

*Access Intersections*

40. The ODP proposes three Primary Road accesses to Dunns Crossing Road, as well as a Secondary Access. The southern Primary Road access has the potential to connect to subdivision on the opposite side of Dunns Crossing Road, when that occurs.

41. The ODP also includes potential connections through to adjacent land to the north and west, should that land be developed.

42. The potential intersection layouts are proposed to be T-intersections for all the accesses. That said, the southern Primary Access intersection could be made into a cross-road to tie-in with access to the land on the eastern side of Dunns Crossing Road (if required).

43. The detailed design and sight distances at the intersections will be confirmed at subdivision stage, although these are anticipated to comply as the road alignments are straight and flat.

*Road Standards*

44. The road cross-sections and intersection spacings within the Plan Change area are proposed to comply with the requirements of the District Plan. It is proposed that the roads identified on the ODP would be constructed as either Local Major or Local Intermediate roads.

**Traffic Generation & Distribution**

*Traffic Generation*

45. The traffic generation rates and assumptions set out in paragraph 35 have been applied to the 950 lots proposed at the Skellerup Block. The resultant traffic generation for this block is set out in **Table 10**. Again, no traffic generation has been assumed for the local centre because this is intended to be of a scale that would accommodate pass-by trips associated with the dwellings in the proposed subdivision.

**Table 10: Skellerup Block Traffic Generation**

| | Arrivals | Departure | Total |
|---|---|---|---|
| AM Peak | 214 | 641 | 855 |
| PM Peak | 556 | 299 | 855 |
| Daily | 3,895 | 3,895 | 7,790 |

*Traffic Distrubution*

46. The distribution of this traffic across the accesses to the wider road network is based on the broad catchments within the subdivision to each of these roads. This leads to an assumption that:

    i. Dunns Crossing Road Northern primary access accommodates approximately 22% of the Plan Change traffic;

    ii. Dunns Crossing Road Central primary access accommodates approximately 40% of the Plan Change traffic;

    iii. Dunns Crossing Road Southern primary access accommodates approximately 19% of the Plan Change traffic; and

    iv. Dunns Crossing Road Southern secondary access accommodates approximately 19% of the Plan Change traffic.

47. The traffic has also been distributed across the wider road network in accordance with information provided from the Rolleston traffic model from 2028. This used data from the residential development coded in that model for the Skellerup Block. This distribution is included on the figures included in **Appendix 2**.

## Assessment of Effects

48. Key matters for the assessment of transport effects associated with the proposed Plan Change are considered to be:

    **i. Parking & Loading:** Whether the District Plan rules adequately provide for the layout and provision of car parking and loading at the application site;

    **ii. Access Arrangements:** Where the accesses are anticipated to operate safely and efficiently and whether the District Plan rules adequately provide for access. Also, the internal roading pattern proposed in the ODP and the associated rules and formation standards; and

iii. **Wider Network Effects:** Whether the effects of the proposed activity can be satisfactorily accommodated by the surrounding road network. Whether the proposed Plan Change will be accessible by a range of transport modes.

49. The above matters are assessed in turn in the following sections.

## Parking & Loading

50. The District Plan rules regarding parking and loading will be adopted for this Plan Change. This is considered to be sufficient to confirm that parking and loading will be satisfactorily provided for in a functional and practical manner.

## Access Arrangements

51. The following assessment has been undertaken using 2028 traffic volume data from the Rolleston Paramics model as a basis for the background traffic volumes. It is understood that this is an interim model, although it is considered to be a reasonable basis for the determining of background traffic on the road network[10]. It is understood this model includes:

    i. A roundabout at the State Highway 1 / Dunns Crossing Road / Walkers Road intersection;

    ii. Anticipated land use growth (and associated increase in traffic volumes) in Rolleston to 2028; and

    iii. An assumption that 96 dwellings are constructed in the Holmes Block and 51 in the Skellerup Block.

52. In addition to the above, the proposed Plan Change traffic has been added to the network as described in previous sections of this report. The traffic flow diagrams that form the basis of the following assessment are contained in **Appendix 2** and these set out the calculation and distribution of the development generated traffic. These follow a process of:

    i. Setting out the received network traffic data;

    ii. Isolating the Holmes Block and Skellerup Block traffic volumes;

    iii. Determining the distribution of traffic associated with the Holmes Block and Skellerup Block based on the above;

    iv. Removing the Holmes Block and Skellerup Block traffic that was included in the model; and

    v. Adding in the quantum of traffic associated with the Holmes Block and Skellerup Block as proposed in this Plan Change.

53. The following assessments are undertaken using the 'Base Plus Plan Change' traffic volumes from **Appendix 2**.

[10] Note: this assessment does not consider or attempt to evaluate the implications of traffic associated with the *potential* future rezoning of other land.

**Holmes Block**

*Dunns Crossing Road / Newman Road / Access*

54. The Dunns Crossing Road / Newman Road / Site Access intersection has been modelled as a cross-road, with Dunns Crossing Road having the priority. It has also been assumed that the speed environment would be reduced to 50km/hr with the urbanisation of the western side of Dunns Crossing Road.

55. The concept layout for this intersection is illustrated in **Figure 7** (which includes a new right turn bay on Newman Road), with the intersection modelling results being included in **Appendix 3**. These results are summarised as:

    i. AM Peak Hour: Overall the intersection is considered to operate satisfactorily, with no movement being worse than Level of Service C[11]. The degree of saturations are also lower than the practical threshold for this type of intersection[12]; and

    ii. PM Peak Hour: Overall the intersection is considered to operate satisfactorily. The worst Level of Service is E, which occurs on the through and right turn movements from the site access and the right turn out of Newman Road. This is considered to be acceptable given this occurs in the weekday PM peak hour on movements that are not high volume. The degree of saturations are again lower than the practical threshold for this type of intersection.

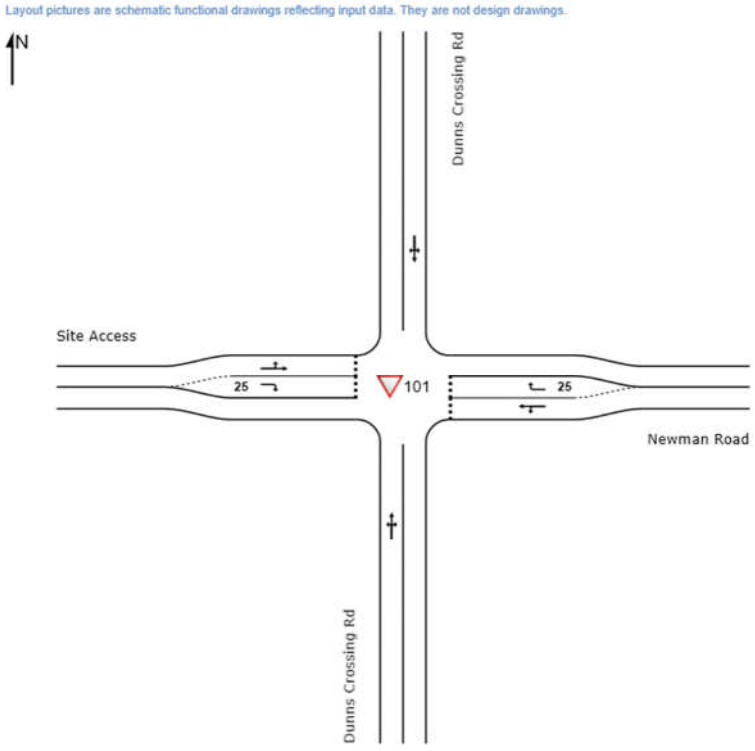



**Figure 7: Dunns Crossing Rd / Newman Rd / Access Concept Arrangement**

[11] Where 'A' is considered to be excellent operation, 'E' is at capacity and 'F' is over-capacity.
[12] The practical threshold for degree of saturation for unsignalized intersections is considered to be 0.85.

56. Overall, this access is predicted to operate satisfactorily in the 2028 peak periods.

*Dunns Crossing Road / Granite Drive / Access*

57. The Dunns Crossing Road / Granite Drive / Site Access intersection has been modelled as a cross-road, with Dunns Crossing Road having the priority. It has again been assumed that the speed environment would be reduced to 50km/hr.

58. The concept layout for this intersection is illustrated in **Figure 8**, with the intersection modelling results being included in **Appendix 4**. These results are summarised as:

    i. AM Peak Hour: Overall the intersection is considered to operate satisfactorily, with no movement being worse than Level of Service C. The degree of saturations are also lower than the practical threshold for this type of intersection; and

    ii. PM Peak Hour: Overall the intersection is considered to operate satisfactorily, with no movement being worse than Level of Service E, which is the through and right turn out of Granite Drive. This is again considered to be acceptable given this this the 2028 PM peak hour. The degree of saturations are also lower than the practical threshold for this type of intersection.

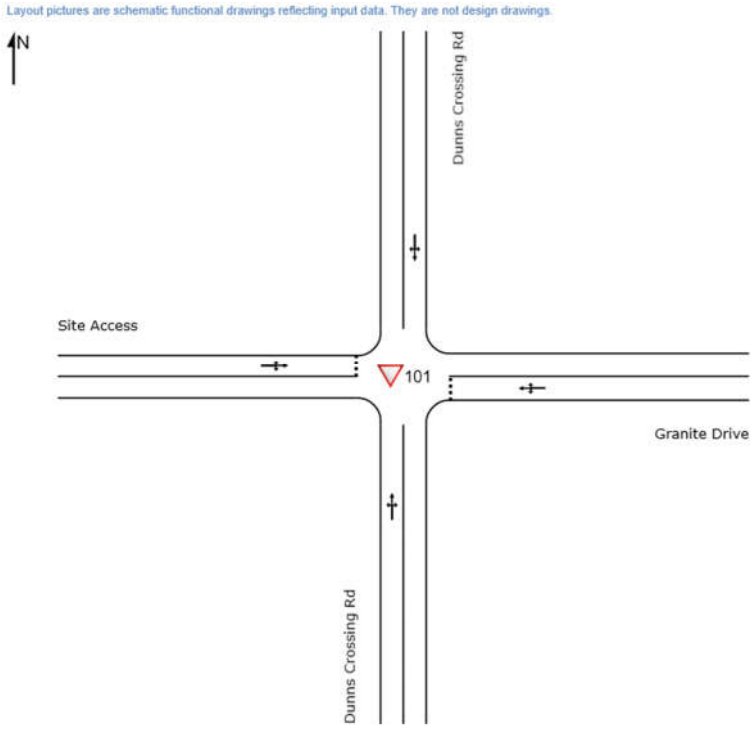



**Figure 8: Dunns Crossing Rd / Granite Dr / Access Concept Arrangement**

59. Overall, this access is predicted to operate satisfactorily in the 2028 peak periods.

*Burnham School Road / Access*

60. The Burnham School Road / Site Access intersection has been modelled as a T-intersection, with Burnham School Road having the priority. The concept layout for this intersection is illustrated in **Figure 9**, with the intersection modelling results being included in **Appendix 5**. These results are summarised as the intersection is predicted to operate satisfactorily, with no movement being worse than Level of

Service A. The degree of saturations are also lower than the practical threshold for this type of intersection.

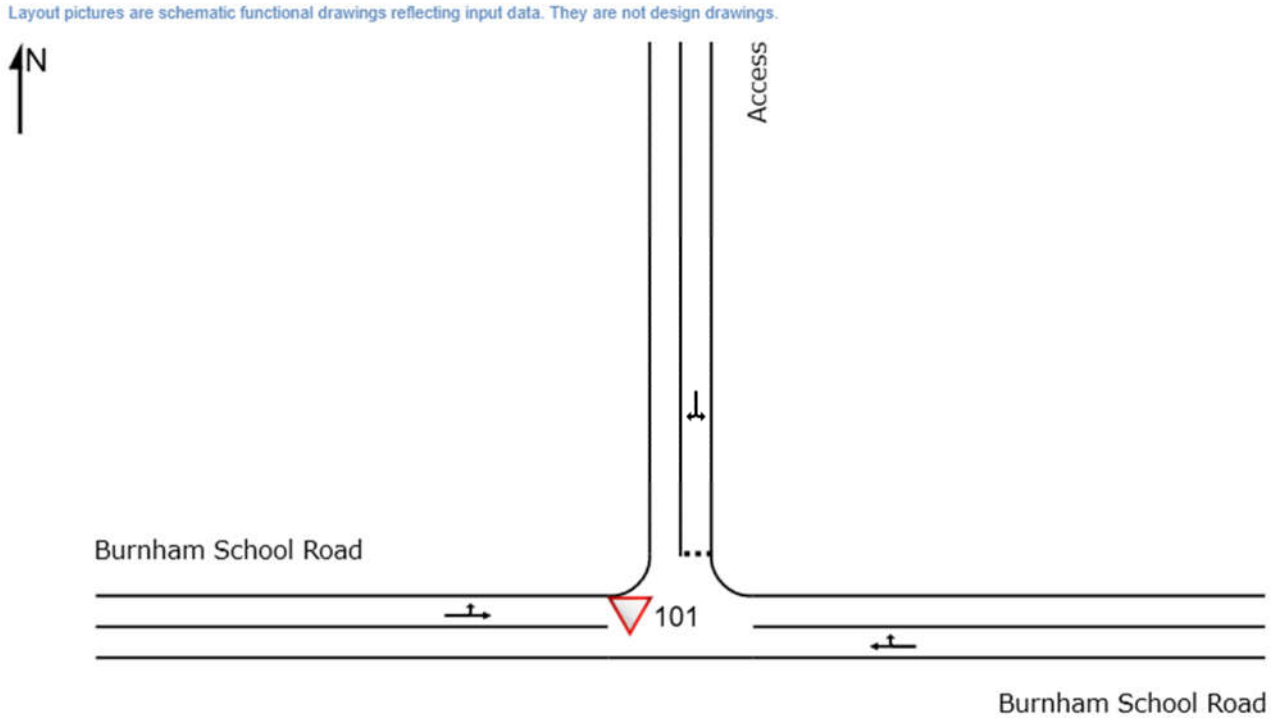



**Figure 9: Burnham School Rd / Access Concept Arrangement**

61. Overall, this access is predicted to operate satisfactorily in the 2028 peak periods.

**Skellerup Block**

62. The Dunns Crossing Road / Site Access intersections have been modelled as T-intersections, with Dunns Crossing Road having the priority. The concept layout for these intersections is illustrated in **Figure 10**, with the intersection modelling results being included in:

    i. **Appendix 6**: Dunns Crossing Road / Northern Primary Access;

    ii. **Appendix 7**: Dunns Crossing Road / Central Primary Access;

    iii. **Appendix 8**: Dunns Crossing Road / Southern Primary Access; and

    iv. **Appendix 9**: Dunns Crossing Road / Southern Secondary Access.

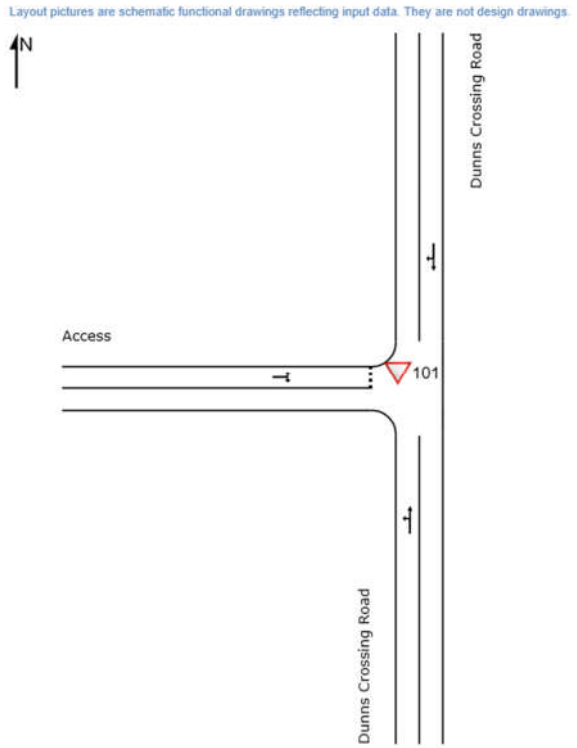



**Figure 10: Dunns Crossing Rd / Access Concept Arrangement**

63. These results of these intersection models are summarised as:

    i. AM Peak Hour: Overall the intersection is considered to operate satisfactorily, with no movement being worse than Level of Service B. The degree of saturations are also lower than the practical threshold for this type of intersection; and

    ii. PM Peak Hour: Overall the intersection is considered to operate satisfactorily, with no movement being worse than Level of Service C. The degree of saturations are also lower than the practical threshold for this type of intersection.

64. Overall, these accesses are predicted to operate satisfactorily in the 2028 peak periods.

**Internal Access Roads**

65. The internal access roads and intersections are proposed to comply with the District Plan requirements and will again be subject to road safety audits. This is considered to be sufficient to confirm the internal network will operate safely and efficiently.

66. Access to individual properties is also proposed to comply with the District Plan requirements. Any non-compliances will either be sought at subdivision stage or addressed on an individual basis and the effects of this on safety and efficiency considered at that stage.

67. The above is considered to be sufficient to confirm that the internal transport network will be safe and efficient.

## Wider Effects

68. The following assessment sets out the traffic effects at key intersections on the wider road network. This assessment is undertaken using the 'Base Plus Plan Change' traffic volumes in **Appendix 2**.

**SH1 / Dunns Crossing Road / Walkers Road**

69. The traffic capacity assessment of this intersection has assumed that the roundabout will be constructed by the time significant development occurs within these Plan Change sites. It is noted that these sites are already zoned for residential development (albeit at a rural residential density), with the Holmes Block being permitted 97 lots and the Skellerup block 51 lots. As such, there is an element of development and associated traffic effects that could occur 'as of right' at present.

70. The concept arrangement for a roundabout at this location is illustrated in **Figure 11**, although a detailed design will need to be undertaken of this arrangement by the NZTA. It is assumed that the speed limit through this area is reduced to at least 80km/hr to safely accommodate the proposed roundabout.

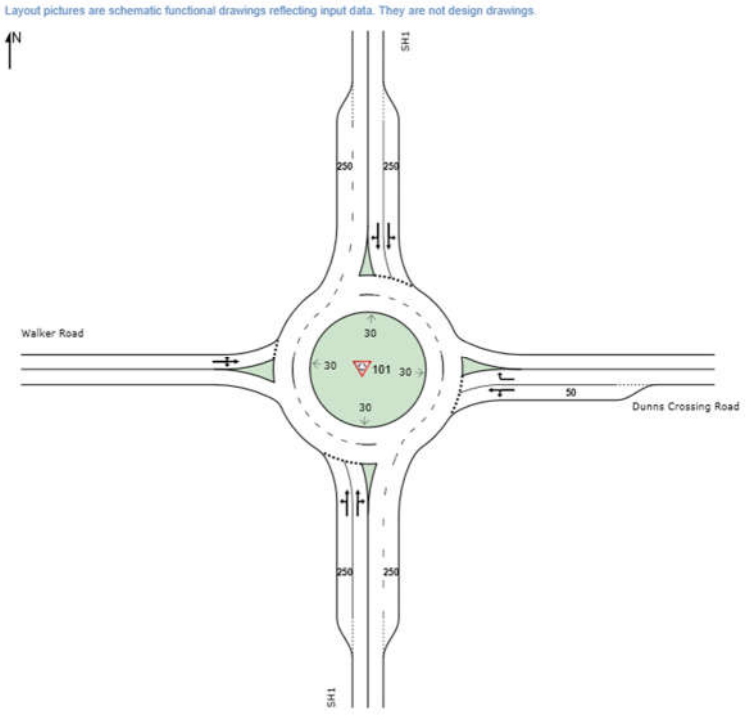



**Figure 11: SH1 / Dunns Crossing Rd / Walkers Rd Roundabout Concept**

71. The intersection modelling results being included in **Appendix 10**, which are summarised as:

i. AM Peak Hour: Overall the intersection is predicted to operate at Level of Service A, with no movement being worse than Level of Service B. The degree of saturations are also lower than the practical threshold for this type of intersection; and

ii. PM Peak Hour: Overall the intersection is predicted to operate at Level of Service A, with no movement being worse than Level of Service B. The degree of saturations are also lower than the practical threshold for this type of intersection.

72. Overall, this intersection is predicted to operate satisfactorily in the 2028 peak periods.

**Burnham School Road / Dunns Crossing Road**

73. An upgrade is understood to be planned for this location leading to a traffic signal controlled intersection. As such, traffic signals are the basis of the modelling undertaken to determine whether the proposed Plan Changes can be accommodated by the surrounding road network. The concept arrangement for traffic signals at this location is illustrated in **Figure 12**, although a detailed design will need to be undertaken of this arrangement by the Council in due course. It is anticipated this intersection would fit within the existing road corridor. A nominal 90 second cycle-time has been adopted for the purpose of this assessment.

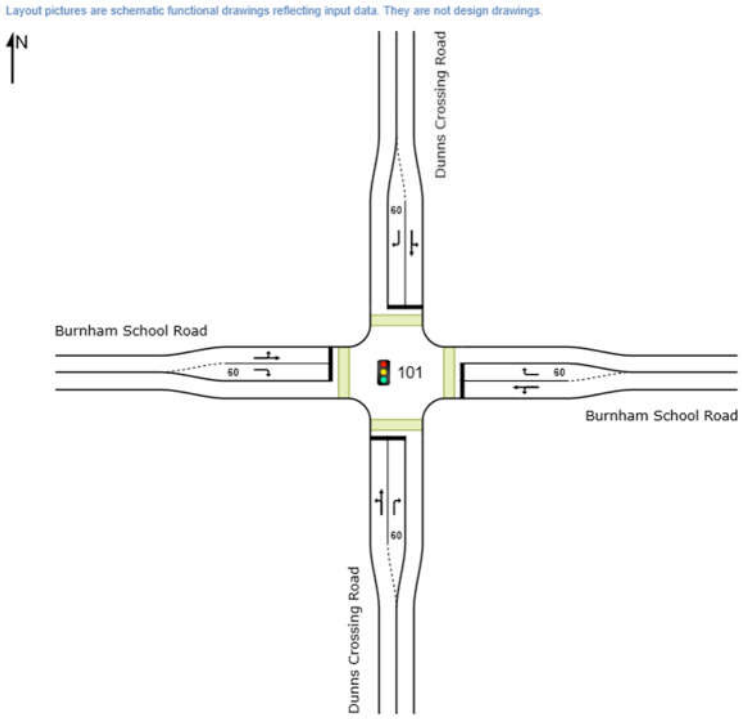



**Figure 12: Burnham School Rd / Dunns Crossing Rd Traffic Signal Concept**

74. The intersection modelling results being included in **Appendix 11**, which are summarised as:

    i. AM Peak Hour: Overall the intersection is predicted to operate at Level of Service C, with no movement being worse than Level of Service D. The degree of saturations are also lower than the practical threshold of 0.9 for signalised intersections; and

    ii. PM Peak Hour: Overall the intersection is predicted to operate at Level of Service C, with no movement being worse than Level of Service D. The degree of saturations are again lower than the practical threshold for this type of intersection.

75. Overall, this intersection is predicted to operate satisfactorily in the 2028 peak periods.

**Brookside Road / Dunns Crossing Road**

76. This intersection is a cross-road, with Dunns Crossing Road having the priority. The existing arrangement as illustrated in **Figure 13** has been used for the traffic model, with the results being included in **Appendix 12**. These results are summarised as:

i. AM Peak Hour: Overall the intersection is considered to operate satisfactorily, with no movement being worse than Level of Service D. The degree of saturations are also lower than the practical threshold for this type of intersection; and

ii. PM Peak Hour: Overall the intersection is considered to operate satisfactorily, with no movement being worse than Level of Service D. The degree of saturations are also lower than the practical threshold for this type of intersection.

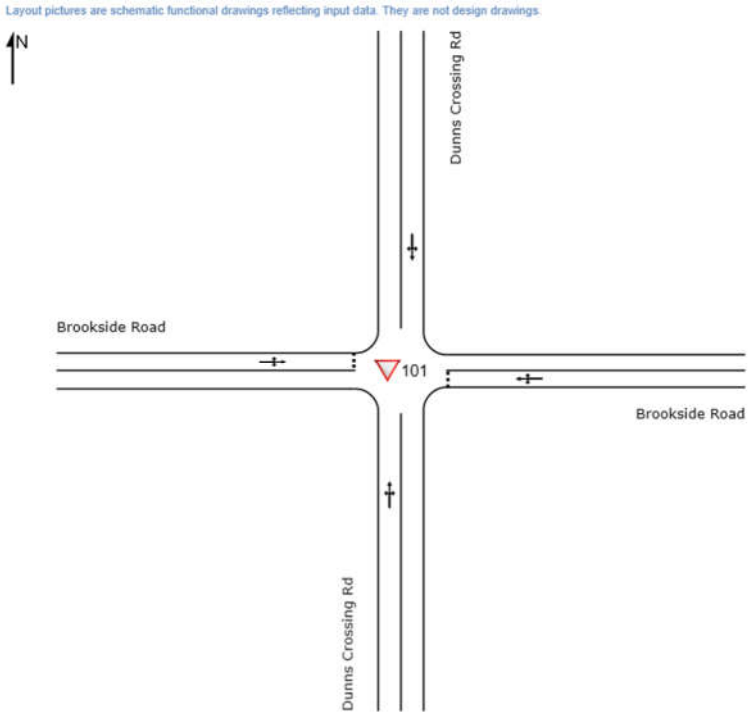



**Figure 13: Brookside Rd / Dunns Crossing Rd Intersection Layout**

77. Overall, this intersection is predicted to operate satisfactorily in the 2028 peak periods.

**Lowes Road / Dunns Crossing Road**

78. This intersection is a T-intersection, with Dunns Crossing Road having the priority. The existing arrangement (as illustrated in **Figure 14**) has been used for the traffic model, with the results being included in **Appendix 13**. These results are summarised as:

i. AM Peak Hour: Overall the intersection is considered to operate satisfactorily, with no movement being worse than Level of Service C. The degree of saturations are also lower than the practical threshold for this type of intersection; and

ii. PM Peak Hour: Overall the intersection is considered to operate satisfactorily, with no movement being worse than Level of Service E. That said, the degree of saturation for the right turn out of Lowes Road is predicted to be 0.889, which is greater than the practical threshold of 0.85. This indicates that large queues and delays could occur on this approach with small increases in traffic volumes.

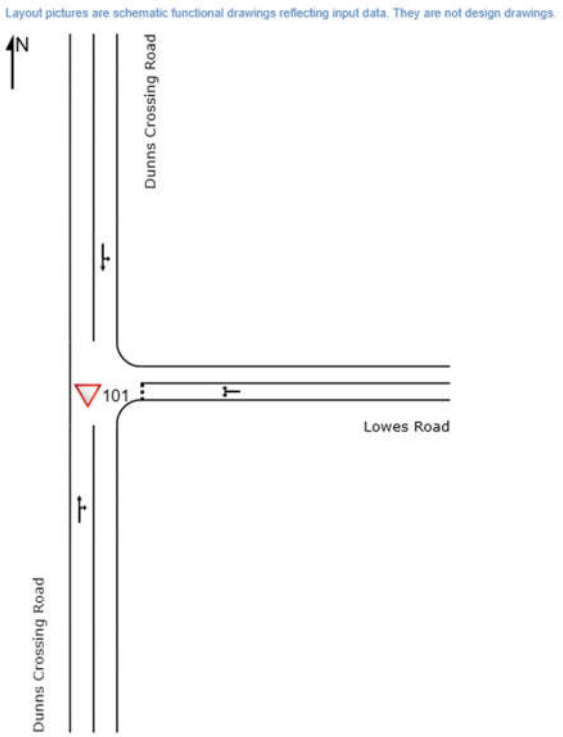



**Figure 14: Dunns Crossing Rd / Lowes Rd Intersection Layout**

79. Given the predicted operation in the weekday PM peak, a concept arrangement for traffic signals has been tested at this intersection. The concept layout is illustrated in **Figure 15**, which is anticipated to fit within the road corridor. This model assumes a 90 second cycle-time for the purpose of this assessment.

80. The results of this traffic model are contained in **Appendix 14**, which indicate:

    i. AM Peak Hour: Overall the intersection is predicted to operate at Level of Service B, with no movement being worse than Level of Service D. The degree of saturations are also lower than the practical threshold for signalised intersections; and

    ii. PM Peak Hour: Overall the intersection is predicted to operate at Level of Service B, with no movement being worse than Level of Service D. The degree of saturations are again lower than the practical threshold for this type of intersection.

81. This is considered to be sufficient to confirm that this intersection can be satisfactorily upgraded to accommodate the predicted future traffic volumes at this location.

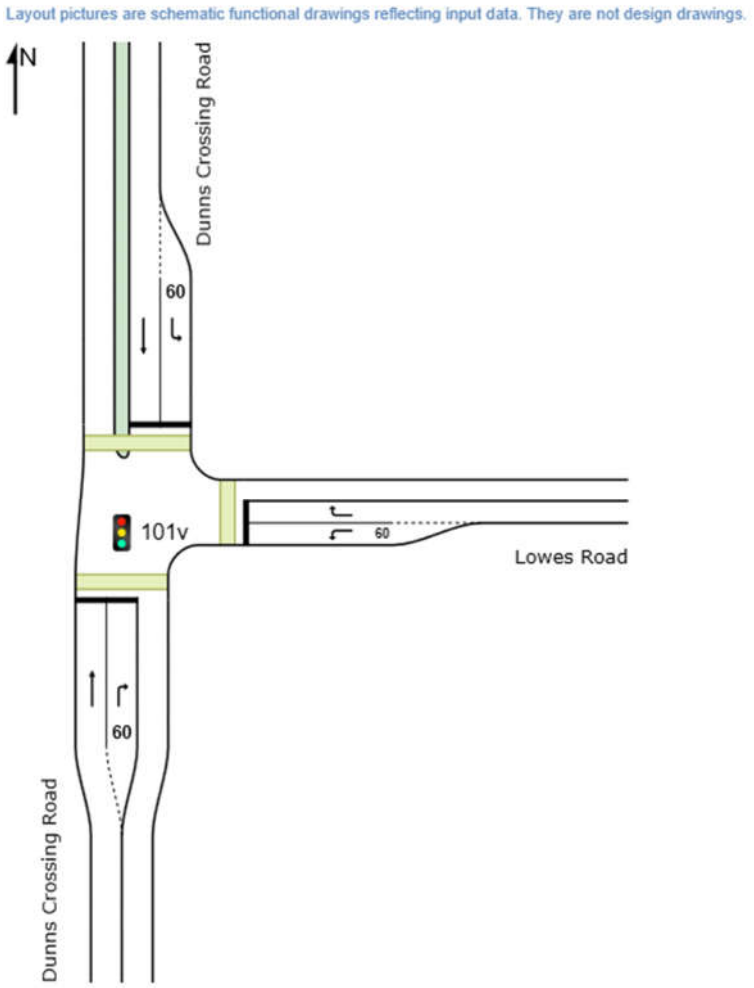



**Figure 15: Dunns Crossing Rd / Lowes Rd Traffic Signal Intersection Layout**

**Dunns Crossing Road / Goulds Road / Selwyn Road**

82. The existing arrangement at this intersection is illustrated in **Figure 3**, which indicates it comprises a closely spaced T-intersection (Goulds Road / Dunns Crossing Road) and a cross-road (Goulds Road / Selwyn Road). This intersection arrangement is used as the basis of traffic modelling at this location, with the two intersections being linked in SIDRA.

83. The results of this traffic model are included in **Appendix 15**, which indicate that:

    i. AM Peak Hour: Overall the intersection is considered to operate satisfactorily, with no movement being worse than Level of Service C. The degree of saturations are also lower than the practical threshold for this type of intersection; and

    ii. PM Peak Hour: Overall the intersection is considered to operate satisfactorily, with no movement being worse than Level of Service B. The degree of saturations are also lower than the practical threshold for this type of intersection.

84. Overall, this intersection is predicted to operate satisfactorily from a traffic capacity perspective in the 2028 peak periods.

85. The crash review undertaken of this intersection in paragraph 22 indicates there is currently a trend in which drivers exiting the Goulds Road approaches are failing to give-way to traffic on Selwyn Road. It is anticipated that the urbanisation of this area (as the adjacent residential zoned land is developed) would better highlight the intersection and reduce the speed limit on Selwyn Road. This may address the crash record at this location. If crashes continue after this area is urbanised, there would be value in Council rationalising the layout.

**Accessibility**

86. There is no public transport in the immediate vicinity of the Plan Change sites at present. The closest bus service is the Yellow Line, which undertakes a loop on Brookside Road, a short segment of Dunns Crossing Road and then Lowes Road to head back to Rolleston Town Centre. The Plan Change sites doe include road networks that would enable bus services to route through the sites on the Primary Road network, so these could accommodate passenger transport in the future.

87. The proposed site will include pedestrian and cycle links within the Plan Change area, as well as providing small local commercial areas that are intended to provide for everyday shopping and further reduce the need to travel by car for local trips. It is also noted that the Holmes Block has a boundary with the West Rolleston Primary School and there is a pre-school at the Burnham School Road / Dunns Crossing Road intersection. These place education facilities within walking distance of this site.

88. These Plan Change sites are within approximately 4.5km of Rolleston Town Centre[13], which means residents will be able to comfortably cycle to / from the shopping and employment in that area.

89. The above is considered to be sufficient to confirm that the site has access to a range of everyday facilities without the need to drive.

# Summary & Conclusion

## Summary

90. The Plan Change proposed would enable the development of up to 1,150 residential Lots plus a small commercial zone at the Holmes Block, plus up to 950 residential Lots plus a small commercial zone at the Skellerup Block.

91. Access to the Holmes Block would be via Dunns Crossing Road and Burnham School Road. The Dunns Crossing Road accesses are anticipated to be cross-road intersections with Newman Road and Granite Drive. Access to the Skellerup Block would be to Dunns Crossing Road, with the southern Primary Access having the potential to link to the road network of any future opposite subdivision.

92. The SH1 / Dunns Crossing Road / Walkers Road is assumed to be upgraded to a roundabout within the next three to four years, as has been advised by the NZTA and Council. This intersection is predicted to operate satisfactorily with the inclusion of Plan Change traffic.

93. It is understood that the Council intend to install traffic signals at the Dunns Crossing Road / Burnham School Road intersection. A concept arrangement has been tested and this layout can accommodate the traffic associated with the proposed Plan Change.

[13] Measured in a straight line.

94. The Dunns Crossing Road / Lowes Road intersection is predicted to operate over the practical capacity threshold with the Plan Change traffic added to the network. A concept traffic signal scheme has been tested at this location and was found to operate satisfactorily.

95. The traffic capacity of other intersections in the immediate vicinity of the Plan Change sites have been assessed and found to be acceptable.

96. The traffic capacity of the site accesses has been assessed and found to be acceptable. There will also be sufficient sight distance for these intersections to operate safely.

## Conclusion

97. Overall and accounting for the off-site improvements outlined in this report, it is considered that the transport effects of the proposed Plan Change will be acceptable on the surrounding transport network.

# Appendix 1

## Outline Development Plans

LEGEND

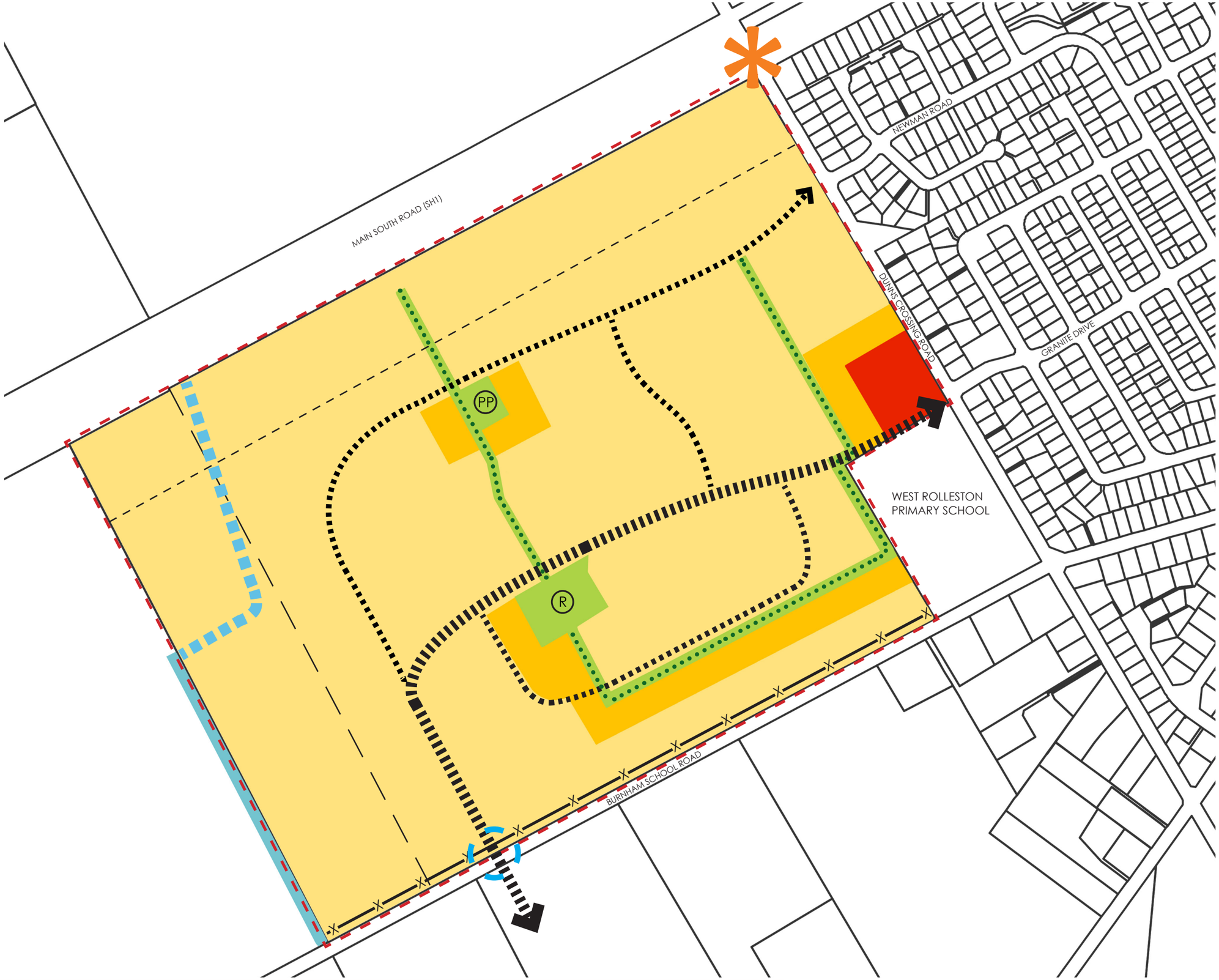
- Plan Change Boundary

**Living Z**

- General Residential Density (Minimum 12 Households/Ha
- Medium Residential Density (Minimum 15 Households/Ha)

**Business**

- Commercial / Business
- Primary Road
- Secondary Road
- Possible Future Connection
- Potential Intersection Upgrade
- Recreation Reserve
- Pocket Park
- Green Link
- Water Race
- Water Race Realigned
- Avoid access onto Burnham School Road from site
- Odour Treatment Area
- Acoustic Treatment Area




A. OUTLINE DEVELOPMENT PLAN

LEGEND

Plan Change Boundary

**Living Z**

General Residential Density
(Minimum 12 Households/Ha

Medium Residential Density
(Minimum 15 Households/Ha)

**Business**

Commercial / Business

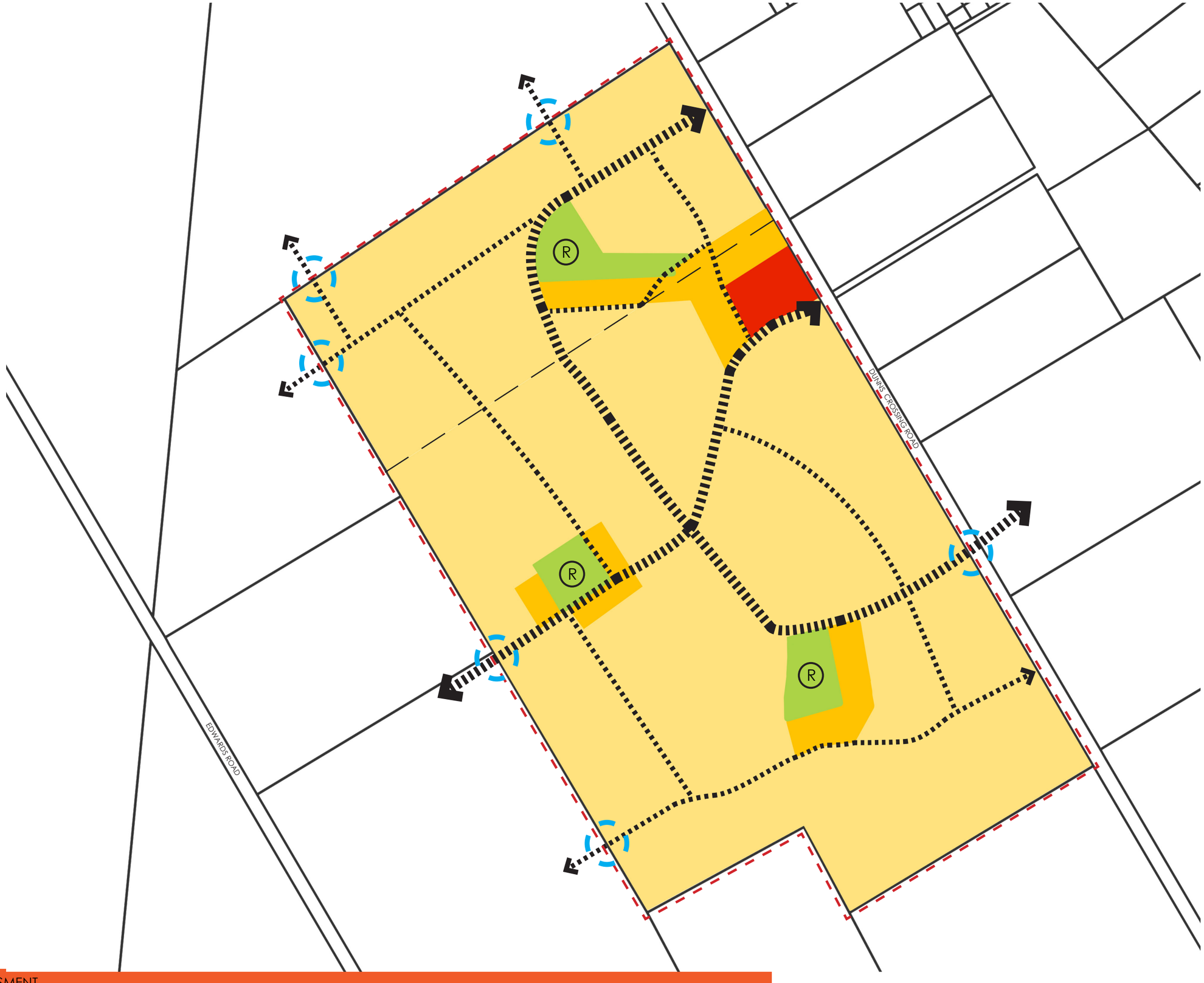
Primary Road

Secondary Road

Possible Future Connection

Recreation Reserve

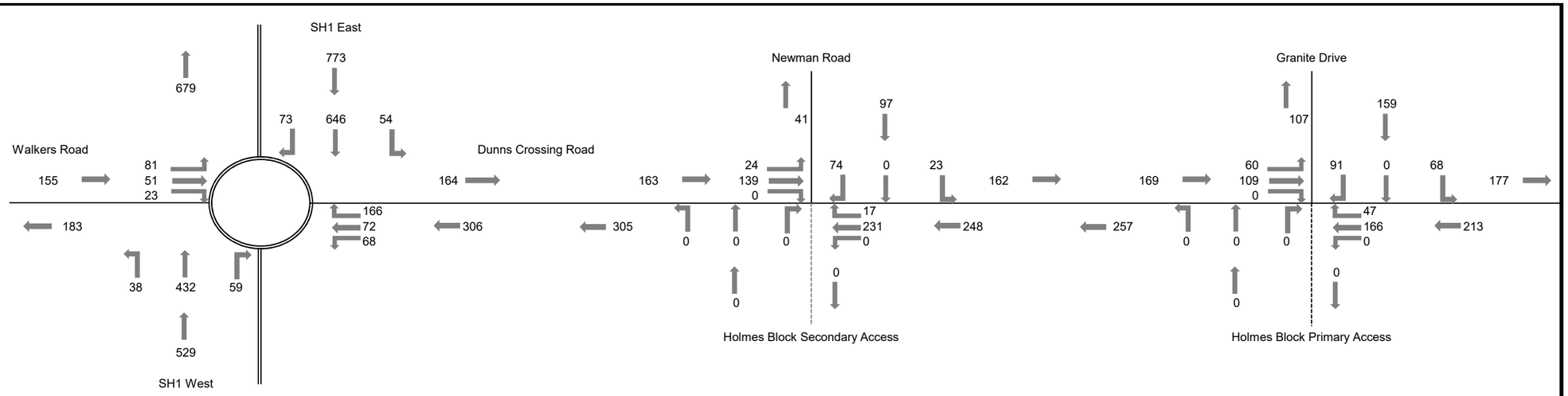
Odour Treatment Area




A. OUTLINE DEVELOPMENT PLAN

# Appendix 2

## Network Traffic Volumes

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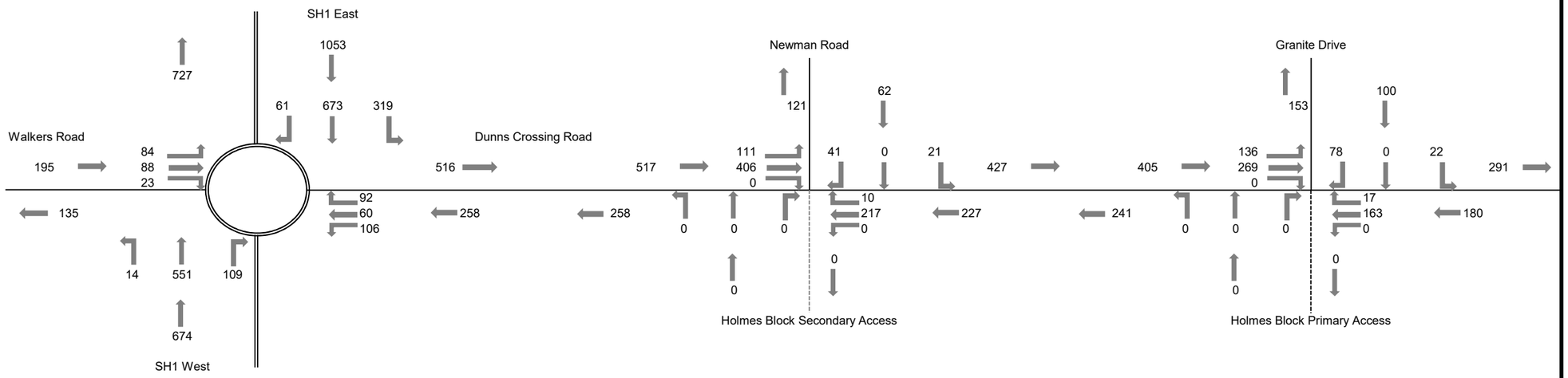
**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**AM Peak Hour**

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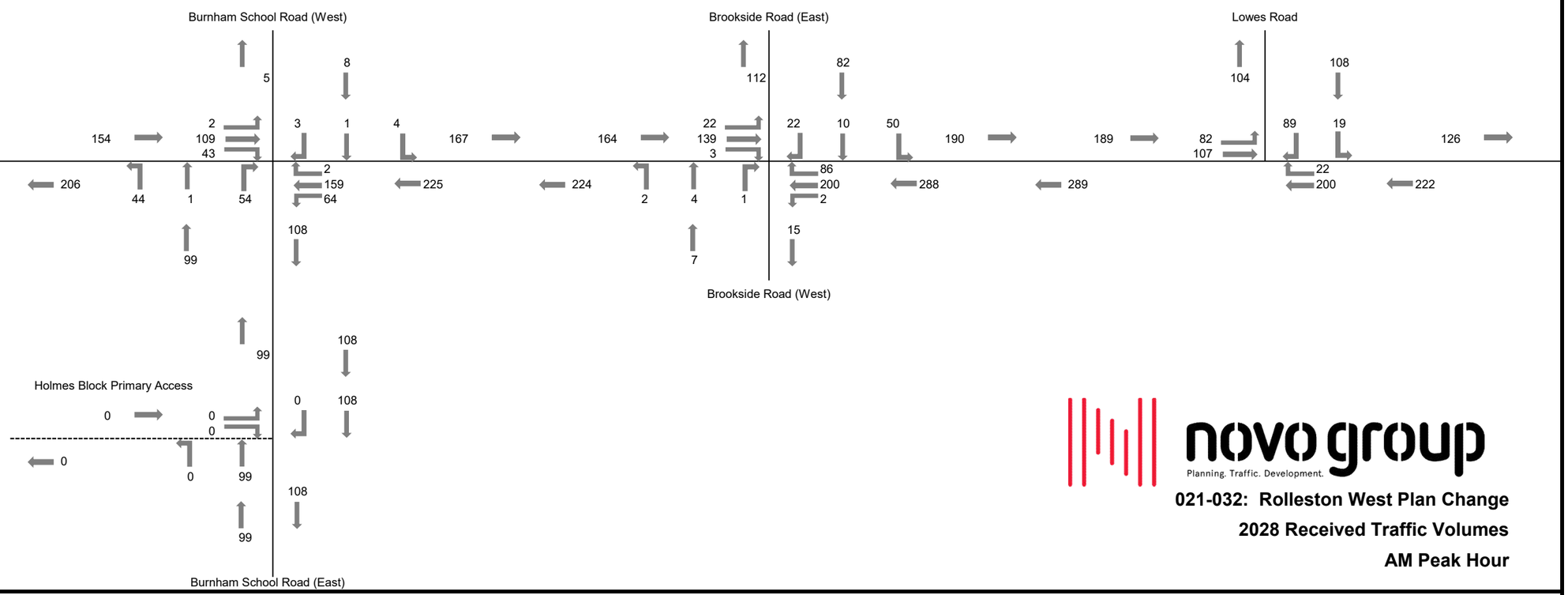
**2028 Received Traffic Volumes**

**PM Peak Hour**

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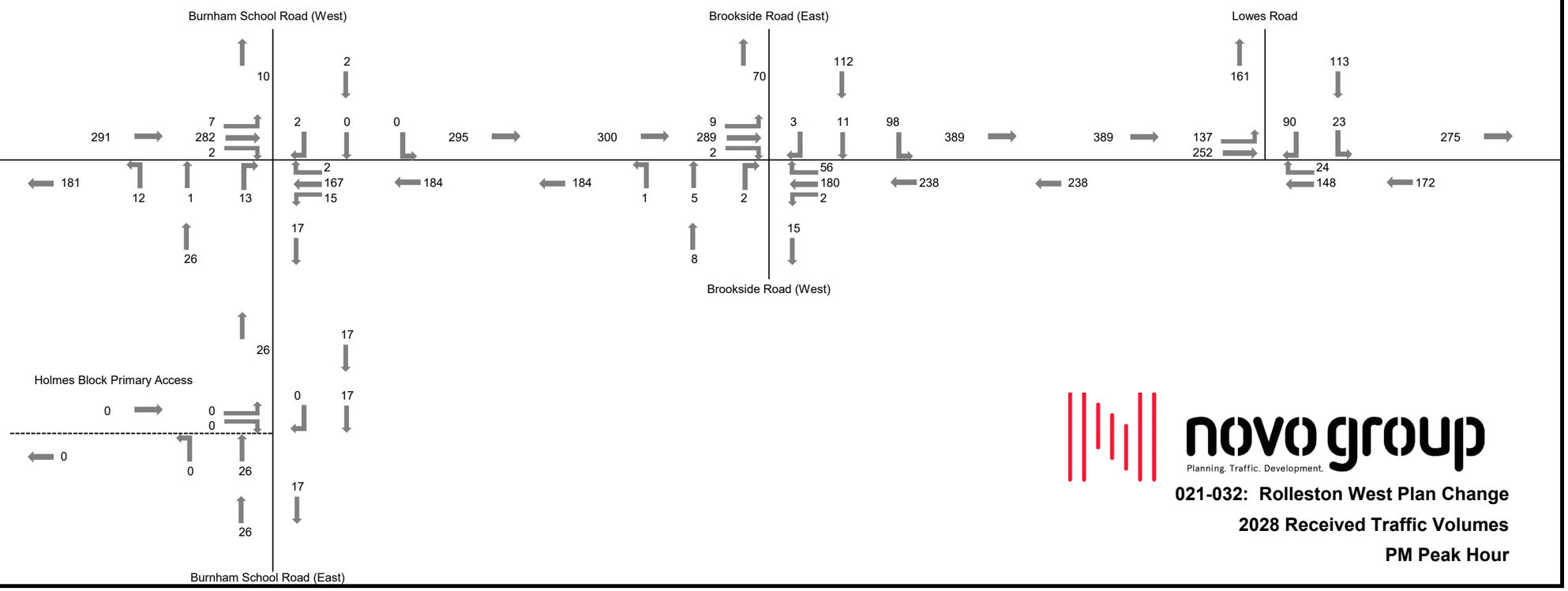
**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**AM Peak Hour**

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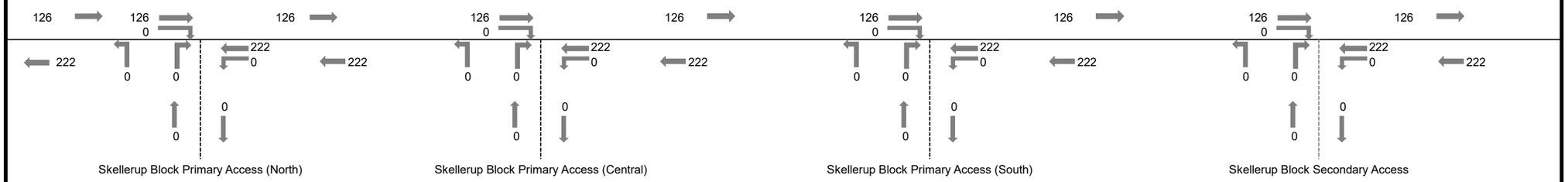
**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**PM Peak Hour**

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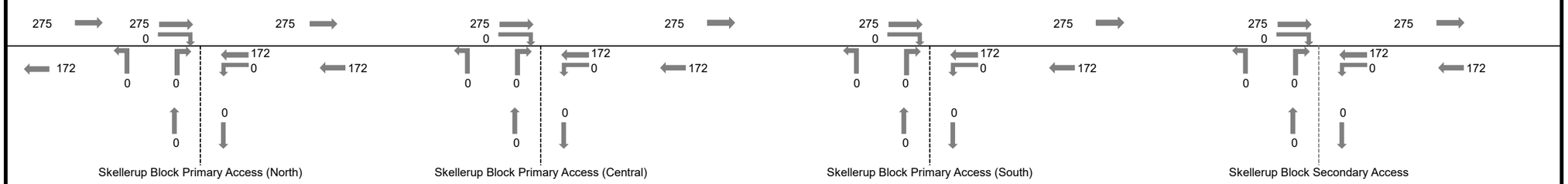
**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**AM Peak Hour**

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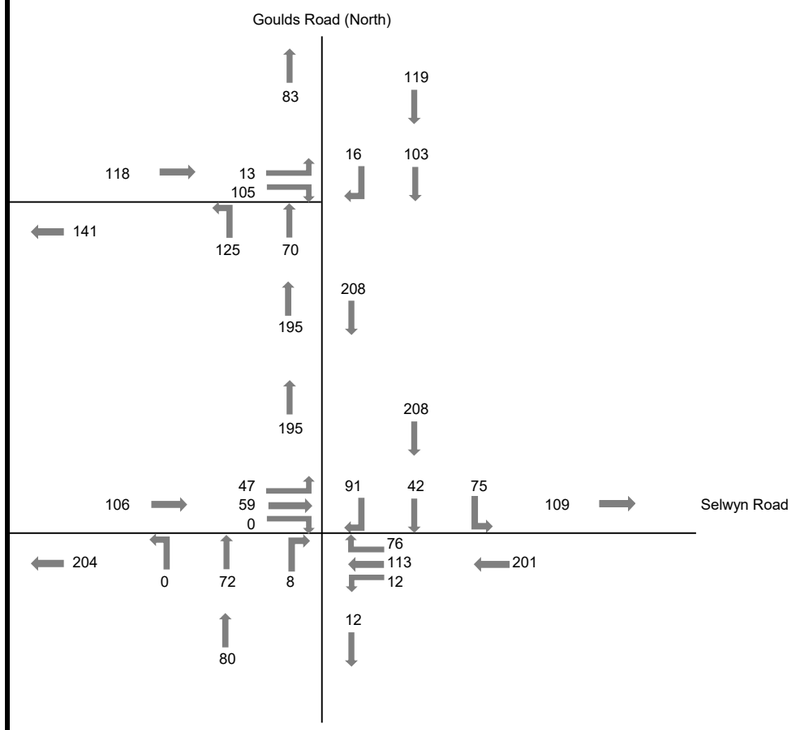
**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**PM Peak Hour**

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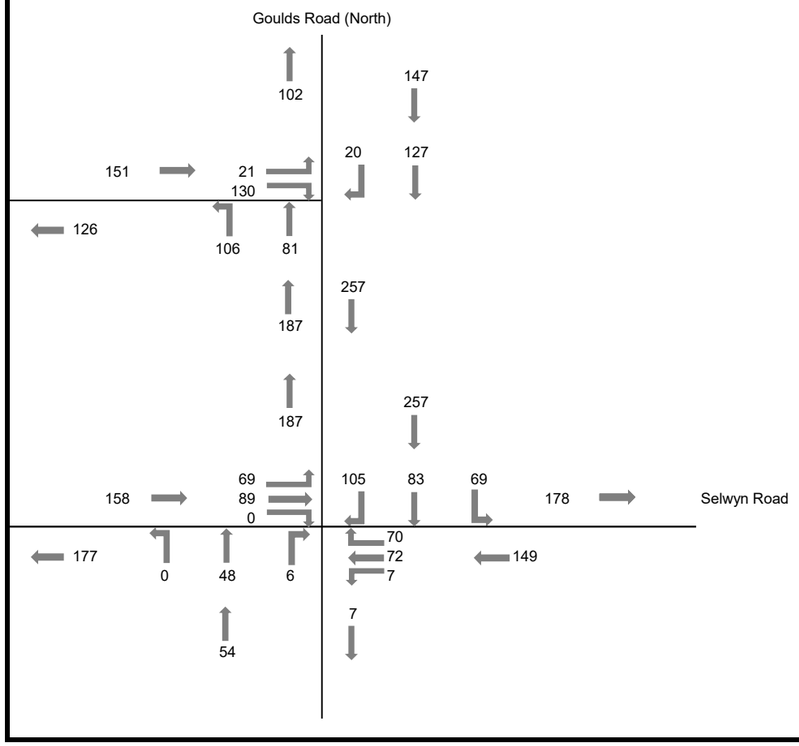
**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**AM Peak Hour**

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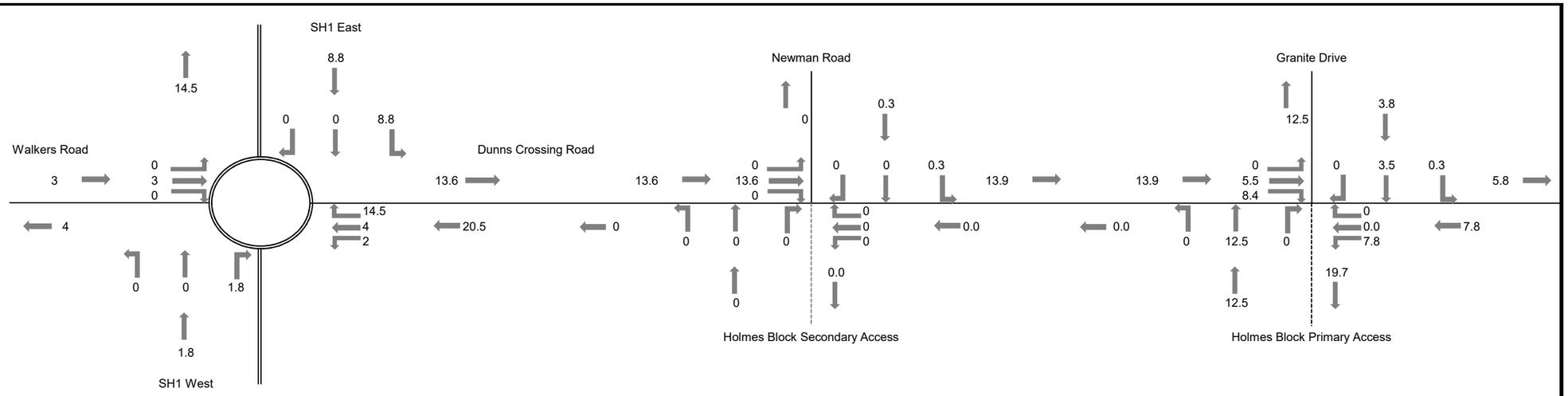
**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**PM Peak Hour**



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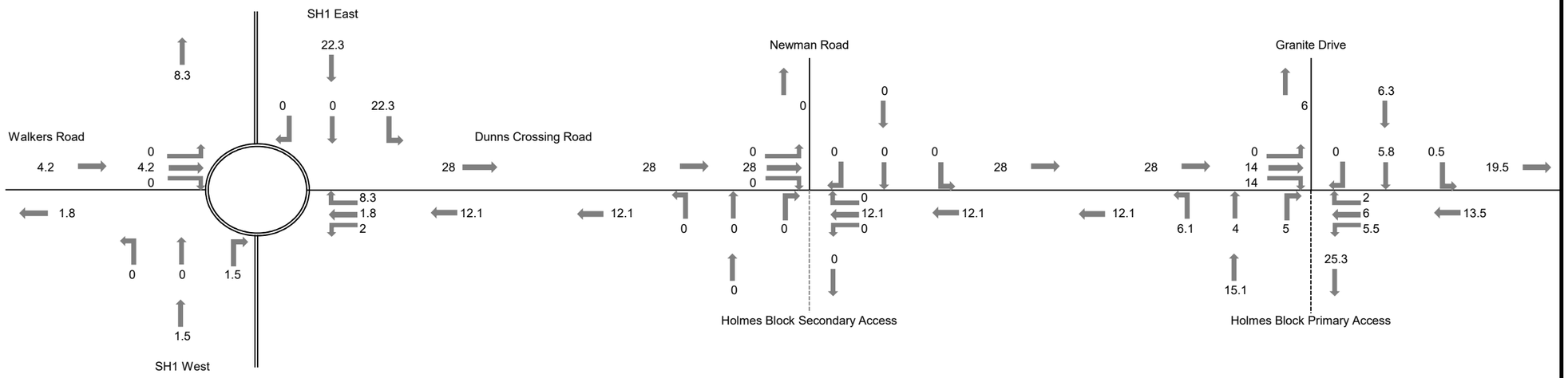
**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**Holmes Block AM Peak**



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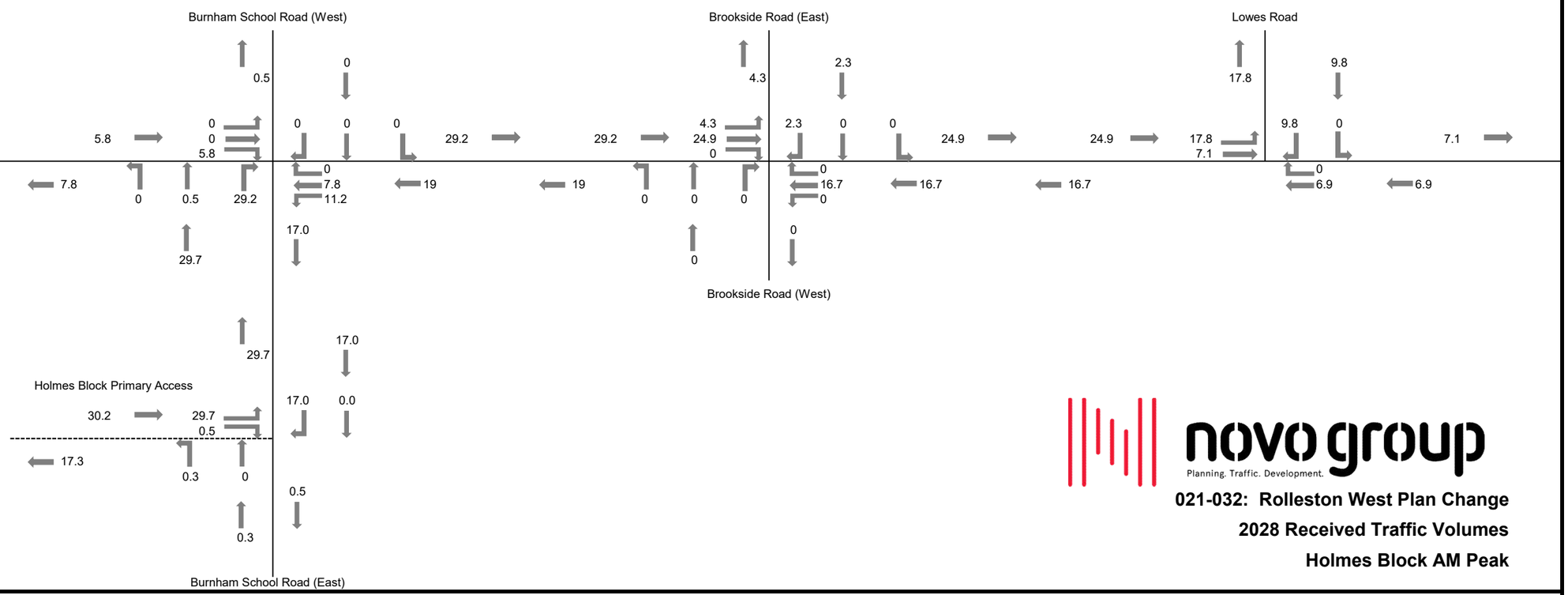


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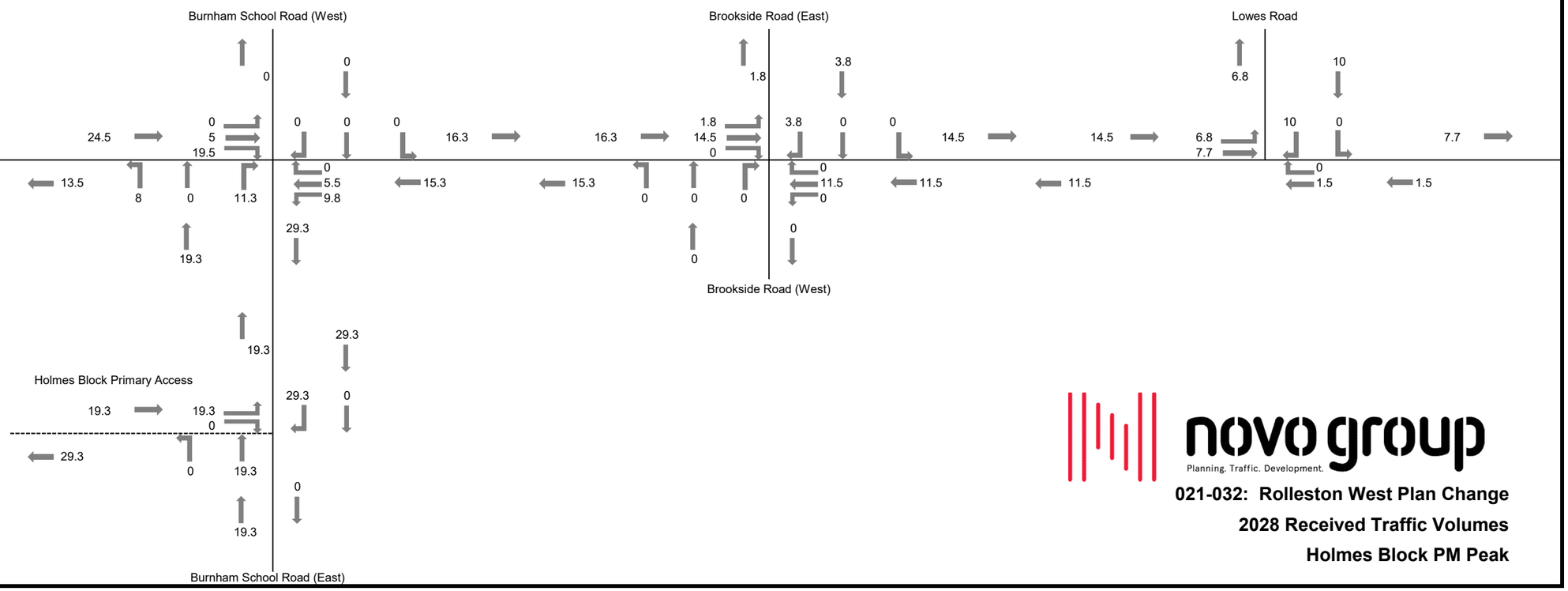


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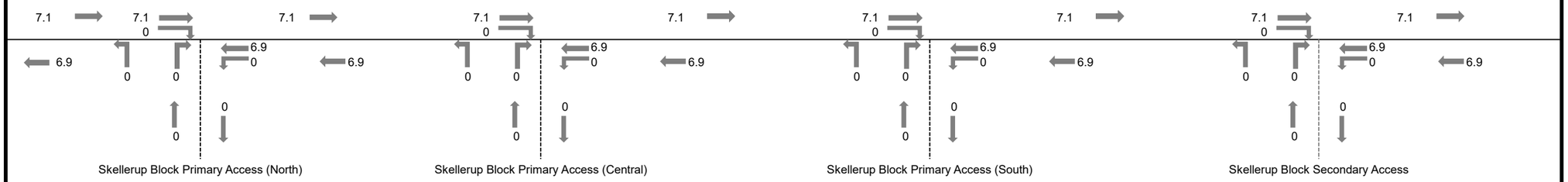


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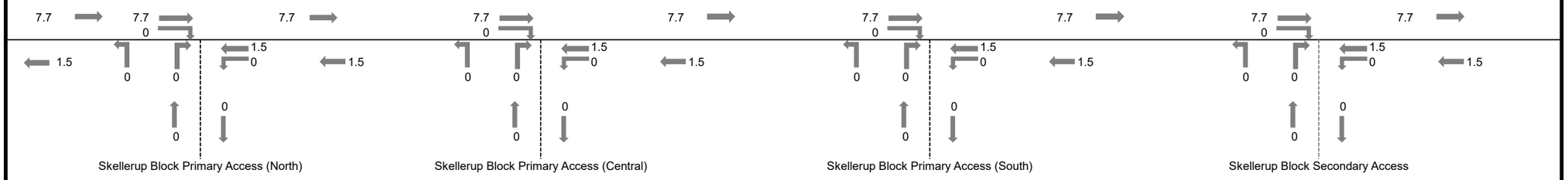
**Holmes Block AM Peak**

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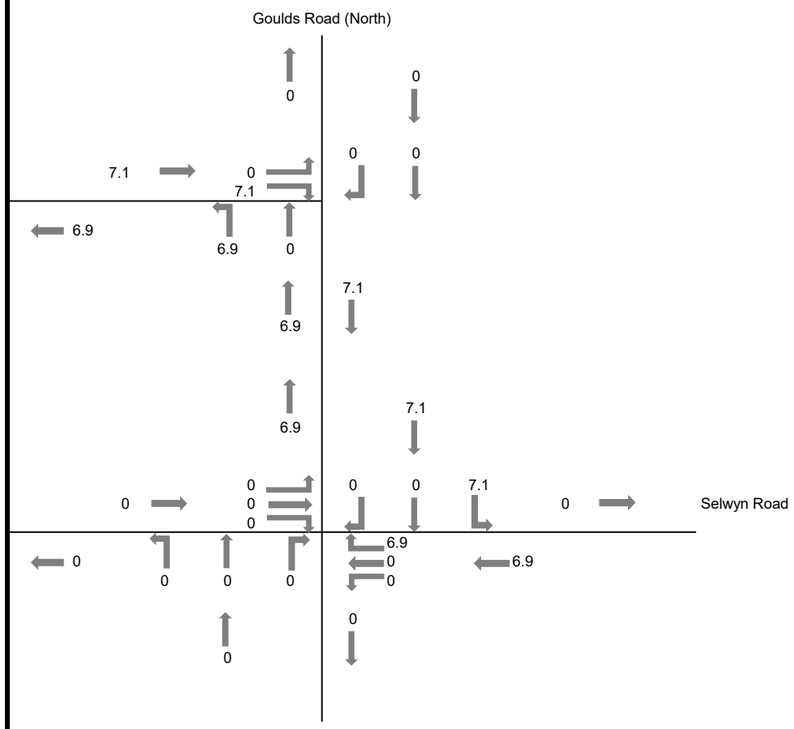


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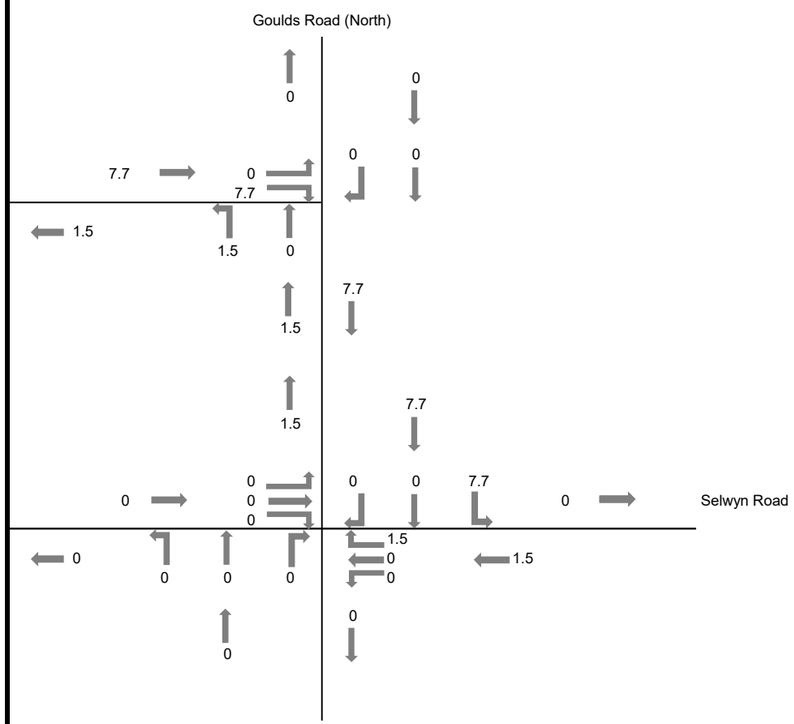


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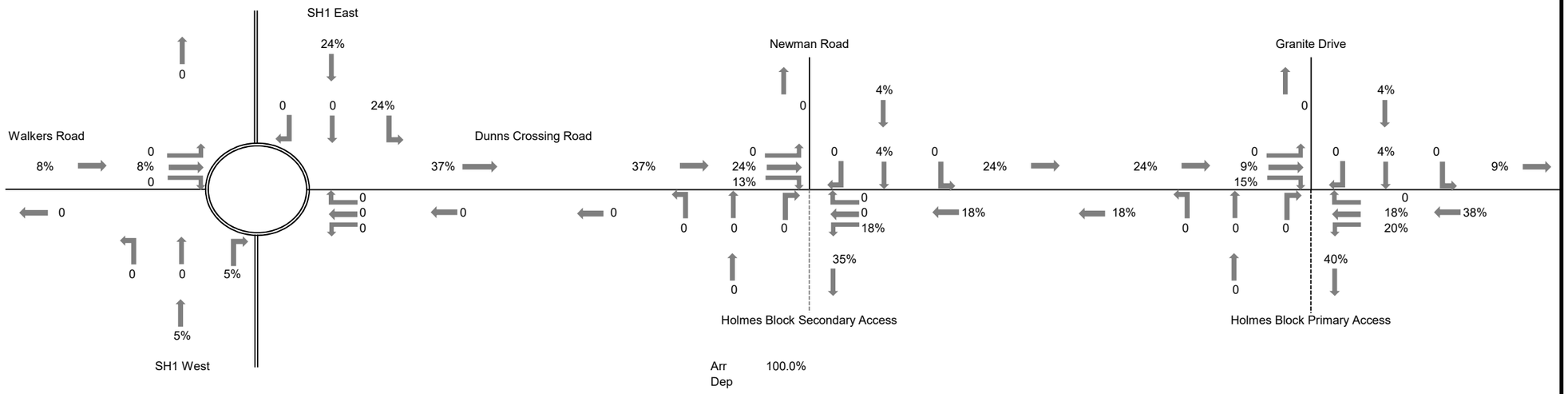


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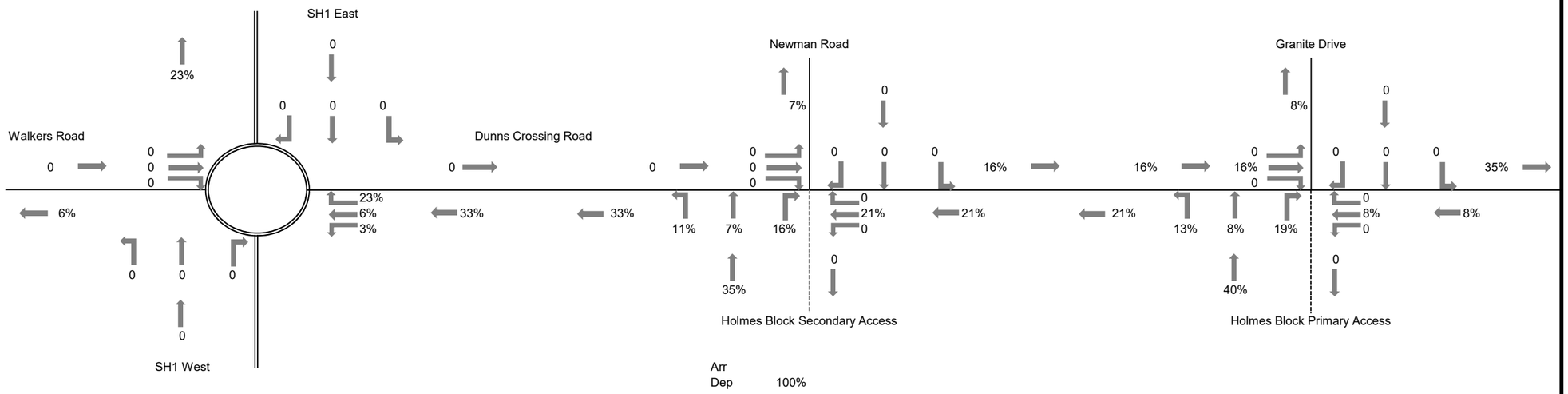
**021-032: Rolleston West Plan Change**

**2028 Distribution Arrivals**

**Holmes Block AM Peak**

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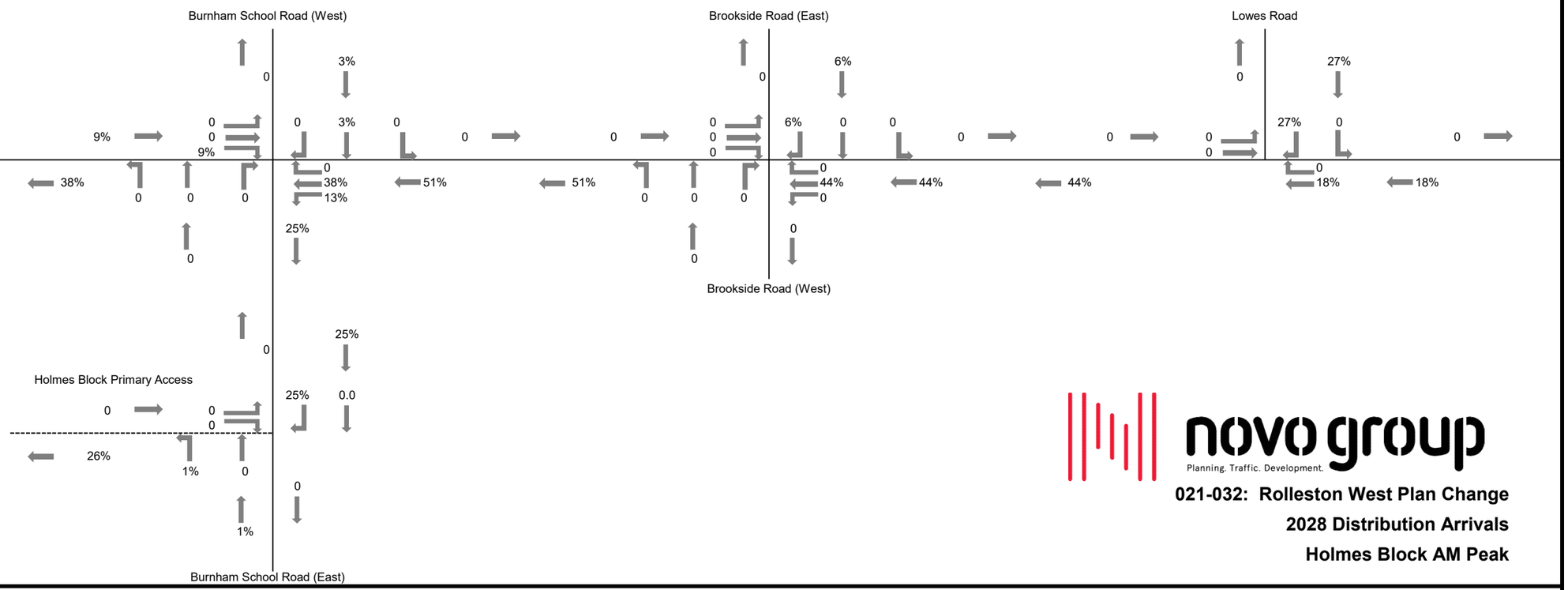
**021-032: Rolleston West Plan Change**

**2028 Distribution Departures**

**Holmes Block AM Peak**

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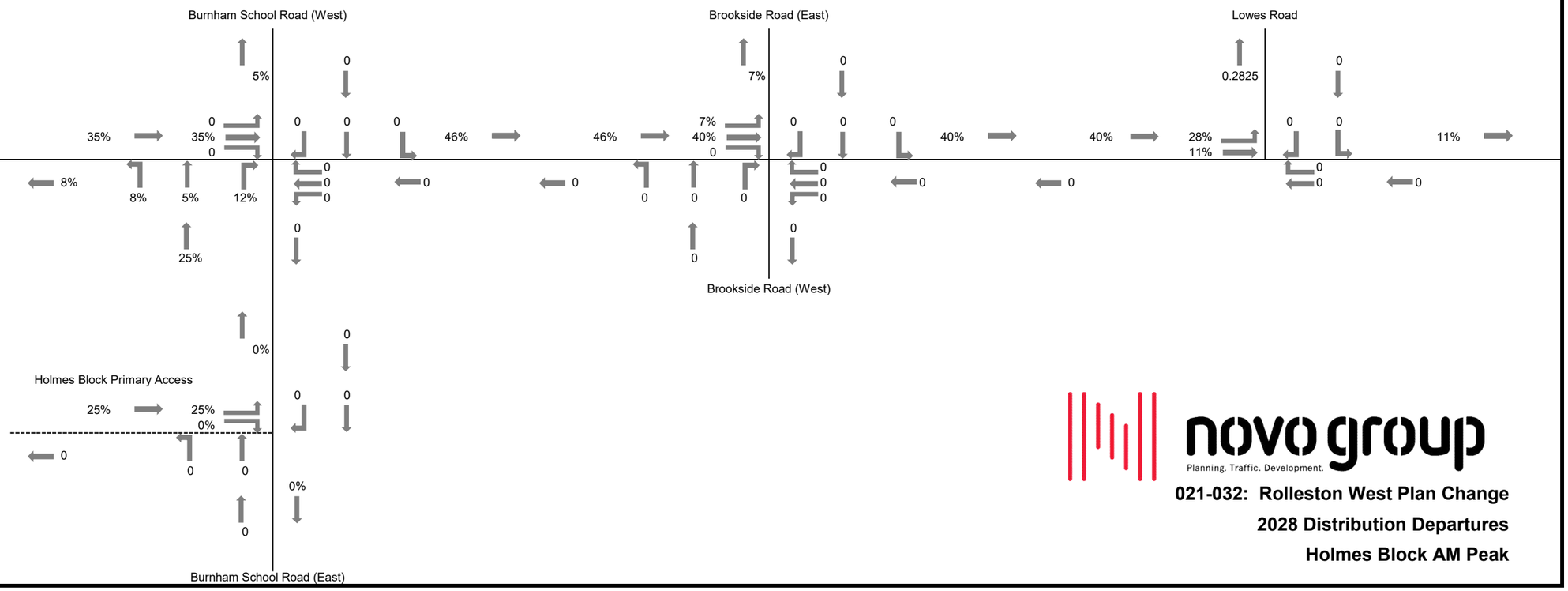


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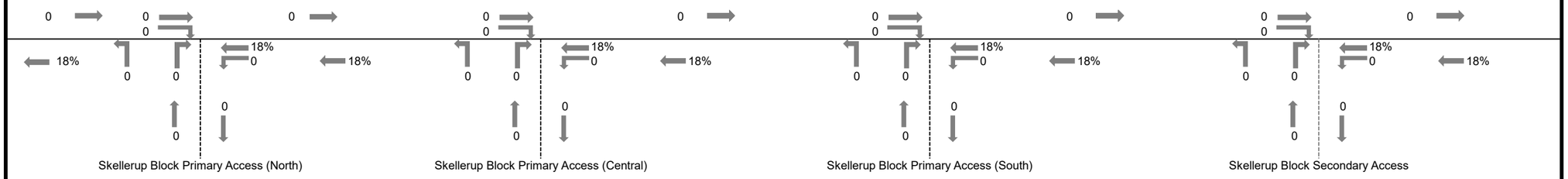


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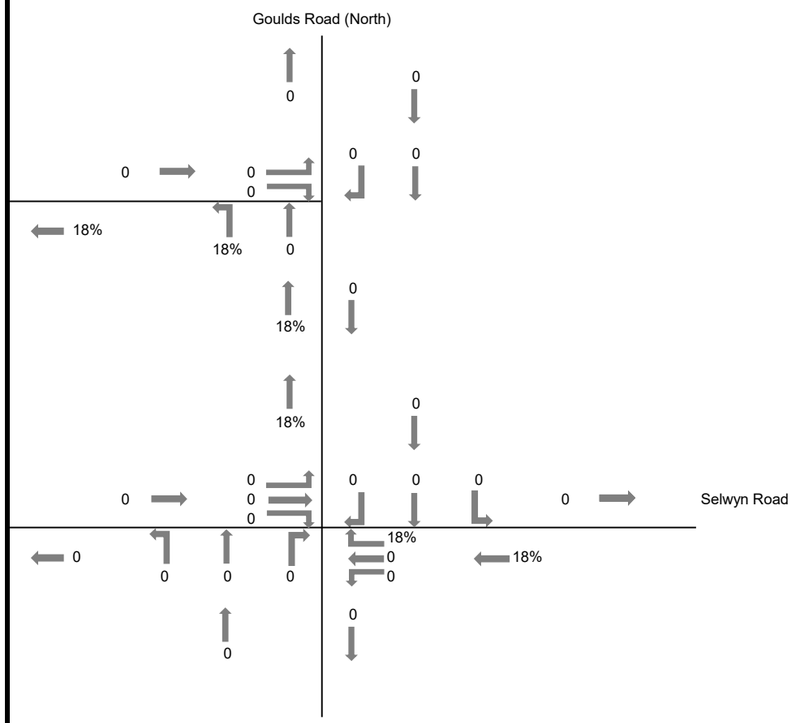


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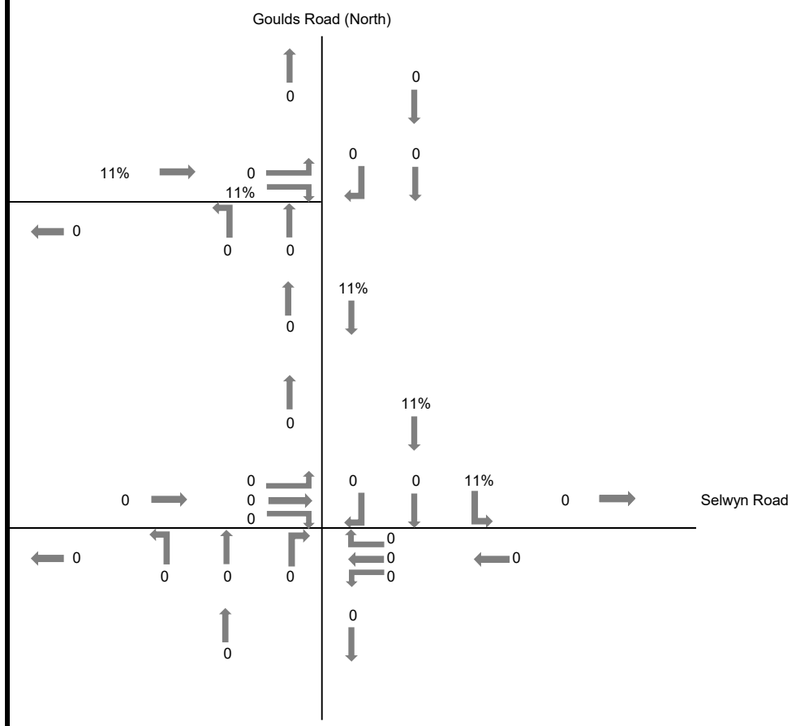


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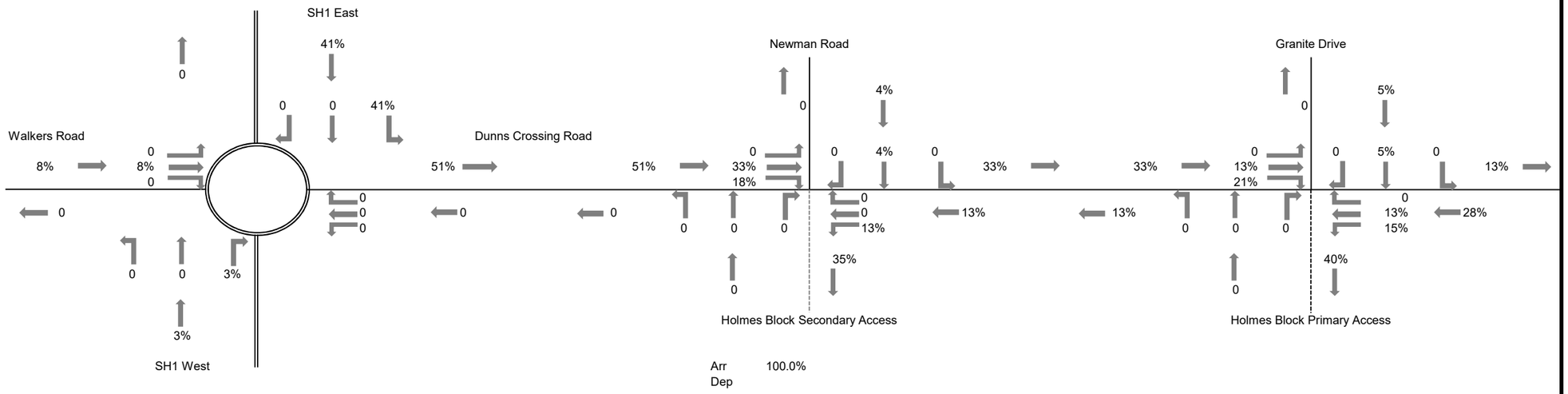


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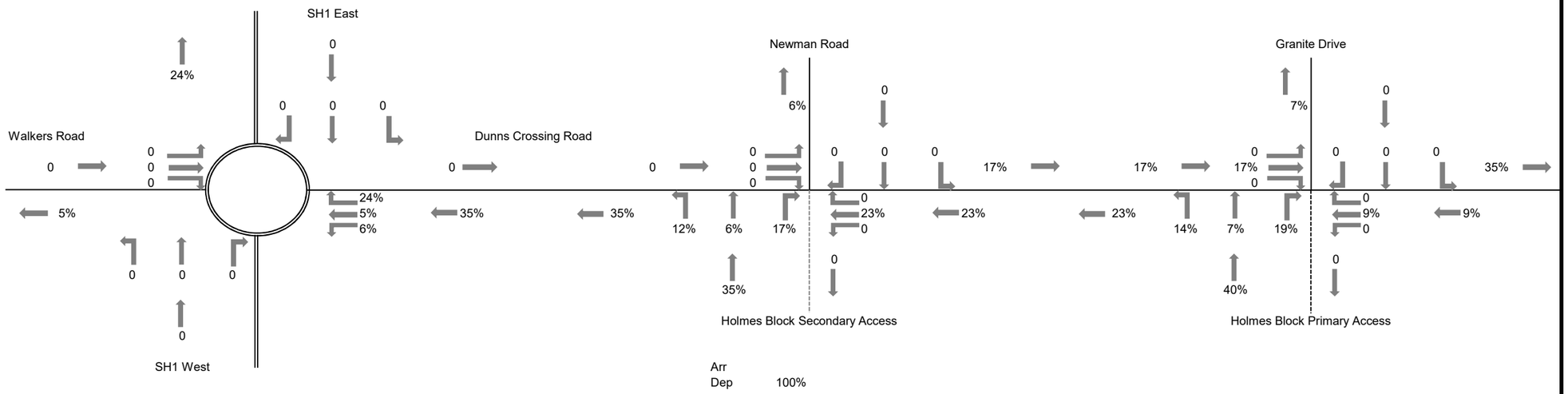


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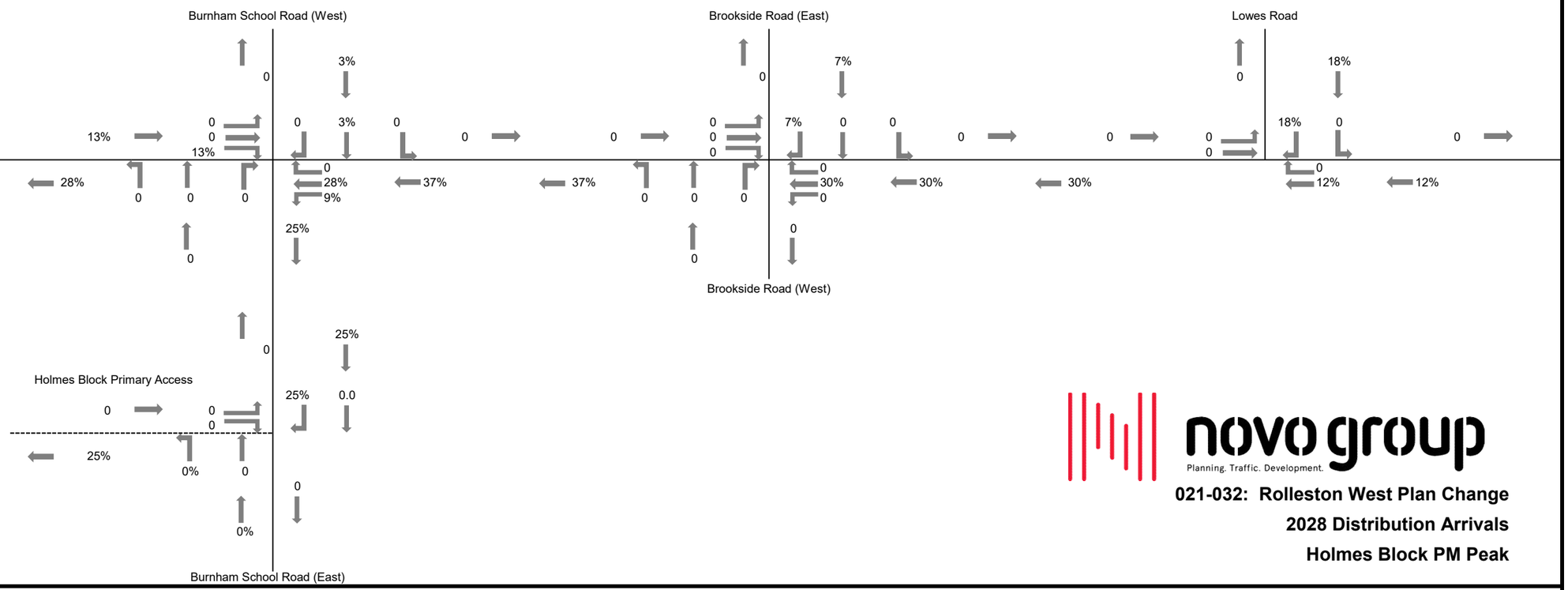


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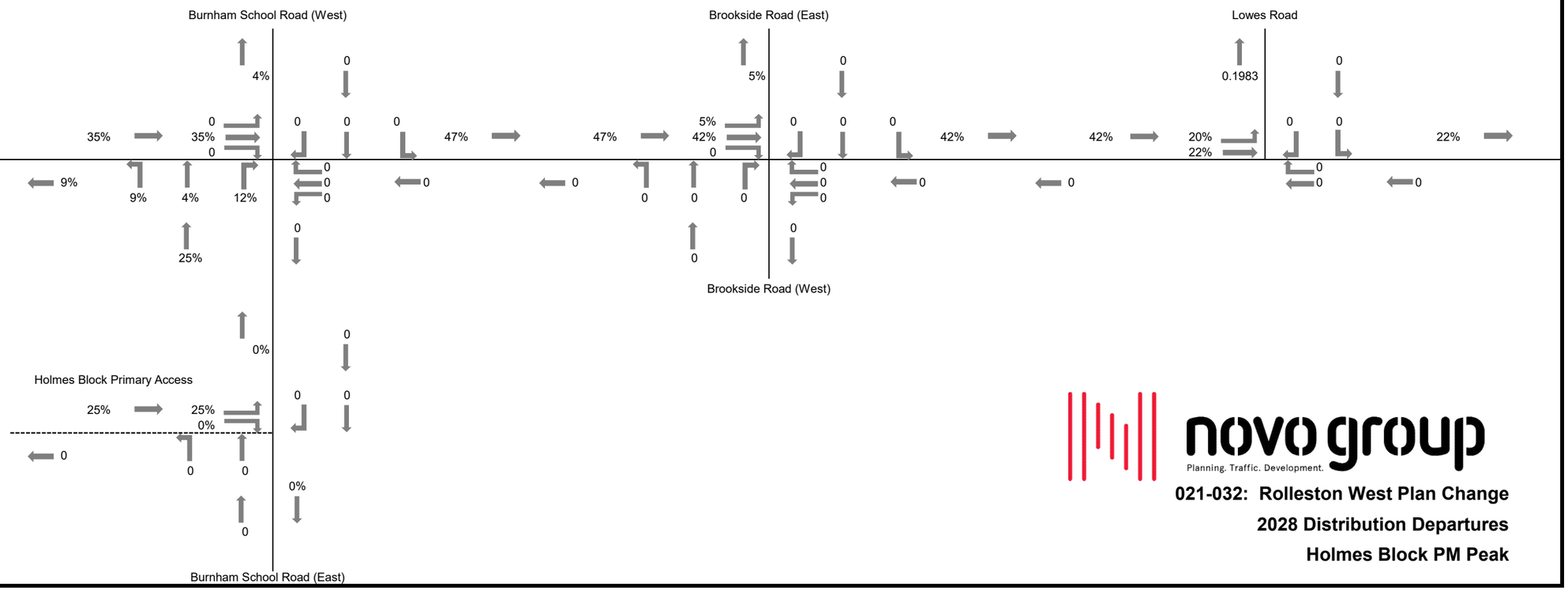


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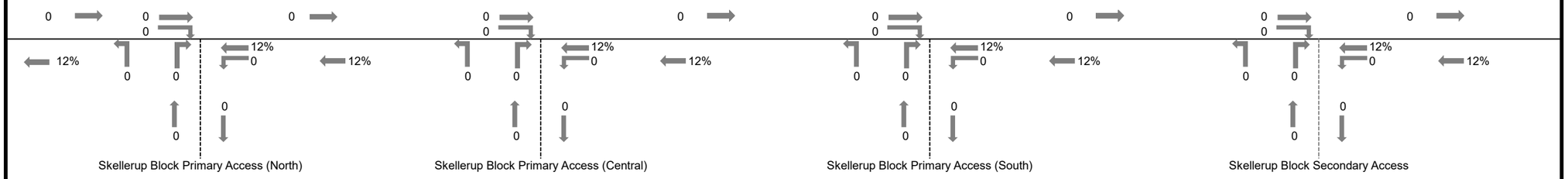


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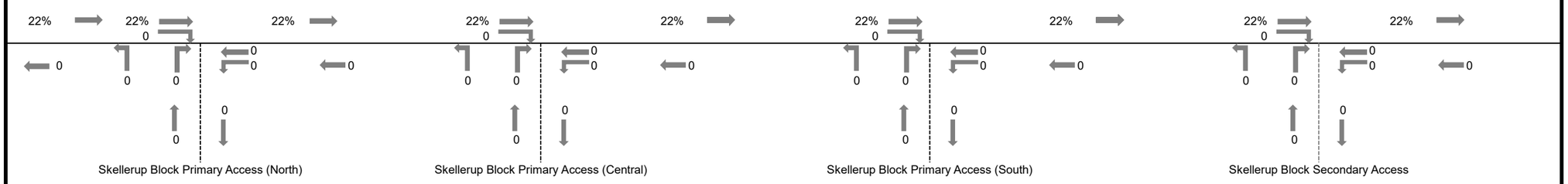


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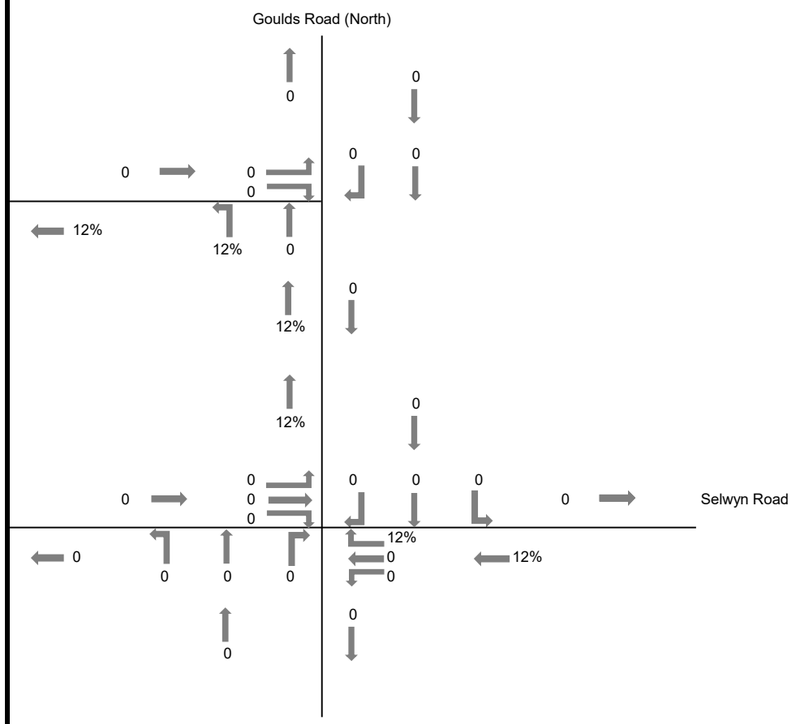


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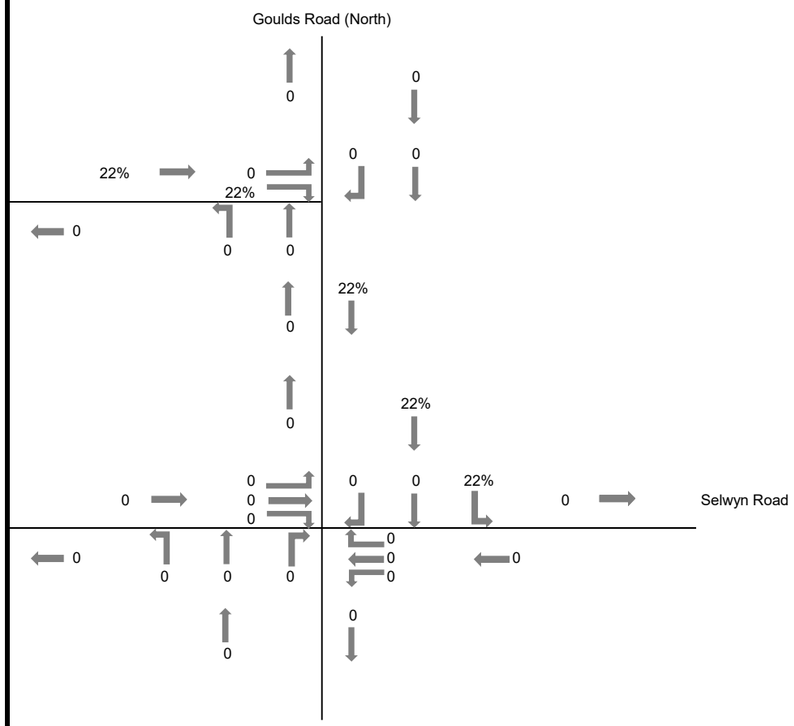


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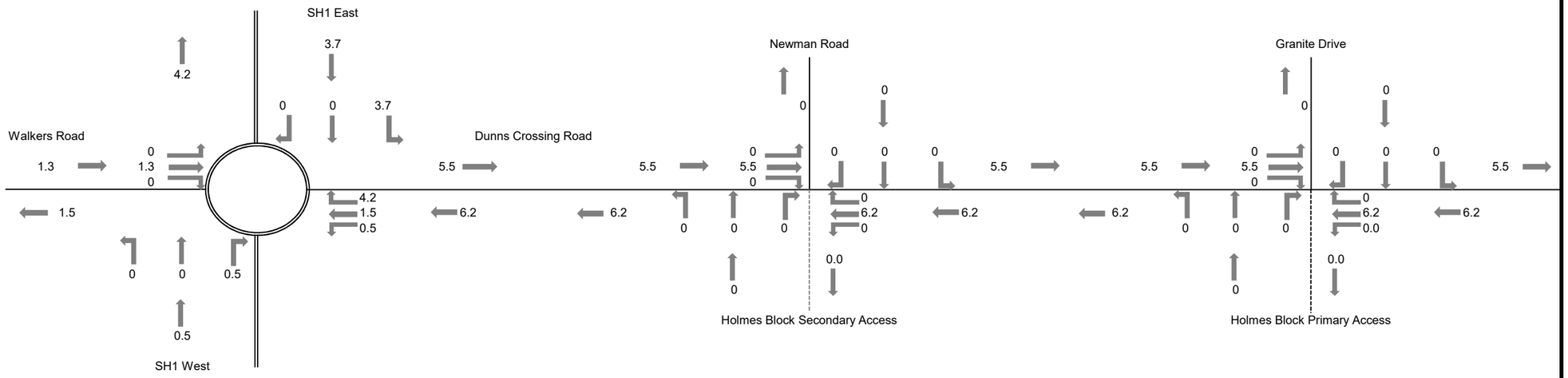


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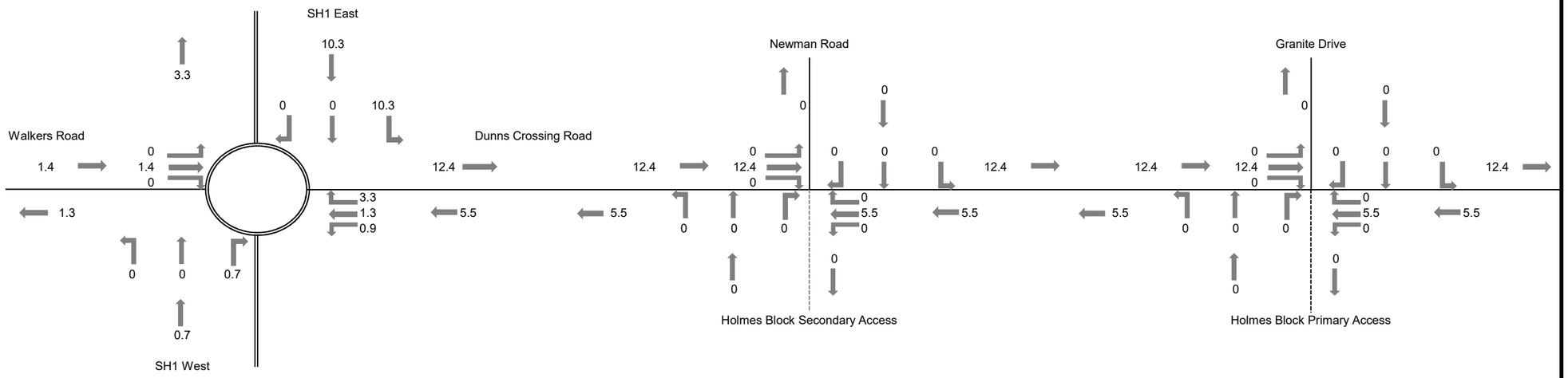
**2028 Received Traffic Volumes**

**Skellerup Block AM Peak**

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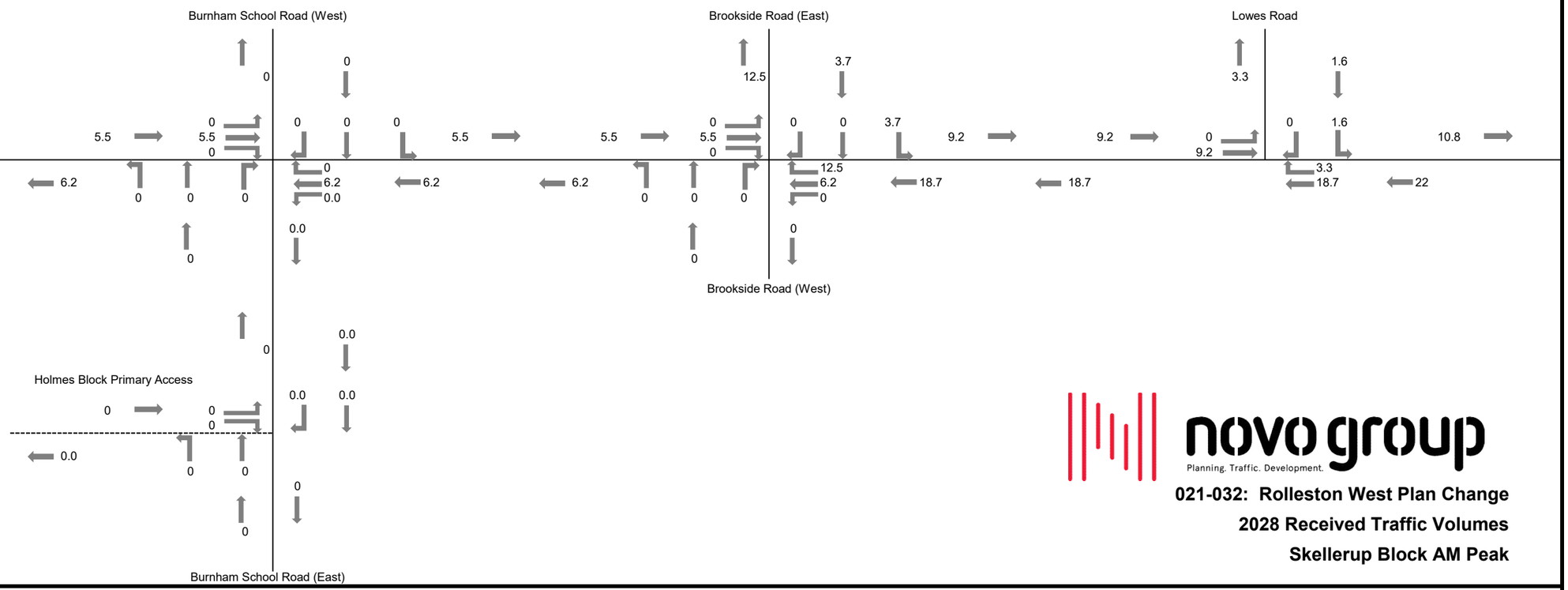


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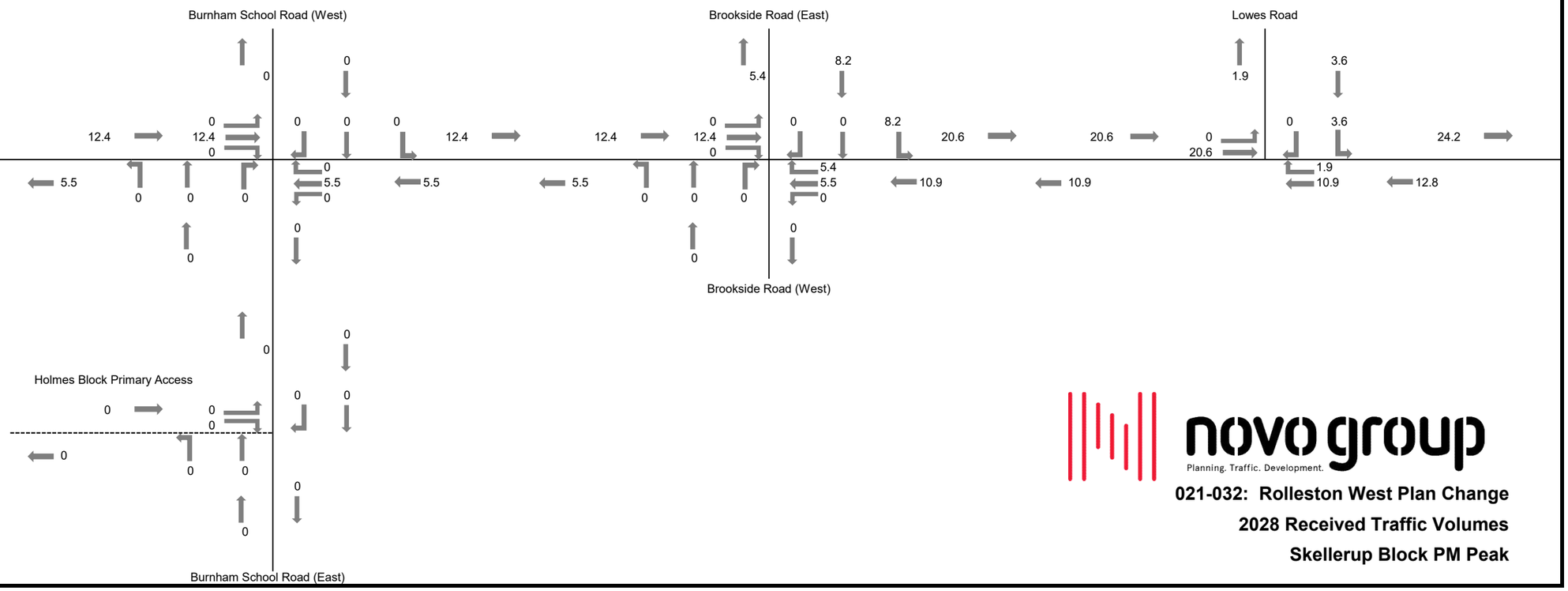


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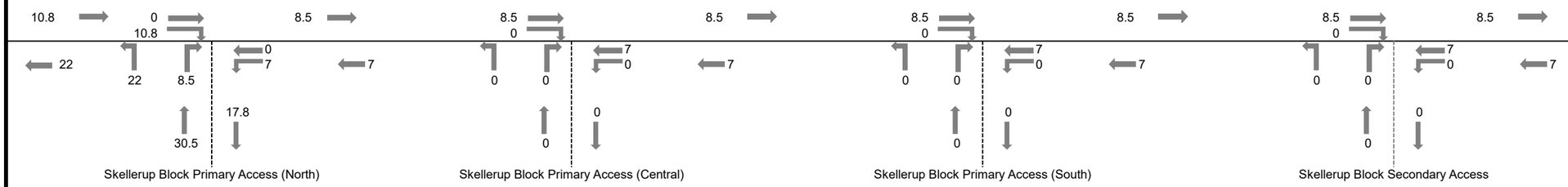


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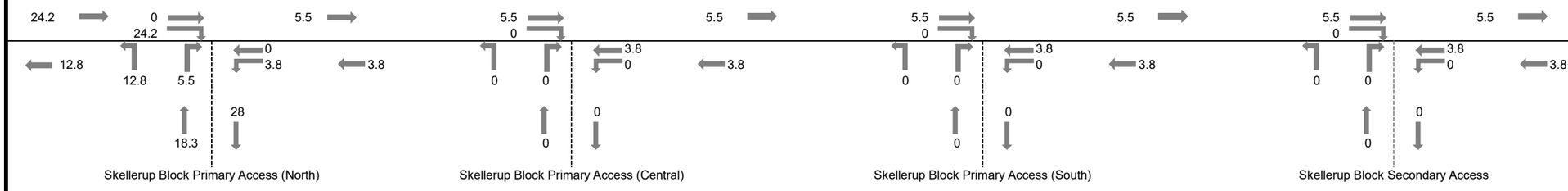


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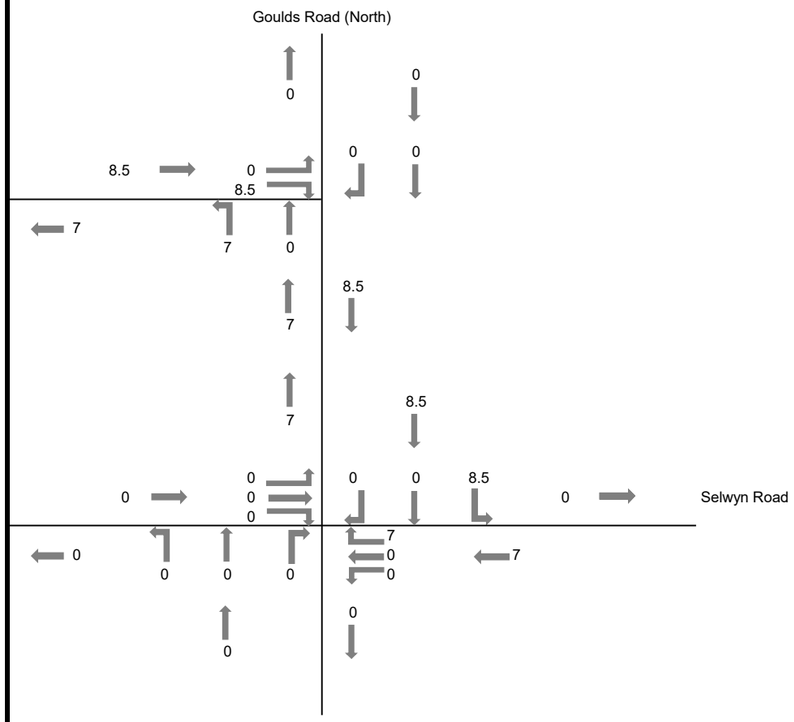


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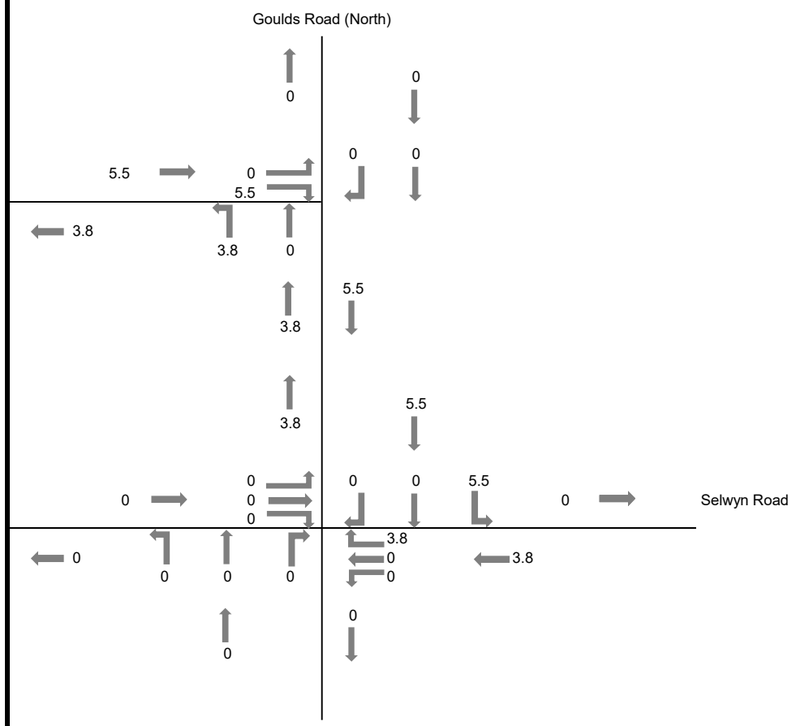


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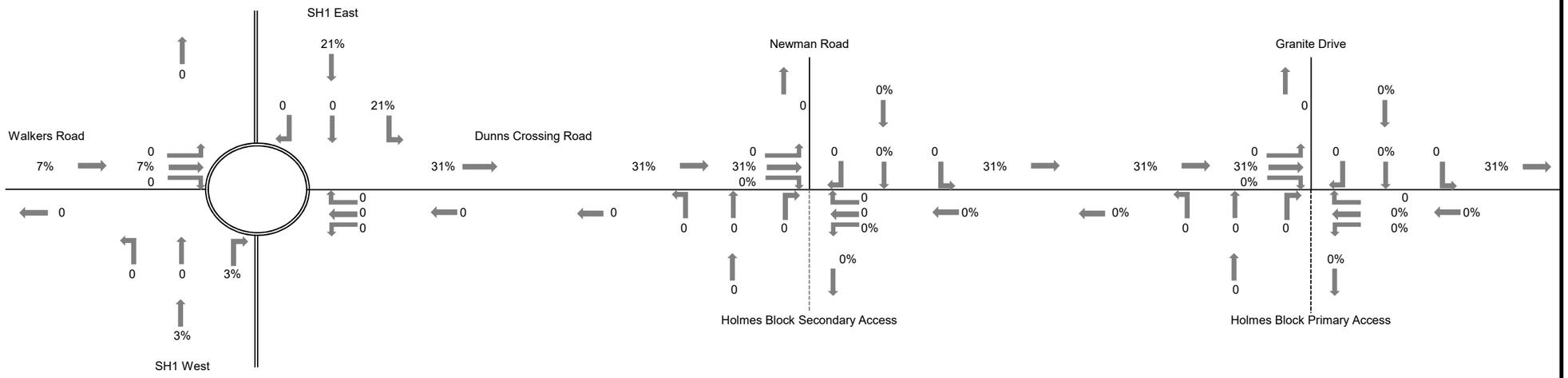


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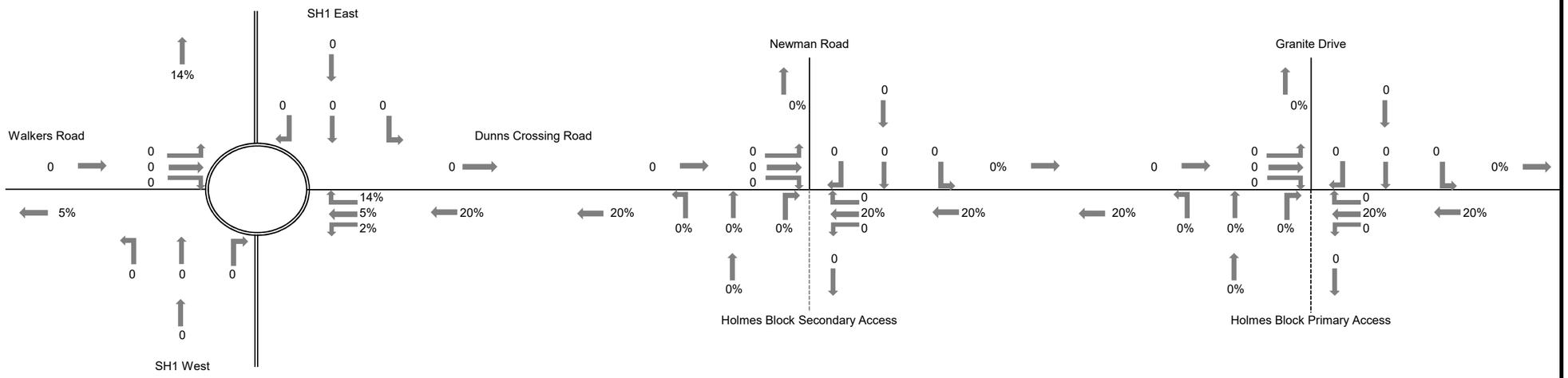
**2028 Distribution Arrivals**

**Skellerup Block AM Peak**

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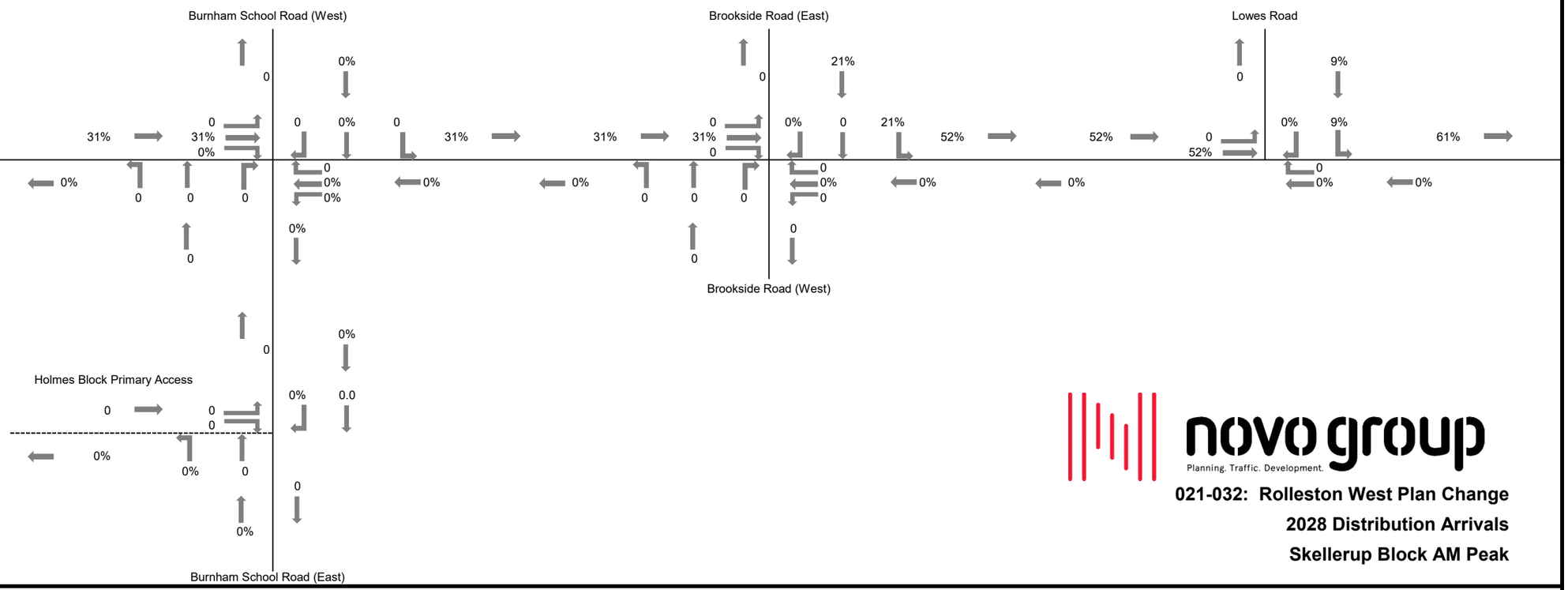
**2028 Distribution Departures**

**Skellerup Block AM Peak**

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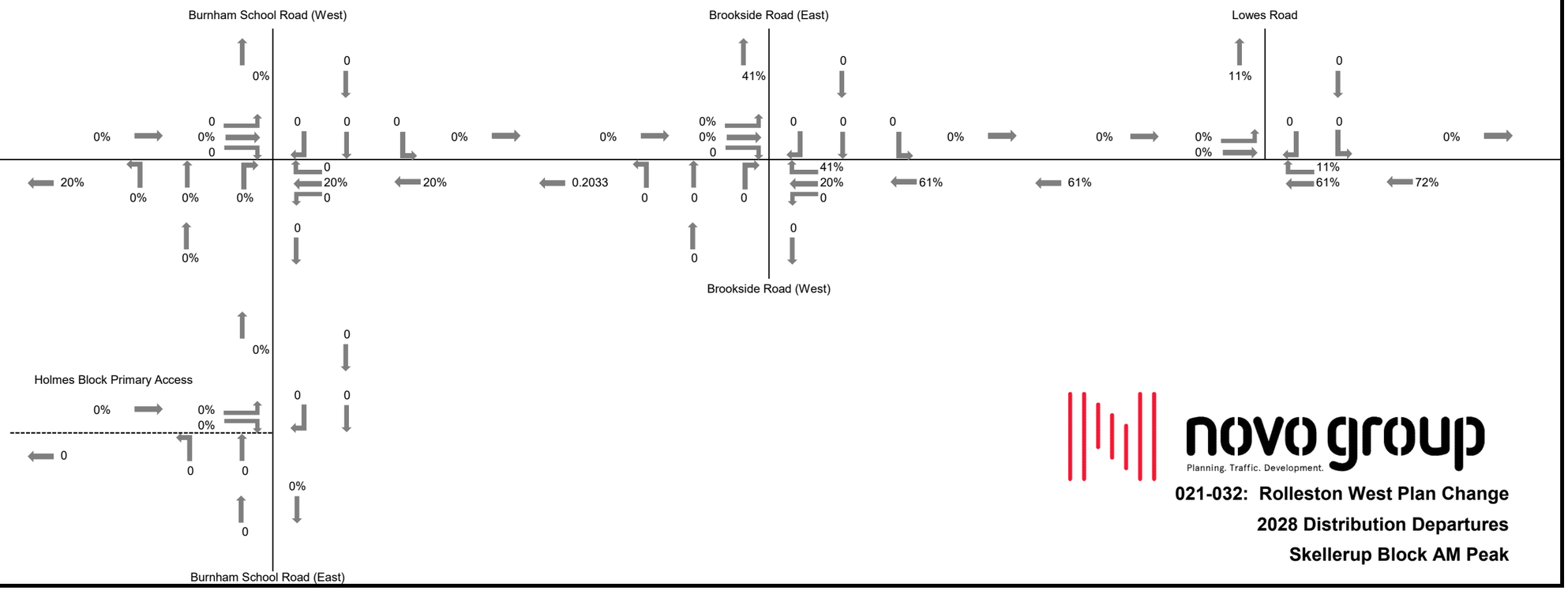


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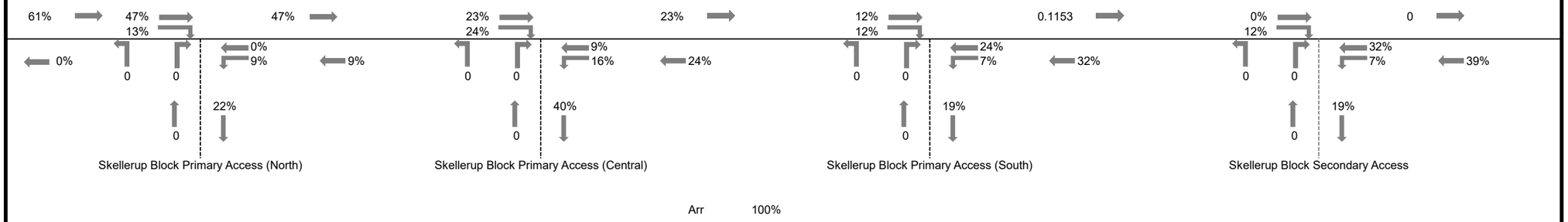


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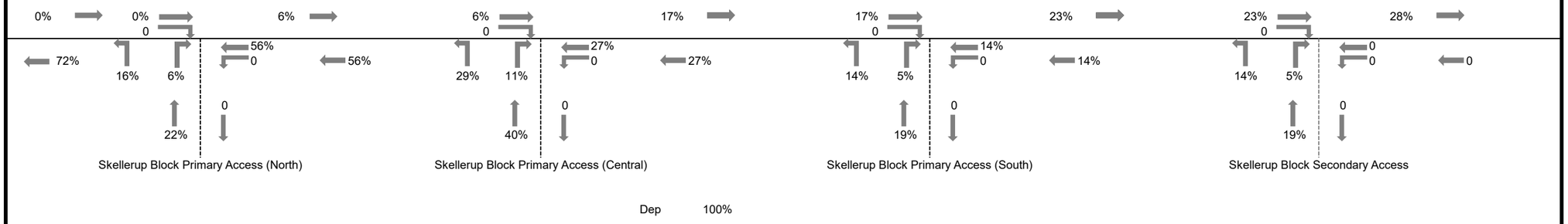


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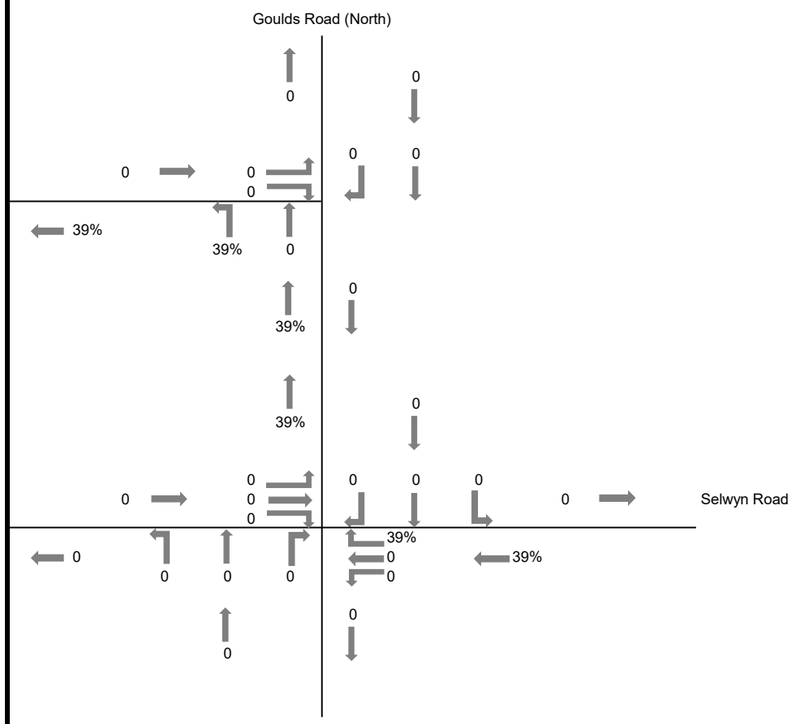


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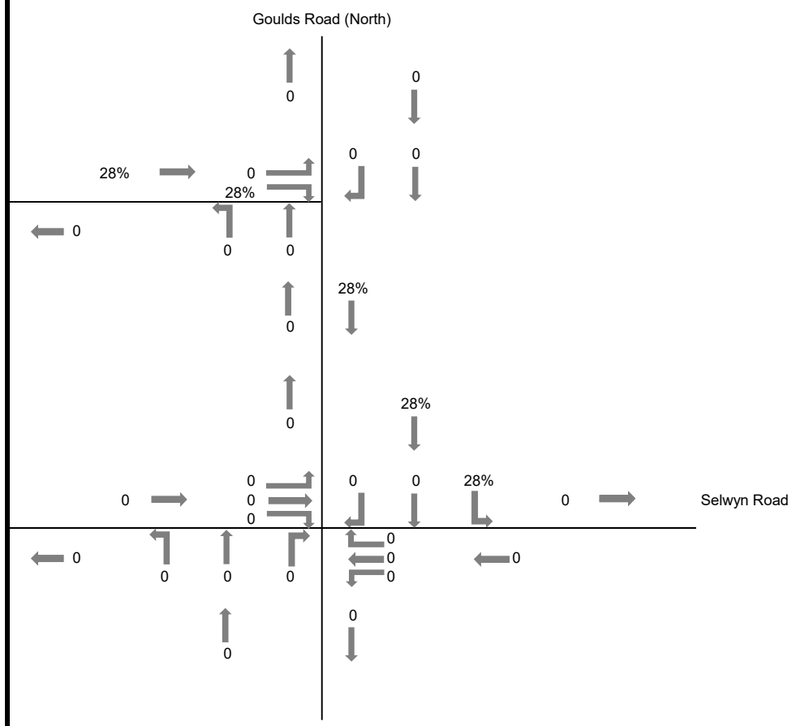


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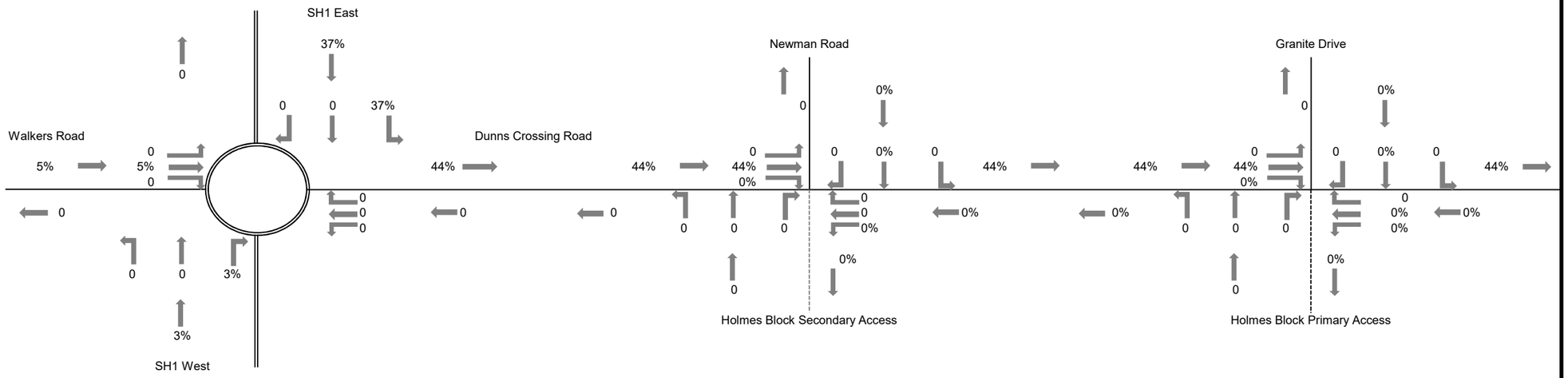


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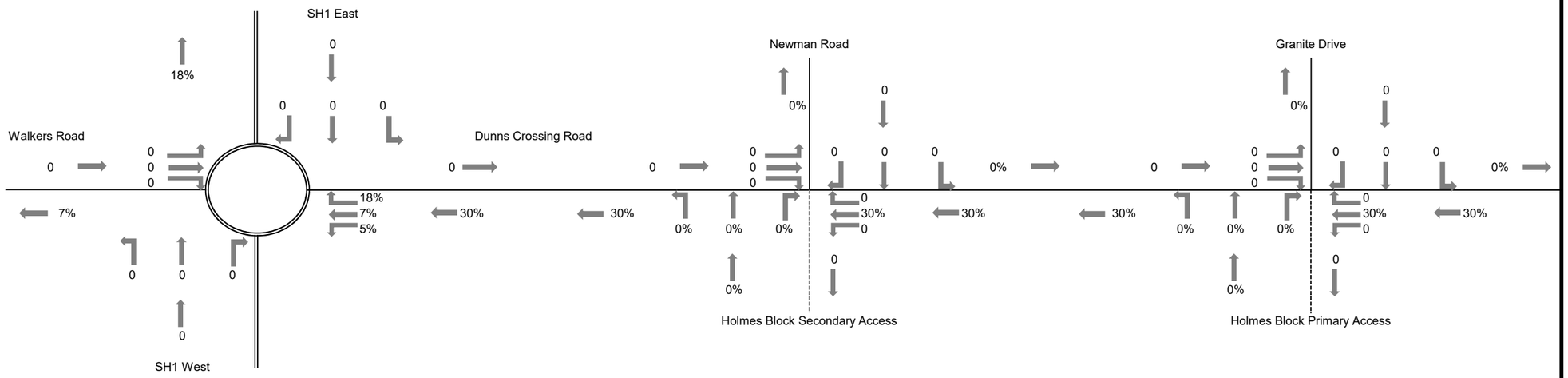


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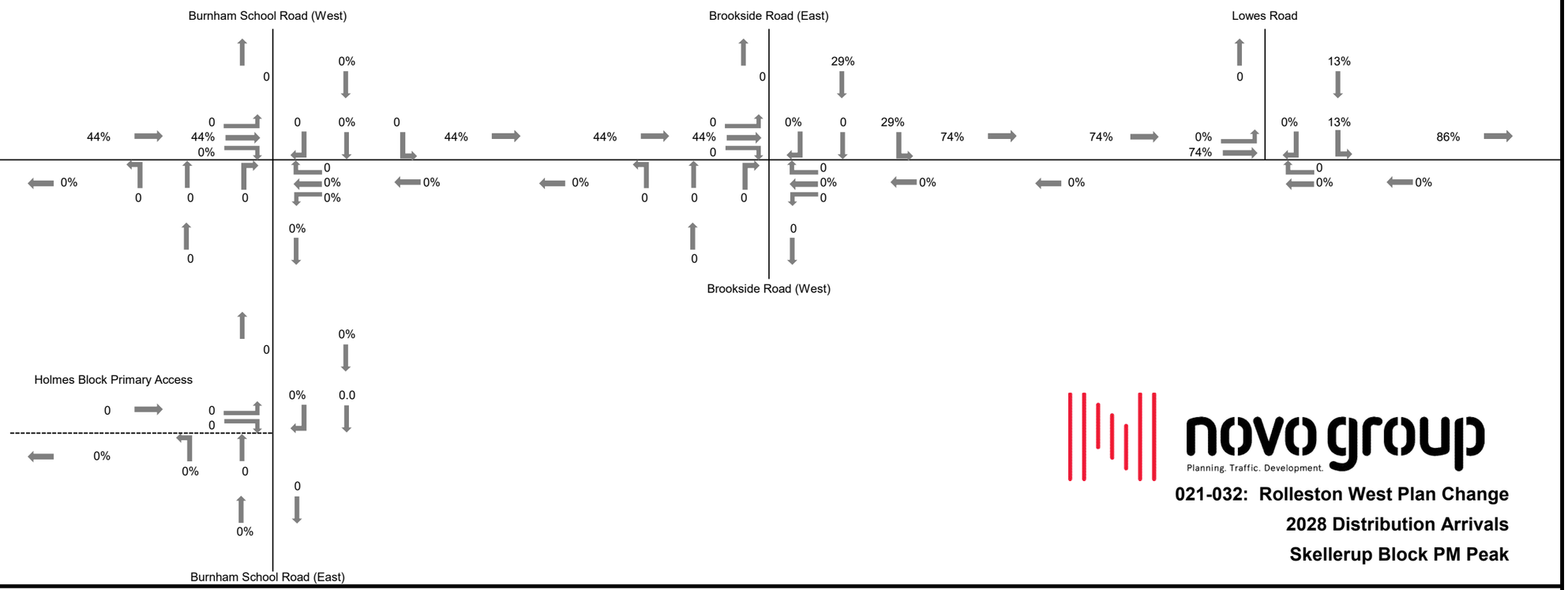


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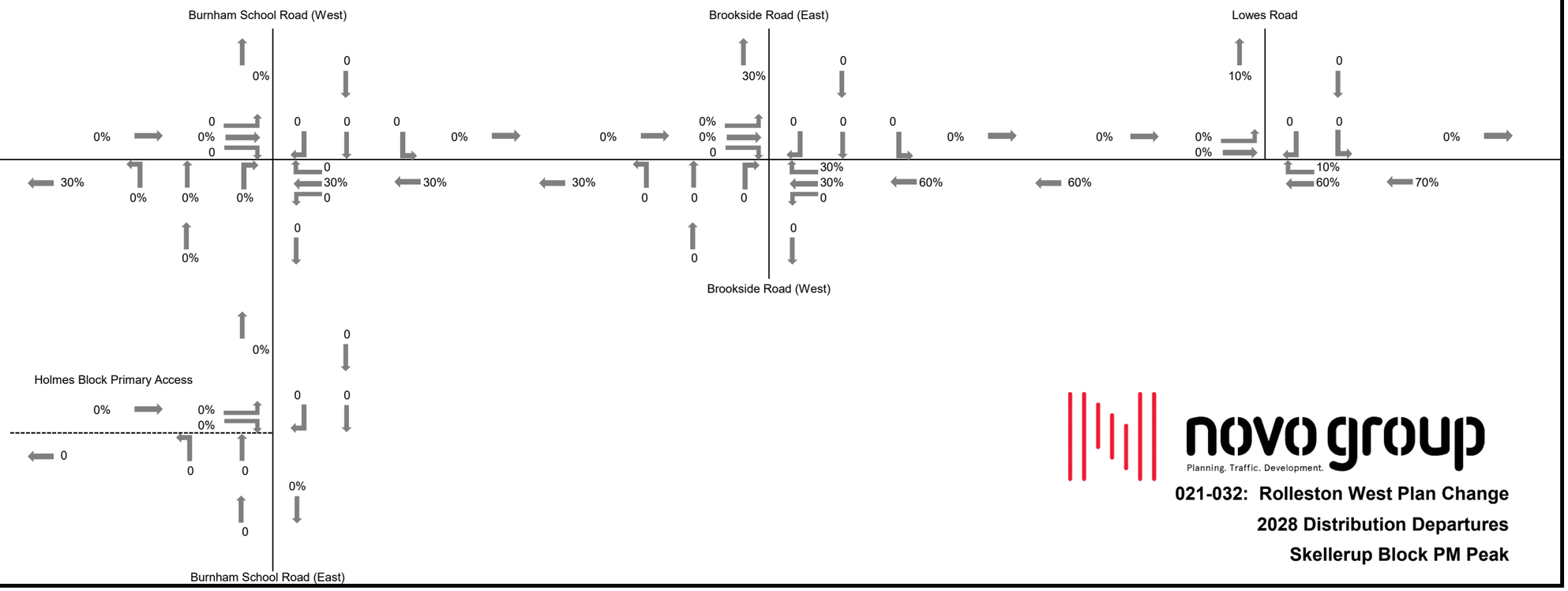


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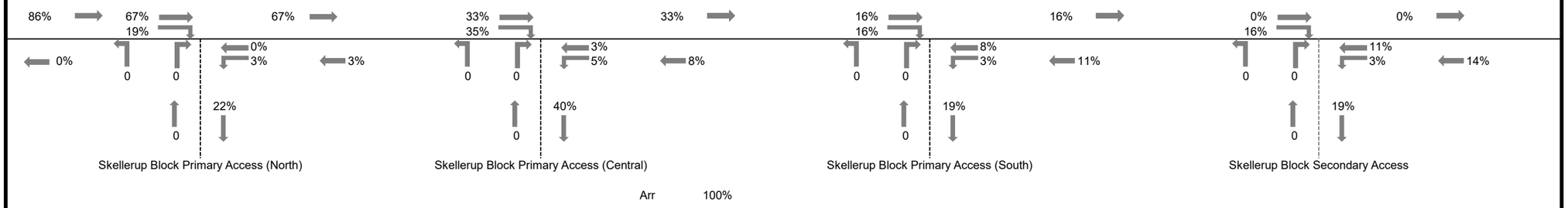


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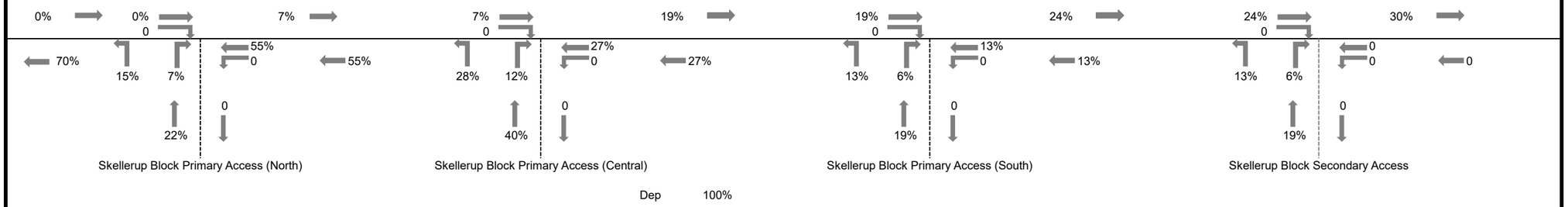
**2028 Distribution Arrivals**

**Skellerup Block PM Peak**

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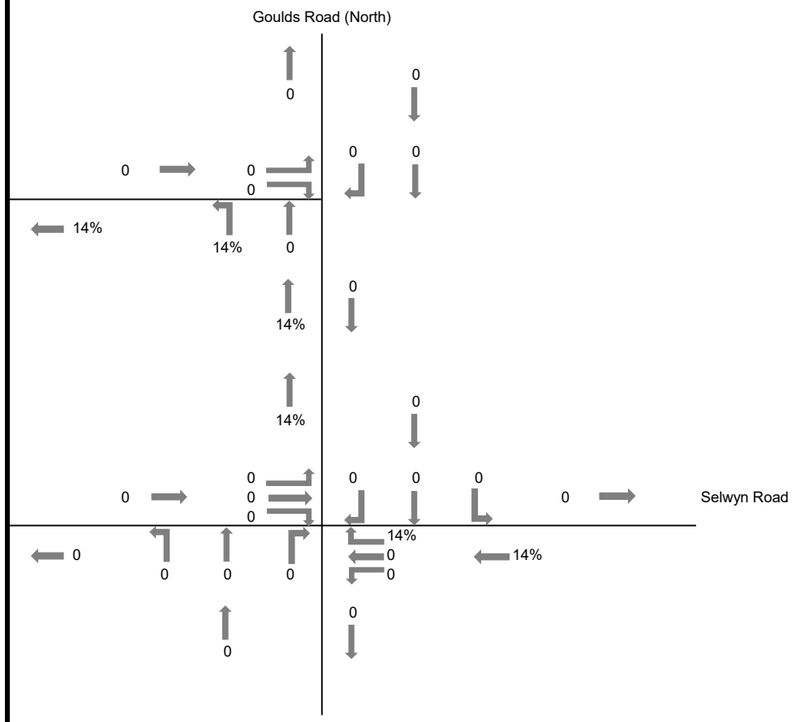
**2028 Distribution Departures**

**Skellerup Block PM Peak**

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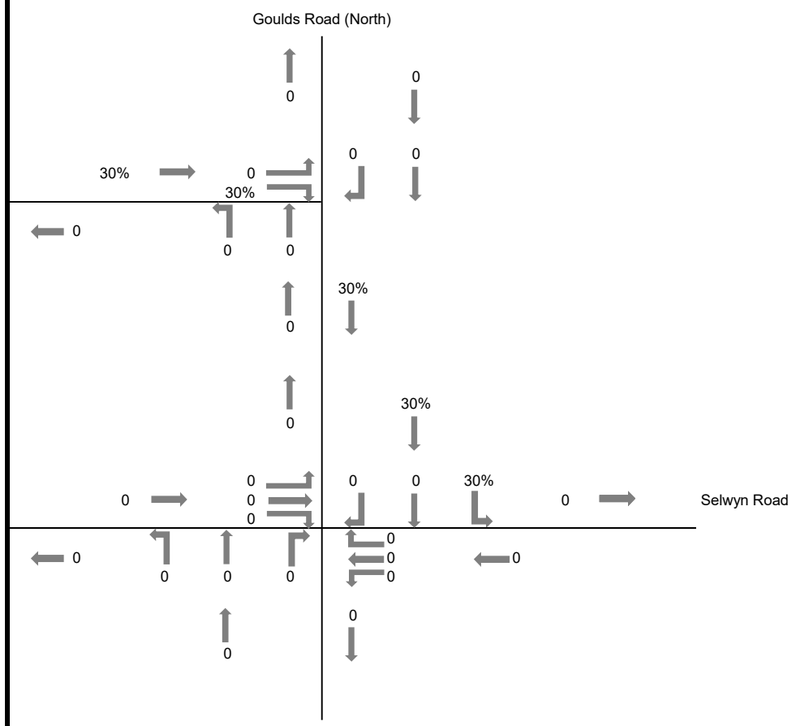
**2028 Distribution Arrivals**

**Skellerup Block PM Peak**

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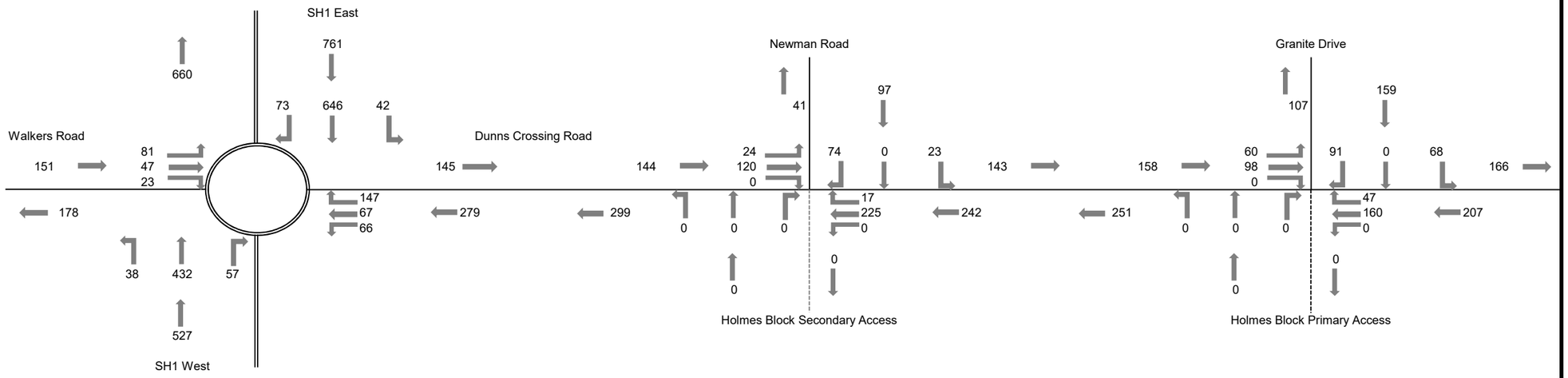
**2028 Distribution Departures**

**Skellerup Block PM Peak**

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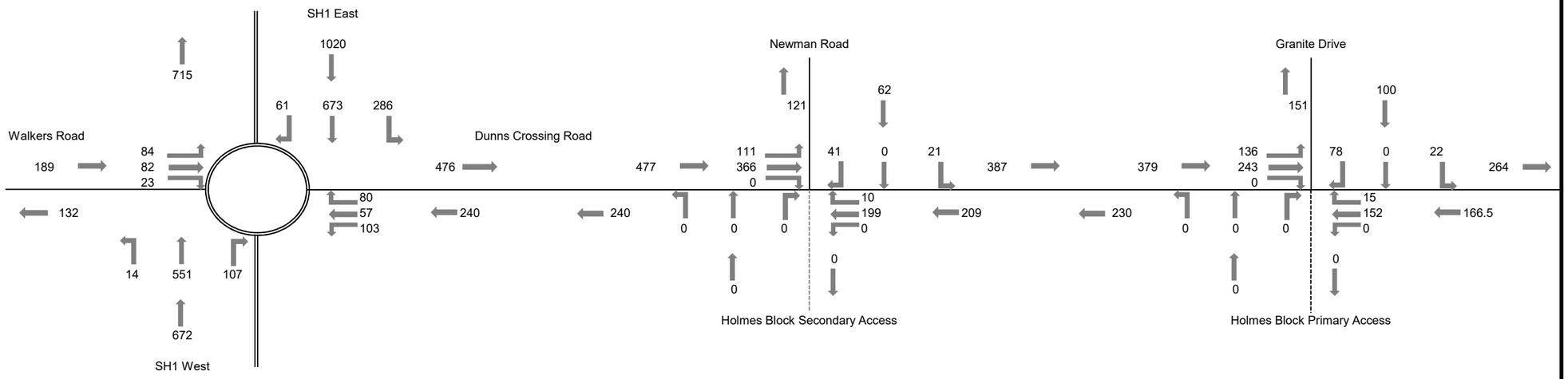
**2028 Less Zoned Traffic**

**AM Peak Hour**

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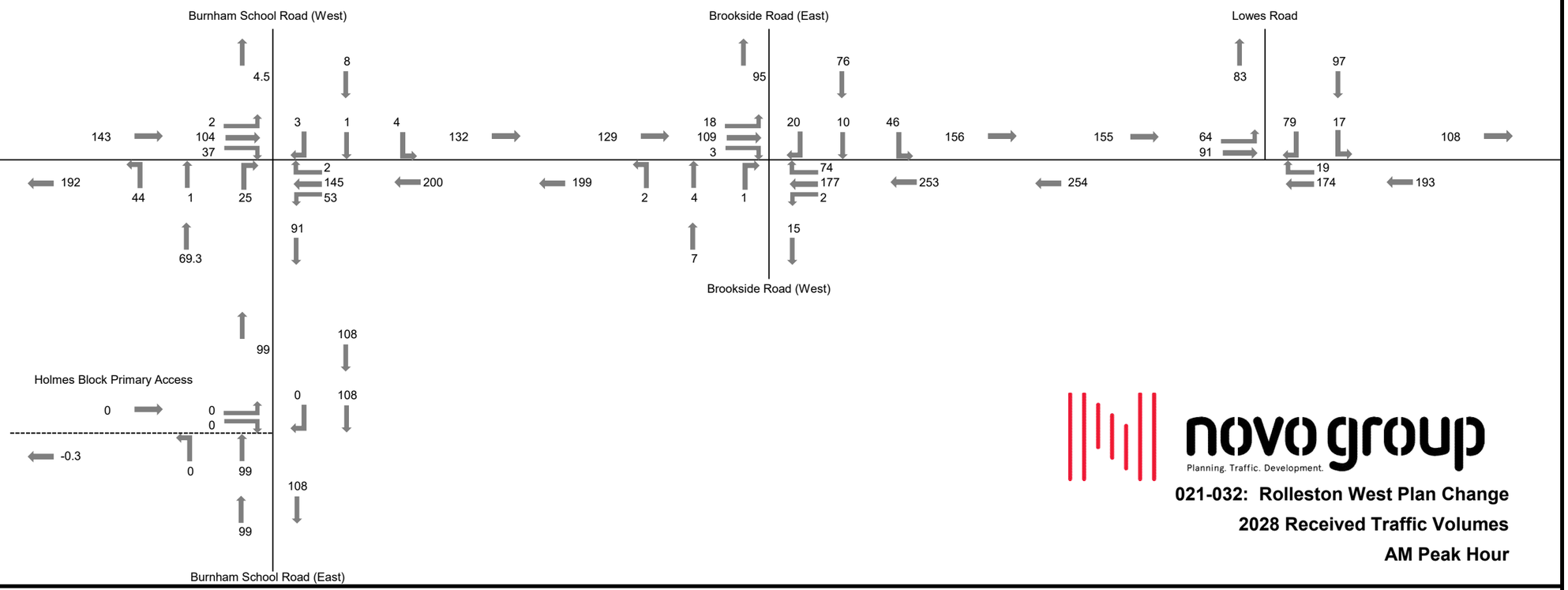
**2028 Less Zoned Traffic**

**PM Peak Hour**

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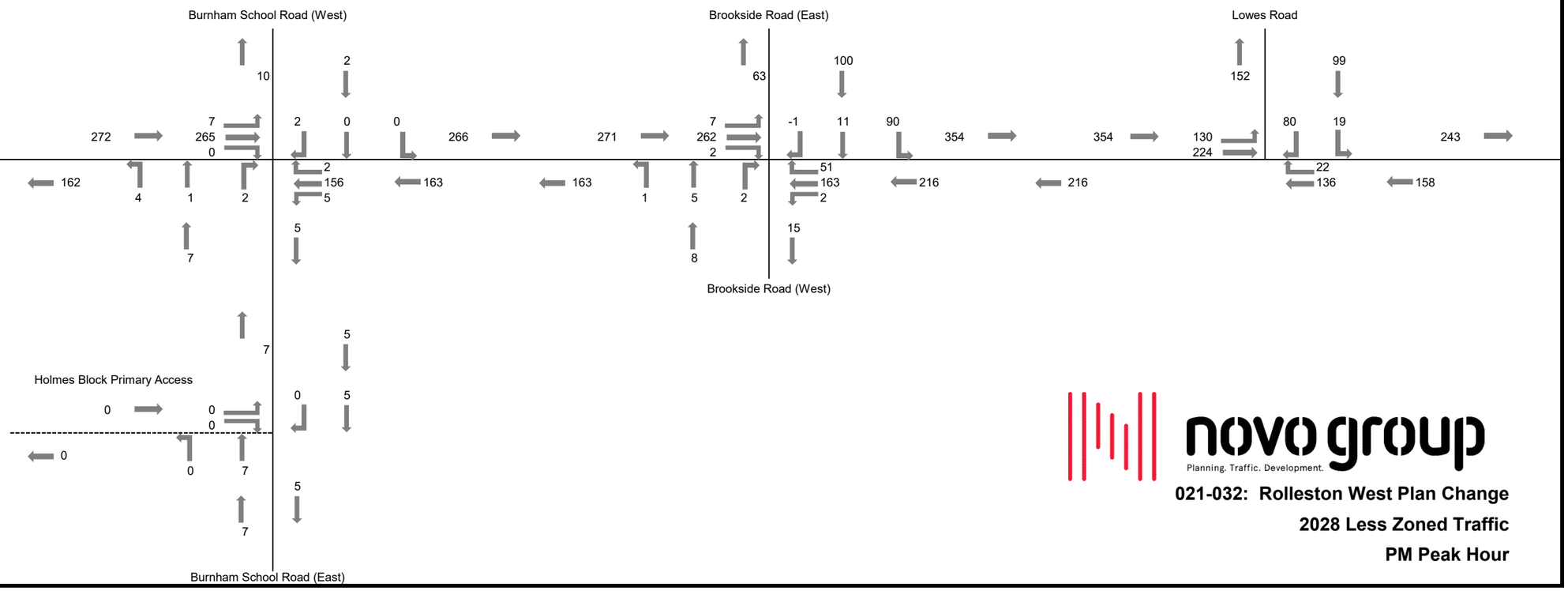
**2028 Received Traffic Volumes**

**AM Peak Hour**

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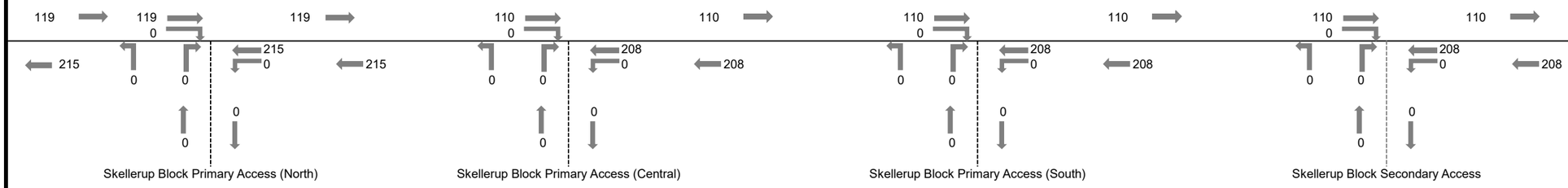
**021-032: Rolleston West Plan Change**

**2028 Less Zoned Traffic**

**PM Peak Hour**

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**2028 Received Traffic Volumes**

**AM Peak Hour**

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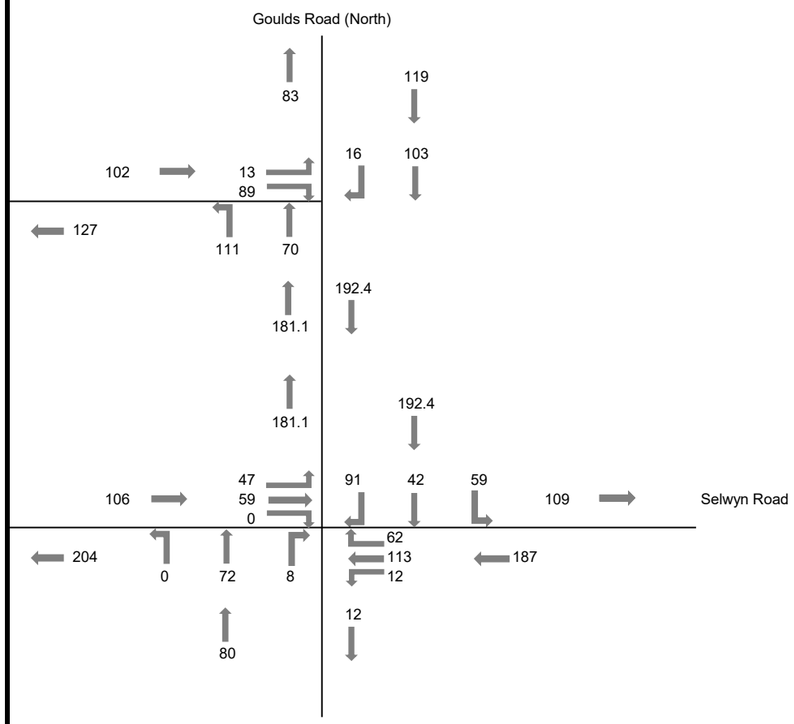
**021-032: Rolleston West Plan Change**

**2028 Less Zoned Traffic**

**PM Peak Hour**

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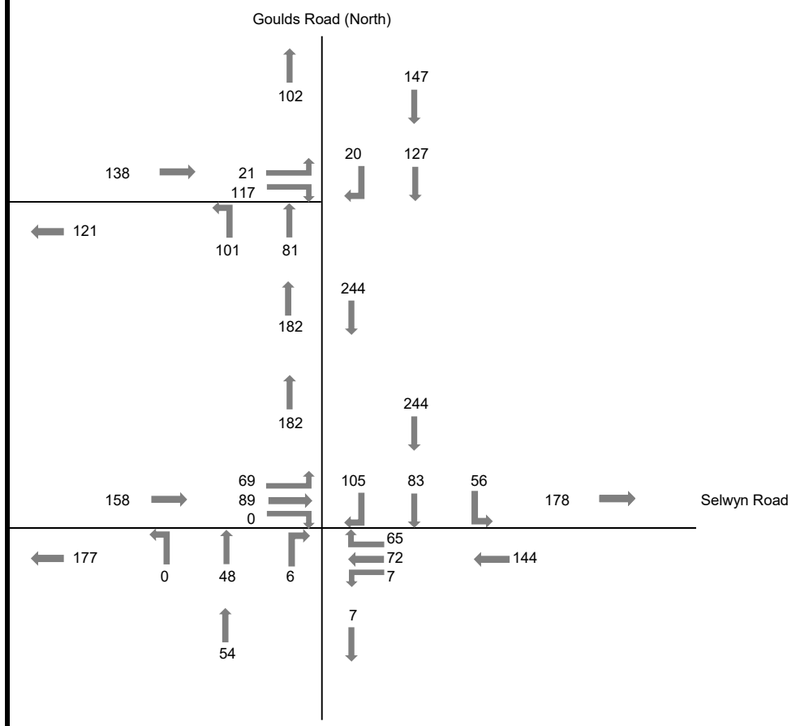
**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**AM Peak Hour**

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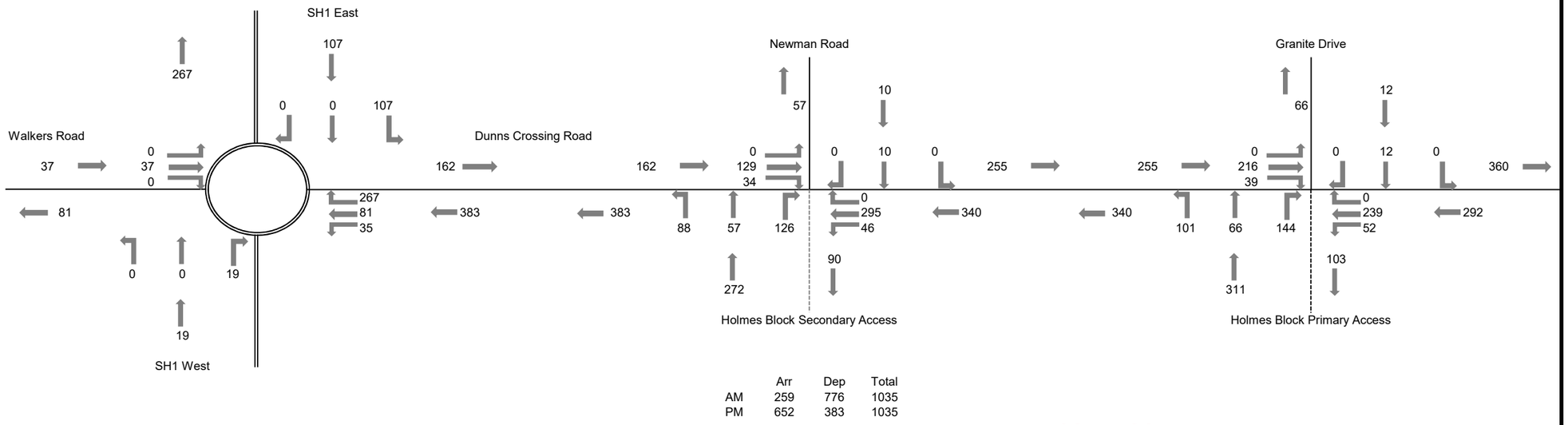
**021-032: Rolleston West Plan Change**

**2028 Less Zoned Traffic**

**PM Peak Hour**




| | Arr | Dep | Total |
|---|---|---|---|
| AM | 259 | 776 | 1035 |
| PM | 652 | 383 | 1035 |

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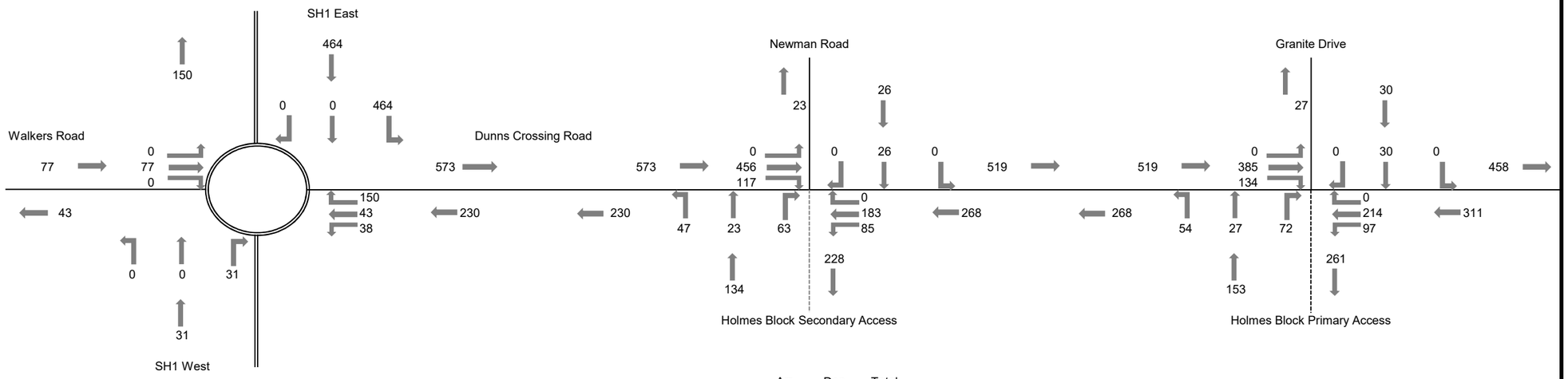
**Plan Change Traffic**

**AM Peak Hour**




| | Arr | Dep | Total |
|---|---|---|---|
| AM | 259 | 776 | 1035 |
| PM | 652 | 383 | 1035 |

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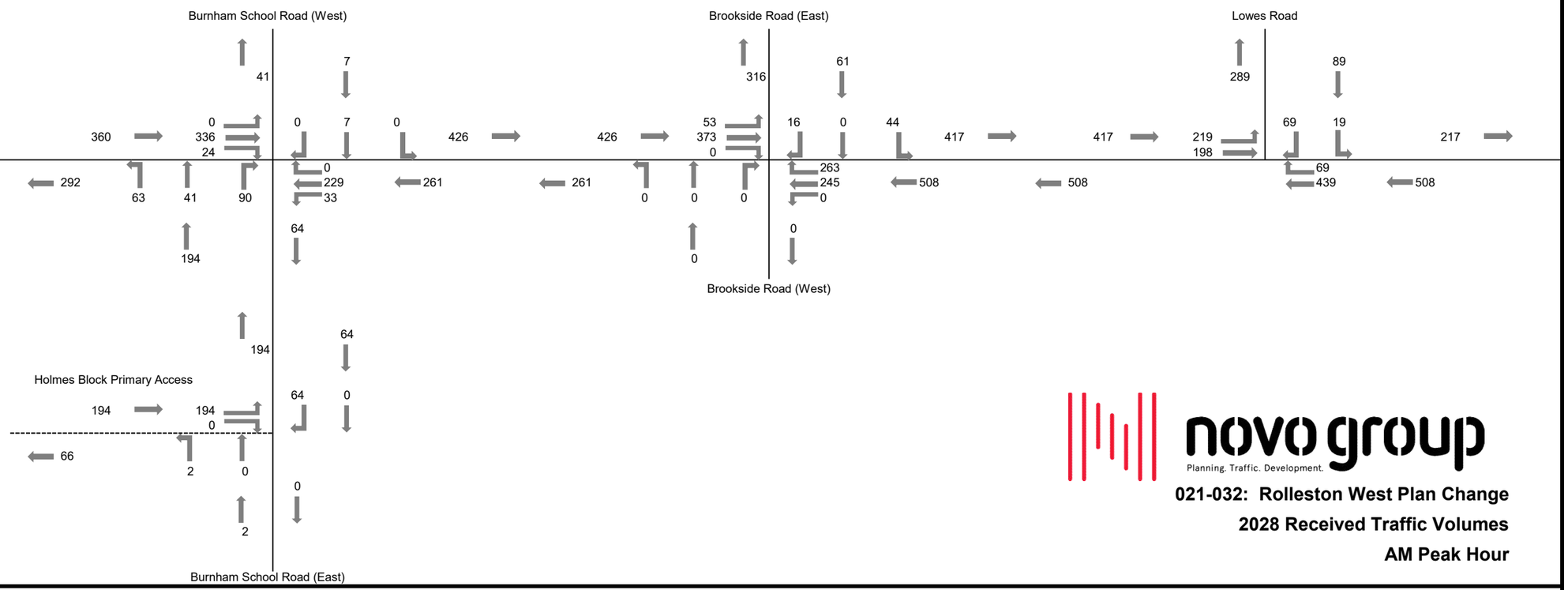
**021-032: Rolleston West Plan Change**

**Plan Change Traffic**

**PM Peak Hour**

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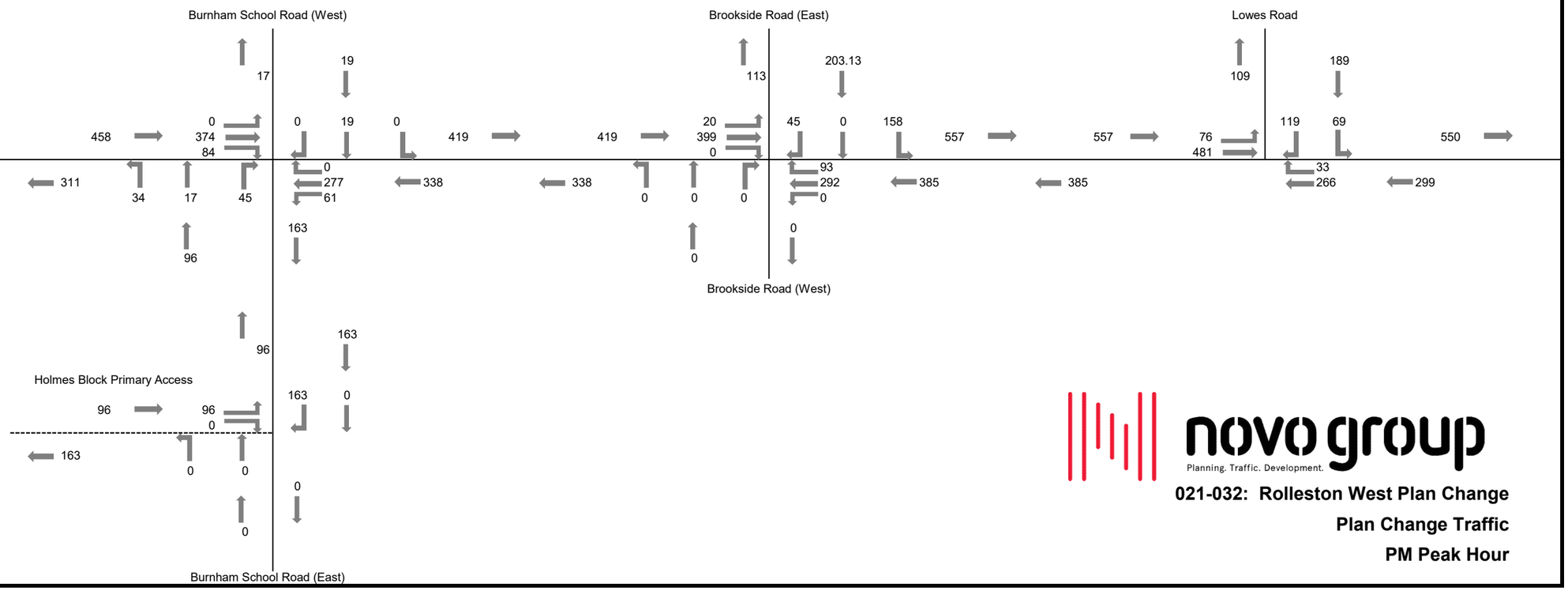
**2028 Received Traffic Volumes**

**AM Peak Hour**

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**021-032: Rolleston West Plan Change**

**Plan Change Traffic**

**PM Peak Hour**

| | Arr | Dep | Total |
|---|---|---|---|
| AM | 214 | 641 | 855 |
| PM | 539 | 316 | 855 |

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**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**AM Peak Hour**

| | Arr | Dep | Total |
|---|---|---|---|
| AM | 214 | 641 | 855 |
| PM | 539 | 316 | 855 |

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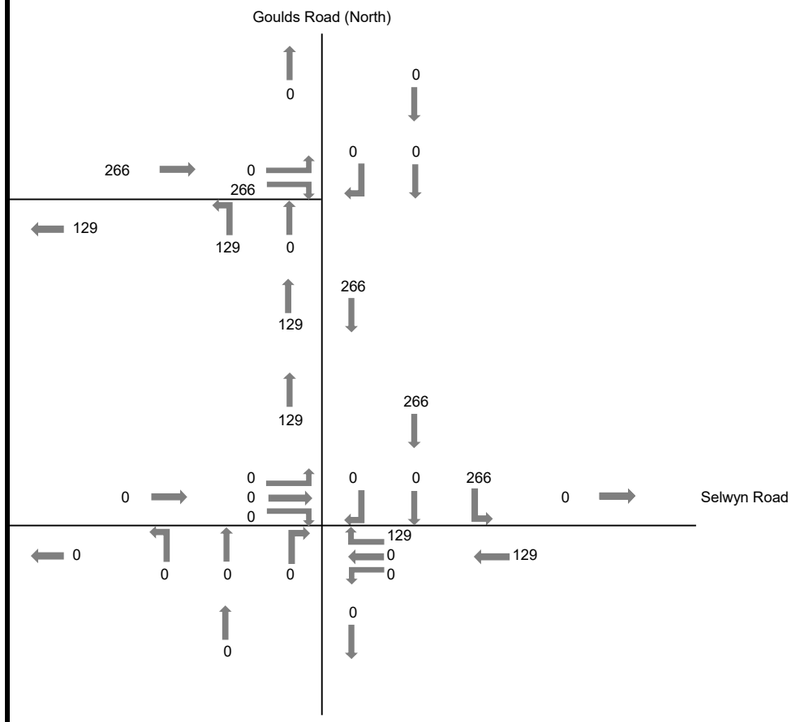
**Plan Change Traffic**

**PM Peak Hour**

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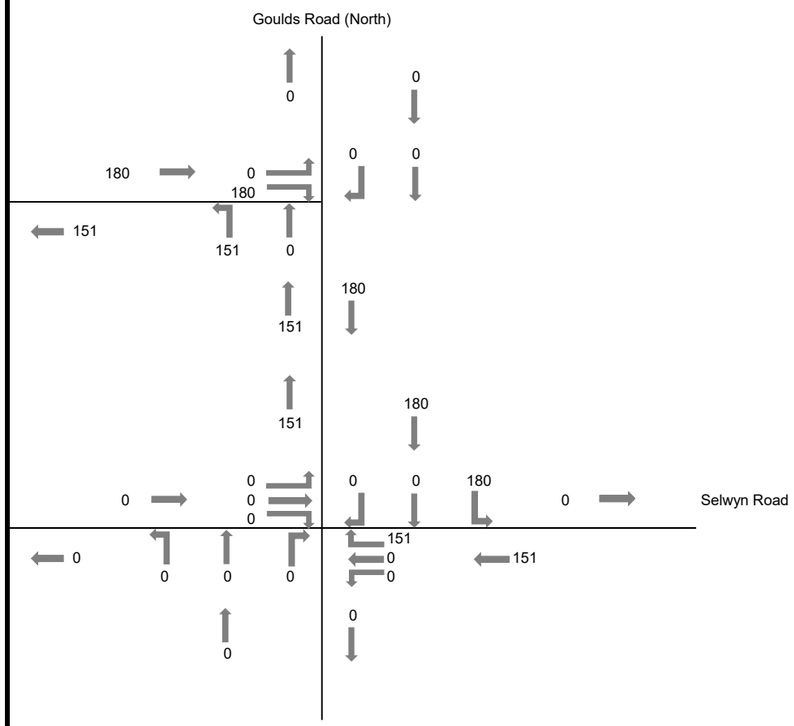
**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**AM Peak Hour**

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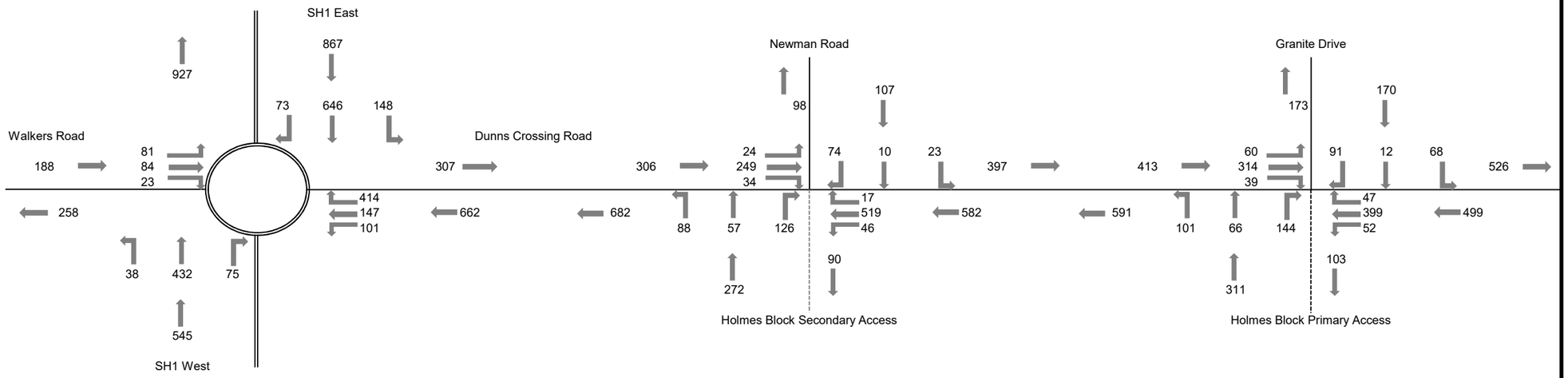
**021-032: Rolleston West Plan Change**

**Plan Change Traffic**

**PM Peak Hour**

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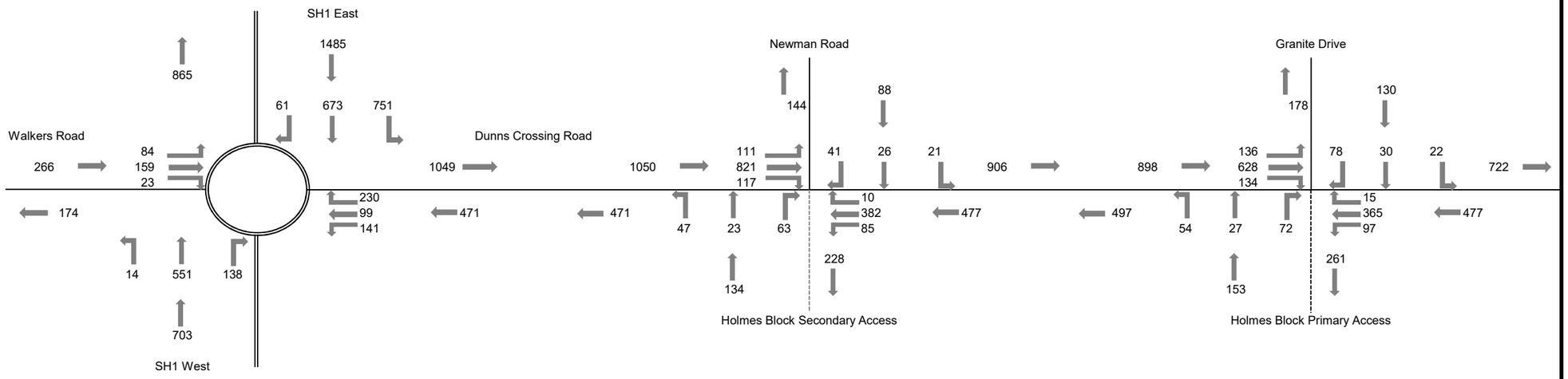
**021-032: Rolleston West Plan Change**

**Base Plus Plan Change**

**AM Peak Hour**

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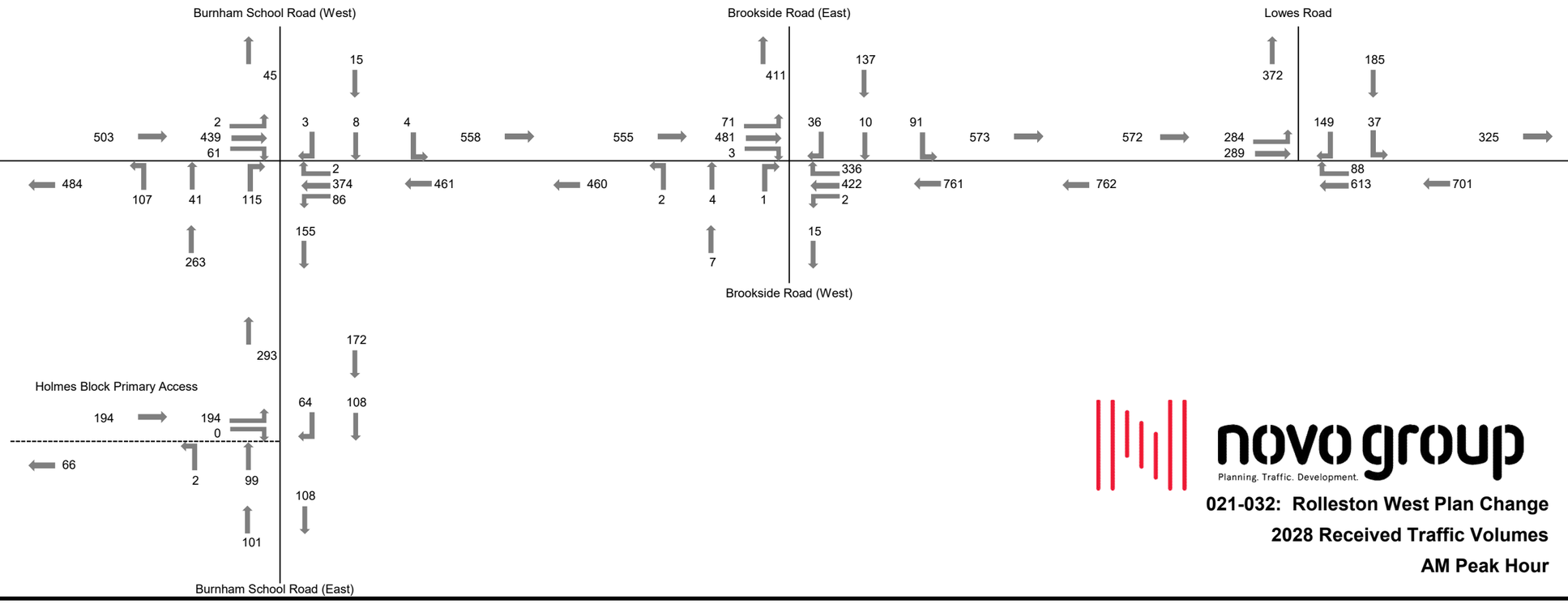
**021-032: Rolleston West Plan Change**

**Base Plus Plan Change**

**PM Peak Hour**

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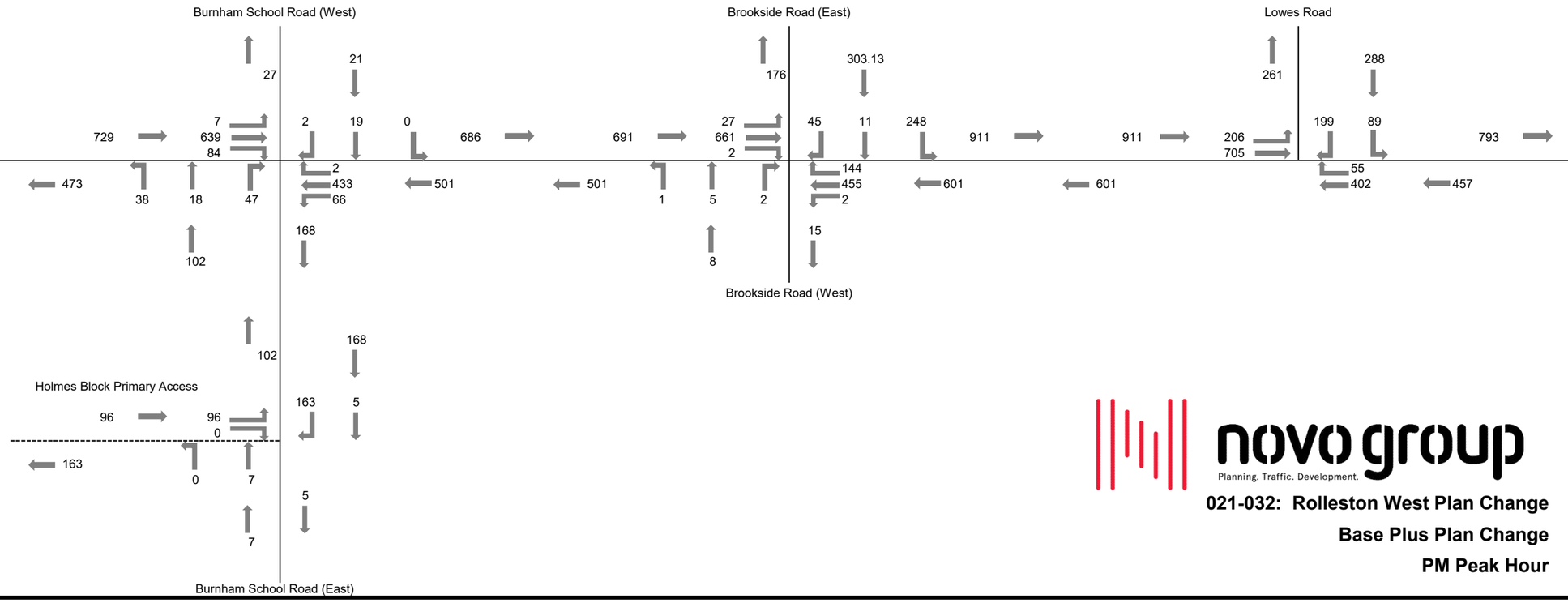
**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**AM Peak Hour**

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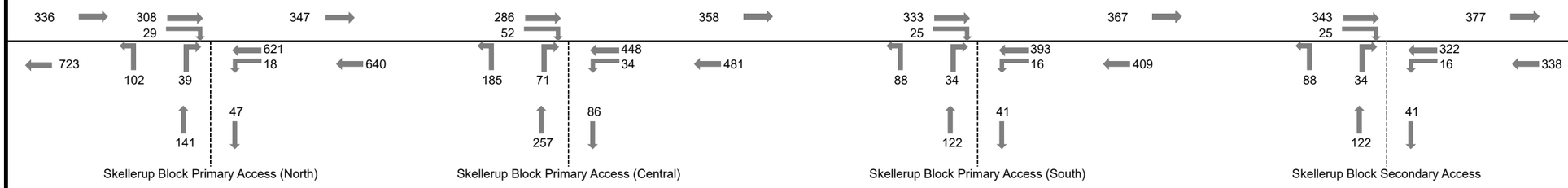
**021-032: Rolleston West Plan Change**

**Base Plus Plan Change**

**PM Peak Hour**

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**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**AM Peak Hour**

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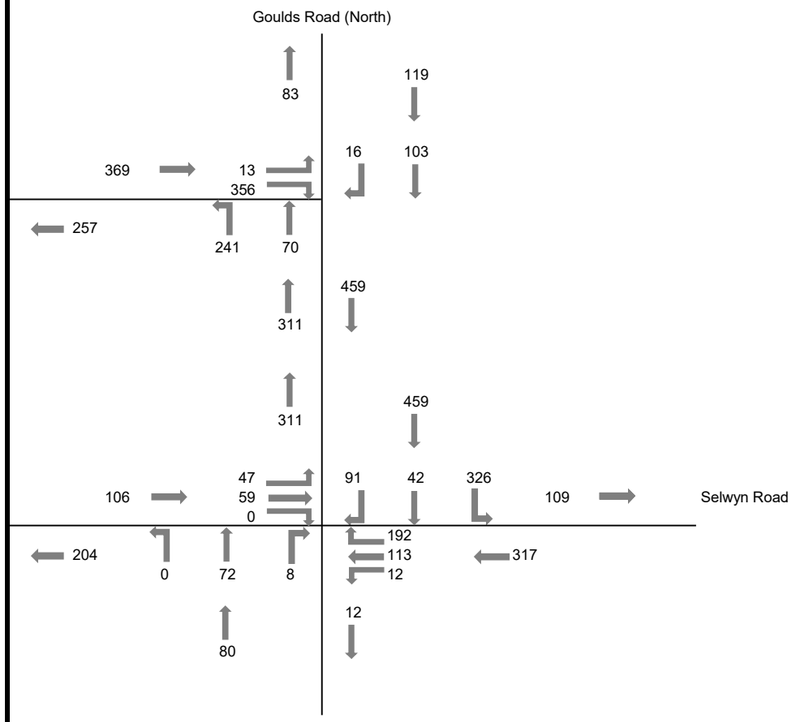
**021-032: Rolleston West Plan Change**

**Base Plus Plan Change**

**PM Peak Hour**

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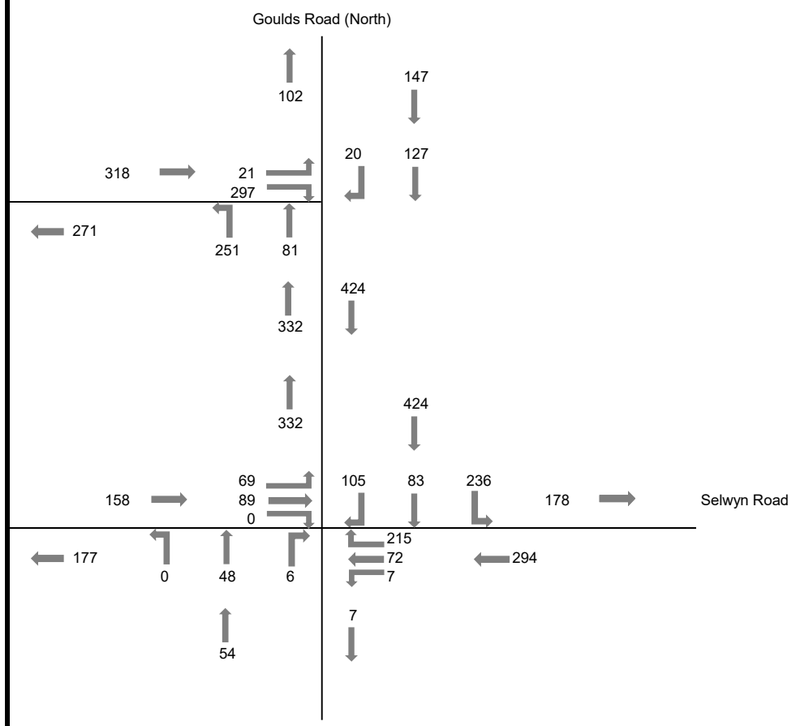
**021-032: Rolleston West Plan Change**

**2028 Received Traffic Volumes**

**AM Peak Hour**

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**Base Plus Plan Change**

**PM Peak Hour**

# Appendix 3

## Dunns Crossing Rd / Newman Rd / Access Traffic Model Results

## MOVEMENT SUMMARY

### Site: 101 [Dunns X-ing / Newman / Access - 2028 AM (Site Folder: Dunns X-ing / Newman)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Rd | | | | | | | | | | | | | | |
| 1 | L2 | 46 | 0.0 | 48 | 0.0 | 0.306 | 5.0 | LOS A | 0.2 | 1.7 | 0.05 | 0.06 | 0.05 | 49.0 |
| 2 | T1 | 519 | 0.0 | 546 | 0.0 | 0.306 | 0.1 | LOS A | 0.2 | 1.7 | 0.05 | 0.06 | 0.05 | 49.5 |
| 3 | R2 | 17 | 0.0 | 18 | 0.0 | 0.306 | 5.9 | LOS A | 0.2 | 1.7 | 0.05 | 0.06 | 0.05 | 49.1 |
| Approach | | 582 | 0.0 | 613 | 0.0 | 0.306 | 0.6 | NA | 0.2 | 1.7 | 0.05 | 0.06 | 0.05 | 49.5 |
| East: Newman Road | | | | | | | | | | | | | | |
| 4 | L2 | 23 | 0.0 | 24 | 0.0 | 0.042 | 5.4 | LOS A | 0.1 | 1.0 | 0.40 | 0.59 | 0.40 | 45.4 |
| 5 | T1 | 10 | 0.0 | 11 | 0.0 | 0.042 | 9.8 | LOS A | 0.1 | 1.0 | 0.40 | 0.59 | 0.40 | 45.5 |
| 6 | R2 | 74 | 0.0 | 78 | 0.0 | 0.249 | 15.7 | LOS C | 0.9 | 6.0 | 0.78 | 0.93 | 0.87 | 40.6 |
| Approach | | 107 | 0.0 | 113 | 0.0 | 0.249 | 12.9 | LOS B | 0.9 | 6.0 | 0.66 | 0.82 | 0.72 | 42.0 |
| North: Dunns Crossing Rd | | | | | | | | | | | | | | |
| 7 | L2 | 24 | 0.0 | 25 | 0.0 | 0.180 | 6.9 | LOS A | 0.5 | 3.8 | 0.22 | 0.10 | 0.22 | 48.2 |
| 8 | T1 | 249 | 0.0 | 262 | 0.0 | 0.180 | 0.7 | LOS A | 0.5 | 3.8 | 0.22 | 0.10 | 0.22 | 48.7 |
| 9 | R2 | 34 | 0.0 | 36 | 0.0 | 0.180 | 7.6 | LOS A | 0.5 | 3.8 | 0.22 | 0.10 | 0.22 | 48.3 |
| Approach | | 307 | 0.0 | 323 | 0.0 | 0.180 | 1.9 | NA | 0.5 | 3.8 | 0.22 | 0.10 | 0.22 | 48.6 |
| West: Site Access | | | | | | | | | | | | | | |
| 10 | L2 | 88 | 0.0 | 93 | 0.0 | 0.229 | 7.1 | LOS A | 0.9 | 6.1 | 0.59 | 0.78 | 0.61 | 44.4 |
| 11 | T1 | 57 | 0.0 | 60 | 0.0 | 0.229 | 10.5 | LOS B | 0.9 | 6.1 | 0.59 | 0.78 | 0.61 | 44.5 |
| 12 | R2 | 126 | 0.0 | 133 | 0.0 | 0.371 | 15.5 | LOS C | 1.5 | 10.3 | 0.77 | 0.97 | 1.00 | 40.8 |
| Approach | | 271 | 0.0 | 285 | 0.0 | 0.371 | 11.7 | LOS B | 1.5 | 10.3 | 0.68 | 0.87 | 0.79 | 42.7 |
| All Vehicles | | 1267 | 0.0 | 1334 | 0.0 | 0.371 | 4.4 | NA | 1.5 | 10.3 | 0.27 | 0.31 | 0.30 | 47.0 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: S:\Novo Projects\020-100 Favourites\021 Carter Group\021032 Rolleston West Plan Change\03 Transport\Sidra\021-032 - Rolleston West Plan Change - 2020-11-06.sip9

## MOVEMENT SUMMARY

### ▽ Site: 101 [Dunns X-ing / Newman / Access - 2028 PM (Site Folder: Dunns X-ing / Newman)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Rd | | | | | | | | | | | | | | |
| 1 | L2 | 85 | 0.0 | 89 | 0.0 | 0.264 | 6.8 | LOS A | 0.6 | 4.2 | 0.12 | 0.10 | 0.14 | 48.2 |
| 2 | T1 | 382 | 0.0 | 402 | 0.0 | 0.264 | 0.7 | LOS A | 0.6 | 4.2 | 0.12 | 0.10 | 0.14 | 48.6 |
| 3 | R2 | 10 | 0.0 | 11 | 0.0 | 0.264 | 14.0 | LOS B | 0.6 | 4.2 | 0.12 | 0.10 | 0.14 | 48.2 |
| Approach | | 477 | 0.0 | 502 | 0.0 | 0.264 | 2.1 | NA | 0.6 | 4.2 | 0.12 | 0.10 | 0.14 | 48.5 |
| East: Newman Road | | | | | | | | | | | | | | |
| 4 | L2 | 21 | 0.0 | 22 | 0.0 | 0.257 | 11.4 | LOS B | 0.8 | 5.6 | 0.88 | 0.97 | 0.97 | 37.5 |
| 5 | T1 | 26 | 0.0 | 27 | 0.0 | 0.257 | 33.5 | LOS D | 0.8 | 5.6 | 0.88 | 0.97 | 0.97 | 37.6 |
| 6 | R2 | 41 | 0.0 | 43 | 0.0 | 0.418 | 46.8 | LOS E | 1.3 | 9.0 | 0.94 | 1.03 | 1.14 | 30.2 |
| Approach | | 88 | 0.0 | 93 | 0.0 | 0.418 | 34.4 | LOS D | 1.3 | 9.0 | 0.91 | 0.99 | 1.05 | 33.7 |
| North: Dunns Crossing Rd | | | | | | | | | | | | | | |
| 7 | L2 | 111 | 0.0 | 117 | 0.0 | 0.599 | 8.0 | LOS A | 4.0 | 28.2 | 0.31 | 0.12 | 0.48 | 47.6 |
| 8 | T1 | 821 | 0.0 | 864 | 0.0 | 0.599 | 1.4 | LOS A | 4.0 | 28.2 | 0.31 | 0.12 | 0.48 | 48.0 |
| 9 | R2 | 117 | 0.0 | 123 | 0.0 | 0.599 | 9.5 | LOS A | 4.0 | 28.2 | 0.31 | 0.12 | 0.48 | 47.6 |
| Approach | | 1049 | 0.0 | 1104 | 0.0 | 0.599 | 3.0 | NA | 4.0 | 28.2 | 0.31 | 0.12 | 0.48 | 47.9 |
| West: Site Access | | | | | | | | | | | | | | |
| 10 | L2 | 47 | 0.0 | 49 | 0.0 | 0.255 | 7.0 | LOS A | 0.8 | 5.8 | 0.68 | 0.79 | 0.74 | 40.5 |
| 11 | T1 | 23 | 0.0 | 24 | 0.0 | 0.255 | 35.9 | LOS E | 0.8 | 5.8 | 0.68 | 0.79 | 0.74 | 40.6 |
| 12 | R2 | 63 | 0.0 | 66 | 0.0 | 0.577 | 49.6 | LOS E | 2.0 | 13.8 | 0.95 | 1.08 | 1.33 | 29.5 |
| Approach | | 133 | 0.0 | 140 | 0.0 | 0.577 | 32.2 | LOS D | 2.0 | 13.8 | 0.81 | 0.93 | 1.02 | 34.4 |
| All Vehicles | | 1747 | 0.0 | 1839 | 0.0 | 0.599 | 6.6 | NA | 4.0 | 28.2 | 0.33 | 0.22 | 0.46 | 45.7 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: S:\Novo Projects\020-100 Favourites\021 Carter Group\021032 Rolleston West Plan Change\03 Transport\Sidra\021-032 - Rolleston West Plan Change - 2020-11-06.sip9

# Appendix 4

## Dunns Crossing Rd / Granite Dr / Access Traffic Model Results

## MOVEMENT SUMMARY

### ▽ Site: 101 [Dunns X-ing / Granite / Access - 2028 AM (Site Folder: Dunns X-ing / Granite)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Rd | | | | | | | | | | | | | | |
| 1 | L2 | 52 | 0.0 | 55 | 0.0 | 0.275 | 5.7 | LOS A | 0.7 | 4.7 | 0.16 | 0.10 | 0.16 | 48.5 |
| 2 | T1 | 399 | 0.0 | 420 | 0.0 | 0.275 | 0.3 | LOS A | 0.7 | 4.7 | 0.16 | 0.10 | 0.16 | 48.9 |
| 3 | R2 | 47 | 0.0 | 49 | 0.0 | 0.275 | 6.5 | LOS A | 0.7 | 4.7 | 0.16 | 0.10 | 0.16 | 48.3 |
| Approach | | 498 | 0.0 | 524 | 0.0 | 0.275 | 1.5 | NA | 0.7 | 4.7 | 0.16 | 0.10 | 0.16 | 48.8 |
| East: Granite Drive | | | | | | | | | | | | | | |
| 4 | L2 | 68 | 0.0 | 72 | 0.0 | 0.392 | 7.4 | LOS A | 1.7 | 12.1 | 0.63 | 0.86 | 0.86 | 42.0 |
| 5 | T1 | 12 | 0.0 | 13 | 0.0 | 0.392 | 12.4 | LOS B | 1.7 | 12.1 | 0.63 | 0.86 | 0.86 | 42.1 |
| 6 | R2 | 91 | 0.0 | 96 | 0.0 | 0.392 | 17.6 | LOS C | 1.7 | 12.1 | 0.63 | 0.86 | 0.86 | 41.9 |
| Approach | | 171 | 0.0 | 180 | 0.0 | 0.392 | 13.2 | LOS B | 1.7 | 12.1 | 0.63 | 0.86 | 0.86 | 41.9 |
| North: Dunns Crossing Rd | | | | | | | | | | | | | | |
| 7 | L2 | 60 | 0.0 | 63 | 0.0 | 0.232 | 5.8 | LOS A | 0.6 | 4.2 | 0.18 | 0.12 | 0.18 | 48.3 |
| 8 | T1 | 314 | 0.0 | 331 | 0.0 | 0.232 | 0.4 | LOS A | 0.6 | 4.2 | 0.18 | 0.12 | 0.18 | 48.8 |
| 9 | R2 | 39 | 0.0 | 41 | 0.0 | 0.232 | 6.9 | LOS A | 0.6 | 4.2 | 0.18 | 0.12 | 0.18 | 48.1 |
| Approach | | 413 | 0.0 | 435 | 0.0 | 0.232 | 1.8 | NA | 0.6 | 4.2 | 0.18 | 0.12 | 0.18 | 48.6 |
| West: Site Access | | | | | | | | | | | | | | |
| 10 | L2 | 101 | 0.0 | 106 | 0.0 | 0.677 | 11.5 | LOS B | 4.5 | 31.7 | 0.77 | 1.17 | 1.57 | 40.2 |
| 11 | T1 | 66 | 0.0 | 69 | 0.0 | 0.677 | 17.0 | LOS C | 4.5 | 31.7 | 0.77 | 1.17 | 1.57 | 40.3 |
| 12 | R2 | 144 | 0.0 | 152 | 0.0 | 0.677 | 21.0 | LOS C | 4.5 | 31.7 | 0.77 | 1.17 | 1.57 | 40.0 |
| Approach | | 311 | 0.0 | 327 | 0.0 | 0.677 | 17.1 | LOS C | 4.5 | 31.7 | 0.77 | 1.17 | 1.57 | 40.1 |
| All Vehicles | | 1393 | 0.0 | 1466 | 0.0 | 0.677 | 6.5 | NA | 4.5 | 31.7 | 0.36 | 0.44 | 0.57 | 45.6 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: S:\Novo Projects\020-100 Favourites\021 Carter Group\021032 Rolleston West Plan Change\03 Transport\Sidra\021-032 - Rolleston West Plan Change - 2020-11-06.sip9

## MOVEMENT SUMMARY

### ▽ Site: 101 [Dunns X-ing / Granite / Access - 2028 PM (Site Folder: Dunns X-ing / Granite)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Rd | | | | | | | | | | | | | | |
| 1 | L2 | 97 | 0.0 | 102 | 0.0 | 0.264 | 6.0 | LOS A | 0.5 | 3.8 | 0.12 | 0.12 | 0.14 | 48.2 |
| 2 | T1 | 365 | 0.0 | 384 | 0.0 | 0.264 | 0.6 | LOS A | 0.5 | 3.8 | 0.12 | 0.12 | 0.14 | 48.7 |
| 3 | R2 | 15 | 0.0 | 16 | 0.0 | 0.264 | 10.6 | LOS B | 0.5 | 3.8 | 0.12 | 0.12 | 0.14 | 48.0 |
| Approach | | 477 | 0.0 | 502 | 0.0 | 0.264 | 2.0 | NA | 0.5 | 3.8 | 0.12 | 0.12 | 0.14 | 48.6 |
| East: Granite Drive | | | | | | | | | | | | | | |
| 4 | L2 | 22 | 0.0 | 23 | 0.0 | 0.702 | 21.6 | LOS C | 3.2 | 22.1 | 0.93 | 1.19 | 1.70 | 32.8 |
| 5 | T1 | 30 | 0.0 | 32 | 0.0 | 0.702 | 36.9 | LOS E | 3.2 | 22.1 | 0.93 | 1.19 | 1.70 | 32.9 |
| 6 | R2 | 78 | 0.0 | 82 | 0.0 | 0.702 | 42.3 | LOS E | 3.2 | 22.1 | 0.93 | 1.19 | 1.70 | 32.7 |
| Approach | | 130 | 0.0 | 137 | 0.0 | 0.702 | 37.6 | LOS E | 3.2 | 22.1 | 0.93 | 1.19 | 1.70 | 32.8 |
| North: Dunns Crossing Rd | | | | | | | | | | | | | | |
| 7 | L2 | 136 | 0.0 | 143 | 0.0 | 0.528 | 7.5 | LOS A | 3.8 | 26.6 | 0.36 | 0.17 | 0.52 | 47.2 |
| 8 | T1 | 628 | 0.0 | 661 | 0.0 | 0.528 | 1.6 | LOS A | 3.8 | 26.6 | 0.36 | 0.17 | 0.52 | 47.7 |
| 9 | R2 | 134 | 0.0 | 141 | 0.0 | 0.528 | 8.8 | LOS A | 3.8 | 26.6 | 0.36 | 0.17 | 0.52 | 47.0 |
| Approach | | 898 | 0.0 | 945 | 0.0 | 0.528 | 3.5 | NA | 3.8 | 26.6 | 0.36 | 0.17 | 0.52 | 47.5 |
| West: Site Access | | | | | | | | | | | | | | |
| 10 | L2 | 54 | 0.0 | 57 | 0.0 | 0.627 | 14.9 | LOS B | 3.0 | 20.7 | 0.82 | 1.10 | 1.45 | 36.0 |
| 11 | T1 | 27 | 0.0 | 28 | 0.0 | 0.627 | 34.3 | LOS D | 3.0 | 20.7 | 0.82 | 1.10 | 1.45 | 36.1 |
| 12 | R2 | 72 | 0.0 | 76 | 0.0 | 0.627 | 34.9 | LOS D | 3.0 | 20.7 | 0.82 | 1.10 | 1.45 | 35.9 |
| Approach | | 153 | 0.0 | 161 | 0.0 | 0.627 | 27.7 | LOS D | 3.0 | 20.7 | 0.82 | 1.10 | 1.45 | 35.9 |
| All Vehicles | | 1658 | 0.0 | 1745 | 0.0 | 0.702 | 8.0 | NA | 3.8 | 26.6 | 0.38 | 0.32 | 0.59 | 44.9 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# Appendix 5

## Burnham School Rd / Access Traffic Model Results

# MOVEMENT SUMMARY

## ▽ Site: 101 [Burnham Schhol / Access - 2028 AM (Site Folder: Burnham School / Access)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East: Burnham School Road | | | | | | | | | | | | | | |
| 5 | T1 | 108 | 0.0 | 114 | 0.0 | 0.100 | 0.2 | LOS A | 0.4 | 2.7 | 0.16 | 0.20 | 0.16 | 48.4 |
| 6 | R2 | 64 | 0.0 | 67 | 0.0 | 0.100 | 4.9 | LOS A | 0.4 | 2.7 | 0.16 | 0.20 | 0.16 | 47.5 |
| Approach | | 172 | 0.0 | 181 | 0.0 | 0.100 | 1.9 | NA | 0.4 | 2.7 | 0.16 | 0.20 | 0.16 | 48.1 |
| North: Access | | | | | | | | | | | | | | |
| 7 | L2 | 194 | 0.0 | 204 | 0.0 | 0.137 | 4.9 | LOS A | 0.6 | 4.2 | 0.21 | 0.51 | 0.21 | 46.1 |
| 9 | R2 | 1 | 0.0 | 1 | 0.0 | 0.137 | 5.8 | LOS A | 0.6 | 4.2 | 0.21 | 0.51 | 0.21 | 45.7 |
| Approach | | 195 | 0.0 | 205 | 0.0 | 0.137 | 4.9 | LOS A | 0.6 | 4.2 | 0.21 | 0.51 | 0.21 | 46.1 |
| West: Burnham School Road | | | | | | | | | | | | | | |
| 10 | L2 | 2 | 0.0 | 2 | 0.0 | 0.055 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 49.4 |
| 11 | T1 | 99 | 0.0 | 104 | 0.0 | 0.055 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 49.9 |
| Approach | | 101 | 0.0 | 106 | 0.0 | 0.055 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 49.9 |
| All Vehicles | | 468 | 0.0 | 493 | 0.0 | 0.137 | 2.8 | NA | 0.6 | 4.2 | 0.15 | 0.29 | 0.15 | 47.6 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# MOVEMENT SUMMARY

## Site: 101 [Burnham Schhol / Access - 2028 PM (Site Folder: Burnham School / Access)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East: Burnham School Road | | | | | | | | | | | | | | |
| 5 | T1 | 5 | 0.0 | 5 | 0.0 | 0.099 | 0.0 | LOS A | 0.5 | 3.4 | 0.05 | 0.52 | 0.05 | 47.0 |
| 6 | R2 | 163 | 0.0 | 172 | 0.0 | 0.099 | 4.6 | LOS A | 0.5 | 3.4 | 0.05 | 0.52 | 0.05 | 46.2 |
| Approach | | 168 | 0.0 | 177 | 0.0 | 0.099 | 4.4 | NA | 0.5 | 3.4 | 0.05 | 0.52 | 0.05 | 46.2 |
| North: Access | | | | | | | | | | | | | | |
| 7 | L2 | 96 | 0.0 | 101 | 0.0 | 0.063 | 4.6 | LOS A | 0.3 | 1.8 | 0.04 | 0.51 | 0.04 | 46.5 |
| 9 | R2 | 1 | 0.0 | 1 | 0.0 | 0.063 | 5.2 | LOS A | 0.3 | 1.8 | 0.04 | 0.51 | 0.04 | 46.1 |
| Approach | | 97 | 0.0 | 102 | 0.0 | 0.063 | 4.6 | LOS A | 0.3 | 1.8 | 0.04 | 0.51 | 0.04 | 46.5 |
| West: Burnham School Road | | | | | | | | | | | | | | |
| 10 | L2 | 1 | 0.0 | 1 | 0.0 | 0.004 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.07 | 0.00 | 49.1 |
| 11 | T1 | 7 | 0.0 | 7 | 0.0 | 0.004 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.07 | 0.00 | 49.6 |
| Approach | | 8 | 0.0 | 8 | 0.0 | 0.004 | 0.6 | NA | 0.0 | 0.0 | 0.00 | 0.07 | 0.00 | 49.5 |
| All Vehicles | | 273 | 0.0 | 287 | 0.0 | 0.099 | 4.4 | NA | 0.5 | 3.4 | 0.04 | 0.51 | 0.04 | 46.4 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# Appendix 6

## Dunns Crossing Rd / Northern Primary Access Traffic Model Results

## MOVEMENT SUMMARY

### ▽ Site: 101 [Dunns X-ing / North Primary - 2028 AM (Site Folder: Dunns X-ing / North Primary)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 1 | L2 | 18 | 0.0 | 19 | 0.0 | 0.330 | 4.7 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.3 |
| 2 | T1 | 621 | 0.0 | 654 | 0.0 | 0.330 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.8 |
| Approach | | 639 | 0.0 | 673 | 0.0 | 0.330 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.7 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 8 | T1 | 308 | 0.0 | 324 | 0.0 | 0.195 | 0.7 | LOS A | 0.5 | 3.2 | 0.16 | 0.05 | 0.16 | 49.1 |
| 9 | R2 | 29 | 0.0 | 31 | 0.0 | 0.195 | 8.4 | LOS A | 0.5 | 3.2 | 0.16 | 0.05 | 0.16 | 48.4 |
| Approach | | 337 | 0.0 | 355 | 0.0 | 0.195 | 1.3 | NA | 0.5 | 3.2 | 0.16 | 0.05 | 0.16 | 49.0 |
| West: Access | | | | | | | | | | | | | | |
| 10 | L2 | 102 | 0.0 | 107 | 0.0 | 0.233 | 8.0 | LOS A | 0.9 | 6.1 | 0.62 | 0.84 | 0.66 | 44.0 |
| 12 | R2 | 39 | 0.0 | 41 | 0.0 | 0.233 | 12.6 | LOS B | 0.9 | 6.1 | 0.62 | 0.84 | 0.66 | 43.8 |
| Approach | | 141 | 0.0 | 148 | 0.0 | 0.233 | 9.3 | LOS A | 0.9 | 6.1 | 0.62 | 0.84 | 0.66 | 43.9 |
| All Vehicles | | 1117 | 0.0 | 1176 | 0.0 | 0.330 | 1.7 | NA | 0.9 | 6.1 | 0.13 | 0.13 | 0.13 | 48.7 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# MOVEMENT SUMMARY

## Site: 101 [Dunns X-ing / North Primary - 2028 PM (Site Folder: Dunns X-ing / North Primary)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 1 | L2 | 16 | 0.0 | 17 | 0.0 | 0.226 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.3 |
| 2 | T1 | 421 | 0.0 | 443 | 0.0 | 0.226 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.8 |
| Approach | | 437 | 0.0 | 460 | 0.0 | 0.226 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.8 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 8 | T1 | 715 | 0.0 | 753 | 0.0 | 0.466 | 0.9 | LOS A | 2.0 | 14.2 | 0.23 | 0.08 | 0.30 | 48.8 |
| 9 | R2 | 102 | 0.0 | 107 | 0.0 | 0.466 | 7.9 | LOS A | 2.0 | 14.2 | 0.23 | 0.08 | 0.30 | 48.1 |
| Approach | | 817 | 0.0 | 860 | 0.0 | 0.466 | 1.8 | NA | 2.0 | 14.2 | 0.23 | 0.08 | 0.30 | 48.7 |
| West: Access | | | | | | | | | | | | | | |
| 10 | L2 | 49 | 0.0 | 52 | 0.0 | 0.140 | 6.2 | LOS A | 0.5 | 3.2 | 0.56 | 0.72 | 0.56 | 43.7 |
| 12 | R2 | 21 | 0.0 | 22 | 0.0 | 0.140 | 18.4 | LOS C | 0.5 | 3.2 | 0.56 | 0.72 | 0.56 | 43.5 |
| Approach | | 70 | 0.0 | 74 | 0.0 | 0.140 | 9.9 | LOS A | 0.5 | 3.2 | 0.56 | 0.72 | 0.56 | 43.6 |
| All Vehicles | | 1324 | 0.0 | 1394 | 0.0 | 0.466 | 1.7 | NA | 2.0 | 14.2 | 0.17 | 0.10 | 0.21 | 48.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# Appendix 7

## Dunns Crossing Rd / Central Primary Access Traffic Model Results

# MOVEMENT SUMMARY

## ▽ Site: 101 [Dunns X-ing / Central Primary - 2028 AM (Site Folder: Dunns X-ing / Central Primary)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 1 | L2 | 34 | 0.0 | 36 | 0.0 | 0.249 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.04 | 0.00 | 49.2 |
| 2 | T1 | 448 | 0.0 | 472 | 0.0 | 0.249 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.04 | 0.00 | 49.7 |
| Approach | | 482 | 0.0 | 507 | 0.0 | 0.249 | 0.4 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 0.00 | 49.6 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 8 | T1 | 286 | 0.0 | 301 | 0.0 | 0.200 | 0.7 | LOS A | 0.6 | 4.3 | 0.22 | 0.10 | 0.22 | 48.9 |
| 9 | R2 | 52 | 0.0 | 55 | 0.0 | 0.200 | 7.0 | LOS A | 0.6 | 4.3 | 0.22 | 0.10 | 0.22 | 48.2 |
| Approach | | 338 | 0.0 | 356 | 0.0 | 0.200 | 1.7 | NA | 0.6 | 4.3 | 0.22 | 0.10 | 0.22 | 48.8 |
| West: Access | | | | | | | | | | | | | | |
| 10 | L2 | 185 | 0.0 | 195 | 0.0 | 0.329 | 7.1 | LOS A | 1.5 | 10.6 | 0.56 | 0.80 | 0.66 | 44.6 |
| 12 | R2 | 71 | 0.0 | 75 | 0.0 | 0.329 | 10.9 | LOS B | 1.5 | 10.6 | 0.56 | 0.80 | 0.66 | 44.4 |
| Approach | | 256 | 0.0 | 269 | 0.0 | 0.329 | 8.2 | LOS A | 1.5 | 10.6 | 0.56 | 0.80 | 0.66 | 44.5 |
| All Vehicles | | 1076 | 0.0 | 1133 | 0.0 | 0.329 | 2.6 | NA | 1.5 | 10.6 | 0.20 | 0.24 | 0.23 | 48.1 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# MOVEMENT SUMMARY

## Site: 101 [Dunns X-ing / Central Primary - 2028 PM (Site Folder: Dunns X-ing / Central Primary)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 1 | L2 | 29 | 0.0 | 31 | 0.0 | 0.193 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.04 | 0.00 | 49.2 |
| 2 | T1 | 344 | 0.0 | 362 | 0.0 | 0.193 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.04 | 0.00 | 49.7 |
| Approach | | 373 | 0.0 | 393 | 0.0 | 0.193 | 0.4 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 0.00 | 49.6 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 8 | T1 | 544 | 0.0 | 573 | 0.0 | 0.443 | 1.3 | LOS A | 2.9 | 20.1 | 0.36 | 0.18 | 0.45 | 48.1 |
| 9 | R2 | 186 | 0.0 | 196 | 0.0 | 0.443 | 7.2 | LOS A | 2.9 | 20.1 | 0.36 | 0.18 | 0.45 | 47.5 |
| Approach | | 730 | 0.0 | 768 | 0.0 | 0.443 | 2.8 | NA | 2.9 | 20.1 | 0.36 | 0.18 | 0.45 | 48.0 |
| West: Access | | | | | | | | | | | | | | |
| 10 | L2 | 89 | 0.0 | 94 | 0.0 | 0.203 | 5.9 | LOS A | 0.7 | 5.0 | 0.51 | 0.69 | 0.51 | 44.3 |
| 12 | R2 | 38 | 0.0 | 40 | 0.0 | 0.203 | 14.9 | LOS B | 0.7 | 5.0 | 0.51 | 0.69 | 0.51 | 44.1 |
| Approach | | 127 | 0.0 | 134 | 0.0 | 0.203 | 8.6 | LOS A | 0.7 | 5.0 | 0.51 | 0.69 | 0.51 | 44.3 |
| All Vehicles | | 1230 | 0.0 | 1295 | 0.0 | 0.443 | 2.7 | NA | 2.9 | 20.1 | 0.27 | 0.19 | 0.32 | 48.0 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# Appendix 8

## Dunns Crossing Rd / Southern Primary Access Traffic Model Results

## MOVEMENT SUMMARY

### Site: 101 [Dunns X-ing / South Primary - 2028 AM (Site Folder: Dunns X-ing / South Primary)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 1 | L2 | 16 | 0.0 | 17 | 0.0 | 0.211 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.3 |
| 2 | T1 | 393 | 0.0 | 414 | 0.0 | 0.211 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.8 |
| Approach | | 409 | 0.0 | 431 | 0.0 | 0.211 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.8 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 8 | T1 | 333 | 0.0 | 351 | 0.0 | 0.195 | 0.2 | LOS A | 0.3 | 2.0 | 0.10 | 0.04 | 0.10 | 49.5 |
| 9 | R2 | 25 | 0.0 | 26 | 0.0 | 0.195 | 6.5 | LOS A | 0.3 | 2.0 | 0.10 | 0.04 | 0.10 | 48.8 |
| Approach | | 358 | 0.0 | 377 | 0.0 | 0.195 | 0.7 | NA | 0.3 | 2.0 | 0.10 | 0.04 | 0.10 | 49.5 |
| West: Access | | | | | | | | | | | | | | |
| 10 | L2 | 88 | 0.0 | 93 | 0.0 | 0.147 | 6.2 | LOS A | 0.5 | 3.8 | 0.48 | 0.69 | 0.48 | 45.2 |
| 12 | R2 | 34 | 0.0 | 36 | 0.0 | 0.147 | 9.2 | LOS A | 0.5 | 3.8 | 0.48 | 0.69 | 0.48 | 45.0 |
| Approach | | 122 | 0.0 | 128 | 0.0 | 0.147 | 7.0 | LOS A | 0.5 | 3.8 | 0.48 | 0.69 | 0.48 | 45.2 |
| All Vehicles | | 889 | 0.0 | 936 | 0.0 | 0.211 | 1.3 | NA | 0.5 | 3.8 | 0.10 | 0.12 | 0.10 | 49.0 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# MOVEMENT SUMMARY

## ▽ Site: 101 [Dunns X-ing / South Primary - 2028 PM (Site Folder: Dunns X-ing / South Primary)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 1 | L2 | 14 | 0.0 | 15 | 0.0 | 0.179 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.3 |
| 2 | T1 | 332 | 0.0 | 349 | 0.0 | 0.179 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.8 |
| Approach | | 346 | 0.0 | 364 | 0.0 | 0.179 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.8 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 8 | T1 | 494 | 0.0 | 520 | 0.0 | 0.328 | 0.5 | LOS A | 1.0 | 6.8 | 0.20 | 0.09 | 0.20 | 49.0 |
| 9 | R2 | 86 | 0.0 | 91 | 0.0 | 0.328 | 6.4 | LOS A | 1.0 | 6.8 | 0.20 | 0.09 | 0.20 | 48.3 |
| Approach | | 580 | 0.0 | 611 | 0.0 | 0.328 | 1.4 | NA | 1.0 | 6.8 | 0.20 | 0.09 | 0.20 | 48.9 |
| West: Access | | | | | | | | | | | | | | |
| 10 | L2 | 42 | 0.0 | 44 | 0.0 | 0.080 | 5.8 | LOS A | 0.3 | 1.9 | 0.45 | 0.65 | 0.45 | 45.0 |
| 12 | R2 | 18 | 0.0 | 19 | 0.0 | 0.080 | 11.0 | LOS B | 0.3 | 1.9 | 0.45 | 0.65 | 0.45 | 44.8 |
| Approach | | 60 | 0.0 | 63 | 0.0 | 0.080 | 7.3 | LOS A | 0.3 | 1.9 | 0.45 | 0.65 | 0.45 | 45.0 |
| All Vehicles | | 986 | 0.0 | 1038 | 0.0 | 0.328 | 1.3 | NA | 1.0 | 6.8 | 0.14 | 0.10 | 0.14 | 48.9 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# Appendix 9

## Dunns Crossing Rd / Southern Secondary Access Traffic Model Results

# MOVEMENT SUMMARY

## ▽ Site: 101 [Dunns X-ing / Secondary - 2028 AM (Site Folder: Dunns X-ing / Secondary)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 1 | L2 | 16 | 0.0 | 17 | 0.0 | 0.175 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 49.3 |
| 2 | T1 | 322 | 0.0 | 339 | 0.0 | 0.175 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 49.8 |
| Approach | | 338 | 0.0 | 356 | 0.0 | 0.175 | 0.3 | NA | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 49.8 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 8 | T1 | 343 | 0.0 | 361 | 0.0 | 0.198 | 0.2 | LOS A | 0.3 | 1.8 | 0.08 | 0.04 | 0.08 | 49.6 |
| 9 | R2 | 25 | 0.0 | 26 | 0.0 | 0.198 | 6.1 | LOS A | 0.3 | 1.8 | 0.08 | 0.04 | 0.08 | 48.8 |
| Approach | | 368 | 0.0 | 387 | 0.0 | 0.198 | 0.6 | NA | 0.3 | 1.8 | 0.08 | 0.04 | 0.08 | 49.5 |
| West: Access | | | | | | | | | | | | | | |
| 10 | L2 | 88 | 0.0 | 93 | 0.0 | 0.135 | 5.8 | LOS A | 0.5 | 3.5 | 0.43 | 0.65 | 0.43 | 45.5 |
| 12 | R2 | 34 | 0.0 | 36 | 0.0 | 0.135 | 8.6 | LOS A | 0.5 | 3.5 | 0.43 | 0.65 | 0.43 | 45.2 |
| Approach | | 122 | 0.0 | 128 | 0.0 | 0.135 | 6.6 | LOS A | 0.5 | 3.5 | 0.43 | 0.65 | 0.43 | 45.4 |
| All Vehicles | | 828 | 0.0 | 872 | 0.0 | 0.198 | 1.3 | NA | 0.5 | 3.5 | 0.10 | 0.12 | 0.10 | 49.0 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# MOVEMENT SUMMARY

## ▽ Site: 101 [Dunns X-ing / Secondary - 2028 PM (Site Folder: Dunns X-ing / Secondary)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 1 | L2 | 14 | 0.0 | 15 | 0.0 | 0.164 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.3 |
| 2 | T1 | 304 | 0.0 | 320 | 0.0 | 0.164 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.8 |
| Approach | | 318 | 0.0 | 335 | 0.0 | 0.164 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.8 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 8 | T1 | 424 | 0.0 | 446 | 0.0 | 0.291 | 0.5 | LOS A | 0.9 | 6.4 | 0.20 | 0.10 | 0.20 | 48.9 |
| 9 | R2 | 88 | 0.0 | 93 | 0.0 | 0.291 | 6.2 | LOS A | 0.9 | 6.4 | 0.20 | 0.10 | 0.20 | 48.2 |
| Approach | | 512 | 0.0 | 539 | 0.0 | 0.291 | 1.4 | NA | 0.9 | 6.4 | 0.20 | 0.10 | 0.20 | 48.8 |
| West: Access | | | | | | | | | | | | | | |
| 10 | L2 | 42 | 0.0 | 44 | 0.0 | 0.073 | 5.6 | LOS A | 0.3 | 1.8 | 0.42 | 0.63 | 0.42 | 45.3 |
| 12 | R2 | 18 | 0.0 | 19 | 0.0 | 0.073 | 9.8 | LOS A | 0.3 | 1.8 | 0.42 | 0.63 | 0.42 | 45.1 |
| Approach | | 60 | 0.0 | 63 | 0.0 | 0.073 | 6.9 | LOS A | 0.3 | 1.8 | 0.42 | 0.63 | 0.42 | 45.2 |
| All Vehicles | | 890 | 0.0 | 937 | 0.0 | 0.291 | 1.4 | NA | 0.9 | 6.4 | 0.15 | 0.11 | 0.15 | 48.9 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# Appendix 10

## SH1 / Dunns Crossing Rd / Walkers Rd Traffic Model Results

# MOVEMENT SUMMARY

## Site: 101 [SH1 / Dunns X-ing / Walker - 2028 AM (Site Folder: SH1 / Dunns X-ing)]

New Site
Site Category: (None)
Roundabout

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SH1 | | | | | | | | | | | | | | |
| 1 | L2 | 38 | 0.0 | 40 | 0.0 | 0.295 | 7.4 | LOS A | 1.5 | 10.6 | 0.60 | 0.63 | 0.60 | 64.1 |
| 2 | T1 | 432 | 0.0 | 455 | 0.0 | 0.295 | 9.1 | LOS A | 1.5 | 10.6 | 0.60 | 0.67 | 0.60 | 65.6 |
| 3 | R2 | 75 | 0.0 | 79 | 0.0 | 0.295 | 14.1 | LOS B | 1.4 | 10.1 | 0.61 | 0.72 | 0.61 | 64.5 |
| Approach | | 545 | 0.0 | 574 | 0.0 | 0.295 | 9.6 | LOS A | 1.5 | 10.6 | 0.60 | 0.68 | 0.60 | 65.4 |
| East: Dunns Crossing Road | | | | | | | | | | | | | | |
| 4 | L2 | 101 | 0.0 | 106 | 0.0 | 0.317 | 9.3 | LOS A | 1.4 | 10.1 | 0.62 | 0.74 | 0.62 | 64.4 |
| 5 | T1 | 147 | 0.0 | 155 | 0.0 | 0.317 | 8.7 | LOS A | 1.4 | 10.1 | 0.62 | 0.74 | 0.62 | 66.6 |
| 6 | R2 | 414 | 0.0 | 436 | 0.0 | 0.416 | 14.2 | LOS B | 2.2 | 15.6 | 0.64 | 0.86 | 0.67 | 61.0 |
| Approach | | 662 | 0.0 | 697 | 0.0 | 0.416 | 12.2 | LOS B | 2.2 | 15.6 | 0.63 | 0.82 | 0.65 | 62.6 |
| North: SH1 | | | | | | | | | | | | | | |
| 7 | L2 | 148 | 0.0 | 156 | 0.0 | 0.349 | 6.3 | LOS A | 2.0 | 14.3 | 0.38 | 0.54 | 0.38 | 65.9 |
| 8 | T1 | 646 | 0.0 | 680 | 0.0 | 0.349 | 7.2 | LOS A | 2.0 | 14.3 | 0.39 | 0.56 | 0.39 | 67.4 |
| 9 | R2 | 73 | 0.0 | 77 | 0.0 | 0.349 | 12.6 | LOS B | 2.0 | 14.1 | 0.39 | 0.58 | 0.39 | 66.6 |
| Approach | | 867 | 0.0 | 913 | 0.0 | 0.349 | 7.5 | LOS A | 2.0 | 14.3 | 0.39 | 0.56 | 0.39 | 67.1 |
| West: Walker Road | | | | | | | | | | | | | | |
| 10 | L2 | 81 | 0.0 | 85 | 0.0 | 0.267 | 10.8 | LOS B | 1.3 | 8.9 | 0.68 | 0.82 | 0.68 | 63.5 |
| 11 | T1 | 84 | 0.0 | 88 | 0.0 | 0.267 | 9.5 | LOS A | 1.3 | 8.9 | 0.68 | 0.82 | 0.68 | 65.4 |
| 12 | R2 | 23 | 0.0 | 24 | 0.0 | 0.267 | 15.3 | LOS B | 1.3 | 8.9 | 0.68 | 0.82 | 0.68 | 65.3 |
| Approach | | 188 | 0.0 | 198 | 0.0 | 0.267 | 10.8 | LOS B | 1.3 | 8.9 | 0.68 | 0.82 | 0.68 | 64.6 |
| All Vehicles | | 2262 | 0.0 | 2381 | 0.0 | 0.416 | 9.7 | LOS A | 2.2 | 15.6 | 0.54 | 0.68 | 0.54 | 65.1 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# MOVEMENT SUMMARY

## Site: 101 [SH1 / Dunns X-ing / Walker - 2028 PM (Site Folder: SH1 / Dunns X-ing)]

New Site
Site Category: (None)
Roundabout

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SH1 | | | | | | | | | | | | | | |
| 1 | L2 | 14 | 0.0 | 15 | 0.0 | 0.332 | 6.8 | LOS A | 1.8 | 12.3 | 0.51 | 0.58 | 0.51 | 64.6 |
| 2 | T1 | 551 | 0.0 | 580 | 0.0 | 0.332 | 8.1 | LOS A | 1.8 | 12.3 | 0.52 | 0.61 | 0.52 | 66.1 |
| 3 | R2 | 138 | 0.0 | 145 | 0.0 | 0.332 | 13.3 | LOS B | 1.7 | 12.0 | 0.53 | 0.68 | 0.53 | 64.7 |
| Approach | | 703 | 0.0 | 740 | 0.0 | 0.332 | 9.1 | LOS A | 1.8 | 12.3 | 0.52 | 0.63 | 0.52 | 65.8 |
| East: Dunns Crossing Road | | | | | | | | | | | | | | |
| 4 | L2 | 141 | 0.0 | 148 | 0.0 | 0.283 | 10.3 | LOS B | 1.7 | 12.2 | 0.73 | 0.77 | 0.73 | 64.0 |
| 5 | T1 | 99 | 0.0 | 104 | 0.0 | 0.283 | 9.0 | LOS A | 1.7 | 12.2 | 0.73 | 0.77 | 0.73 | 66.1 |
| 6 | R2 | 230 | 0.0 | 242 | 0.0 | 0.321 | 15.4 | LOS B | 1.9 | 13.1 | 0.74 | 0.89 | 0.74 | 60.5 |
| Approach | | 470 | 0.0 | 495 | 0.0 | 0.321 | 12.5 | LOS B | 1.9 | 13.1 | 0.73 | 0.83 | 0.73 | 62.6 |
| North: SH1 | | | | | | | | | | | | | | |
| 7 | L2 | 751 | 0.0 | 791 | 0.0 | 0.662 | 8.3 | LOS A | 6.3 | 44.4 | 0.69 | 0.73 | 0.75 | 64.8 |
| 8 | T1 | 673 | 0.0 | 708 | 0.0 | 0.662 | 9.3 | LOS A | 6.3 | 44.4 | 0.71 | 0.76 | 0.80 | 64.9 |
| 9 | R2 | 61 | 0.0 | 64 | 0.0 | 0.662 | 15.1 | LOS B | 6.3 | 44.2 | 0.71 | 0.76 | 0.80 | 64.6 |
| Approach | | 1485 | 0.0 | 1563 | 0.0 | 0.662 | 9.0 | LOS A | 6.3 | 44.4 | 0.70 | 0.74 | 0.77 | 64.9 |
| West: Walker Road | | | | | | | | | | | | | | |
| 10 | L2 | 84 | 0.0 | 88 | 0.0 | 0.372 | 10.3 | LOS B | 1.9 | 13.1 | 0.69 | 0.82 | 0.74 | 63.4 |
| 11 | T1 | 159 | 0.0 | 167 | 0.0 | 0.372 | 9.6 | LOS A | 1.9 | 13.1 | 0.69 | 0.82 | 0.74 | 65.3 |
| 12 | R2 | 23 | 0.0 | 24 | 0.0 | 0.372 | 15.5 | LOS B | 1.9 | 13.1 | 0.69 | 0.82 | 0.74 | 65.2 |
| Approach | | 266 | 0.0 | 280 | 0.0 | 0.372 | 10.4 | LOS B | 1.9 | 13.1 | 0.69 | 0.82 | 0.74 | 64.7 |
| All Vehicles | | 2924 | 0.0 | 3078 | 0.0 | 0.662 | 9.7 | LOS A | 6.3 | 44.4 | 0.66 | 0.74 | 0.70 | 64.7 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# Appendix 11

## Burnham School Rd / Dunns Crossing Rd Traffic Model Results

# MOVEMENT SUMMARY

## Site: 101 [Dunns X-ing / Burnham School - 2028 AM (Site Folder: Dunns X-ing / Burnham School)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 90 seconds (Site User-Given Cycle Time)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 1 | L2 | 86 | 0.0 | 91 | 0.0 | 0.595 | 26.2 | LOS C | 16.4 | 114.8 | 0.83 | 0.74 | 0.83 | 38.0 |
| 2 | T1 | 374 | 0.0 | 394 | 0.0 | 0.595 | 21.6 | LOS C | 16.4 | 114.8 | 0.83 | 0.74 | 0.83 | 38.2 |
| 3 | R2 | 2 | 0.0 | 2 | 0.0 | 0.017 | 48.3 | LOS D | 0.1 | 0.6 | 0.95 | 0.61 | 0.95 | 29.8 |
| Approach | | 462 | 0.0 | 486 | 0.0 | 0.595 | 22.6 | LOS C | 16.4 | 114.8 | 0.83 | 0.74 | 0.83 | 38.1 |
| East: Burnham School Road | | | | | | | | | | | | | | |
| 4 | L2 | 4 | 0.0 | 4 | 0.0 | 0.049 | 41.8 | LOS D | 0.5 | 3.4 | 0.90 | 0.64 | 0.90 | 32.4 |
| 5 | T1 | 8 | 0.0 | 8 | 0.0 | 0.049 | 37.3 | LOS D | 0.5 | 3.4 | 0.90 | 0.64 | 0.90 | 32.6 |
| 6 | R2 | 3 | 0.0 | 3 | 0.0 | 0.015 | 43.5 | LOS D | 0.1 | 0.9 | 0.91 | 0.63 | 0.91 | 31.0 |
| Approach | | 15 | 0.0 | 16 | 0.0 | 0.049 | 39.7 | LOS D | 0.5 | 3.4 | 0.90 | 0.64 | 0.90 | 32.3 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 7 | L2 | 2 | 0.0 | 2 | 0.0 | 0.609 | 25.8 | LOS C | 15.5 | 108.2 | 0.81 | 0.71 | 0.81 | 38.4 |
| 8 | T1 | 439 | 0.0 | 462 | 0.0 | *0.609 | 21.2 | LOS C | 15.5 | 108.2 | 0.81 | 0.71 | 0.81 | 38.7 |
| 9 | R2 | 61 | 0.0 | 64 | 0.0 | *0.519 | 51.8 | LOS D | 2.9 | 20.6 | 1.00 | 0.76 | 1.01 | 29.0 |
| Approach | | 502 | 0.0 | 528 | 0.0 | 0.609 | 25.0 | LOS C | 15.5 | 108.2 | 0.84 | 0.72 | 0.84 | 37.2 |
| West: Burnham School Road | | | | | | | | | | | | | | |
| 10 | L2 | 107 | 0.0 | 113 | 0.0 | 0.621 | 46.3 | LOS D | 6.8 | 47.6 | 0.99 | 0.82 | 1.03 | 30.7 |
| 11 | T1 | 41 | 0.0 | 43 | 0.0 | *0.621 | 41.7 | LOS D | 6.8 | 47.6 | 0.99 | 0.82 | 1.03 | 30.9 |
| 12 | R2 | 115 | 0.0 | 121 | 0.0 | *0.587 | 47.9 | LOS D | 5.3 | 37.4 | 1.00 | 0.80 | 1.02 | 29.9 |
| Approach | | 263 | 0.0 | 277 | 0.0 | 0.621 | 46.3 | LOS D | 6.8 | 47.6 | 0.99 | 0.81 | 1.02 | 30.4 |
| All Vehicles | | 1242 | 0.0 | 1307 | 0.0 | 0.621 | 28.8 | LOS C | 16.4 | 114.8 | 0.87 | 0.75 | 0.87 | 35.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

## MOVEMENT SUMMARY

**Site: 101 [Dunns X-ing / Burnham School - 2028 PM (Site Folder: Dunns X-ing / Burnham School)]**

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 90 seconds (Site User-Given Cycle Time)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 1 | L2 | 66 | 0.0 | 69 | 0.0 | 0.532 | 20.4 | LOS C | 15.4 | 107.7 | 0.72 | 0.66 | 0.72 | 40.5 |
| 2 | T1 | 433 | 0.0 | 456 | 0.0 | 0.532 | 15.8 | LOS B | 15.4 | 107.7 | 0.72 | 0.66 | 0.72 | 40.8 |
| 3 | R2 | 2 | 0.0 | 2 | 0.0 | 0.017 | 48.3 | LOS D | 0.1 | 0.6 | 0.95 | 0.61 | 0.95 | 29.8 |
| Approach | | 501 | 0.0 | 527 | 0.0 | 0.532 | 16.5 | LOS B | 15.4 | 107.7 | 0.72 | 0.66 | 0.72 | 40.7 |
| East: Burnham School Road | | | | | | | | | | | | | | |
| 4 | L2 | 1 | 0.0 | 1 | 0.0 | 0.122 | 46.9 | LOS D | 0.9 | 6.2 | 0.95 | 0.67 | 0.95 | 31.4 |
| 5 | T1 | 19 | 0.0 | 20 | 0.0 | 0.122 | 42.4 | LOS D | 0.9 | 6.2 | 0.95 | 0.67 | 0.95 | 31.6 |
| 6 | R2 | 2 | 0.0 | 2 | 0.0 | 0.017 | 48.3 | LOS D | 0.1 | 0.6 | 0.95 | 0.61 | 0.95 | 29.8 |
| Approach | | 22 | 0.0 | 23 | 0.0 | 0.122 | 43.1 | LOS D | 0.9 | 6.2 | 0.95 | 0.67 | 0.95 | 31.4 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 7 | L2 | 7 | 0.0 | 7 | 0.0 | 0.741 | 22.3 | LOS C | 22.3 | 156.3 | 0.81 | 0.73 | 0.81 | 39.9 |
| 8 | T1 | 639 | 0.0 | 673 | 0.0 | *0.741 | 17.7 | LOS B | 22.3 | 156.3 | 0.81 | 0.73 | 0.81 | 40.2 |
| 9 | R2 | 84 | 0.0 | 88 | 0.0 | *0.714 | 53.9 | LOS D | 4.2 | 29.5 | 1.00 | 0.86 | 1.21 | 26.5 |
| Approach | | 730 | 0.0 | 768 | 0.0 | 0.741 | 21.9 | LOS C | 22.3 | 156.3 | 0.83 | 0.74 | 0.86 | 38.4 |
| West: Burnham School Road | | | | | | | | | | | | | | |
| 10 | L2 | 38 | 0.0 | 40 | 0.0 | 0.352 | 48.5 | LOS D | 2.6 | 18.0 | 0.98 | 0.74 | 0.98 | 30.3 |
| 11 | T1 | 18 | 0.0 | 19 | 0.0 | *0.352 | 43.9 | LOS D | 2.6 | 18.0 | 0.98 | 0.74 | 0.98 | 30.4 |
| 12 | R2 | 47 | 0.0 | 49 | 0.0 | *0.400 | 51.2 | LOS D | 2.2 | 15.7 | 1.00 | 0.74 | 1.00 | 29.1 |
| Approach | | 103 | 0.0 | 108 | 0.0 | 0.400 | 48.9 | LOS D | 2.6 | 18.0 | 0.99 | 0.74 | 0.99 | 29.8 |
| All Vehicles | | 1356 | 0.0 | 1427 | 0.0 | 0.741 | 22.3 | LOS C | 22.3 | 156.3 | 0.80 | 0.71 | 0.82 | 38.2 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# Appendix 12

## Brookside Rd / Dunns Crossing Rd Traffic Model Results

# MOVEMENT SUMMARY

## Site: 101 [Dunns X-ing / Brookside - 2028 AM (Site Folder: Dunns X-ing / Brookside)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Rd | | | | | | | | | | | | | | |
| 1 | L2 | 2 | 0.0 | 2 | 0.0 | 0.587 | 10.3 | LOS B | 6.7 | 46.7 | 0.69 | 0.47 | 1.16 | 45.1 |
| 2 | T1 | 422 | 0.0 | 444 | 0.0 | 0.587 | 4.7 | LOS A | 6.7 | 46.7 | 0.69 | 0.47 | 1.16 | 45.5 |
| 3 | R2 | 336 | 0.0 | 354 | 0.0 | 0.587 | 10.3 | LOS B | 6.7 | 46.7 | 0.69 | 0.47 | 1.16 | 44.8 |
| Approach | | 760 | 0.0 | 800 | 0.0 | 0.587 | 7.2 | NA | 6.7 | 46.7 | 0.69 | 0.47 | 1.16 | 45.2 |
| East: Brookside Road | | | | | | | | | | | | | | |
| 4 | L2 | 91 | 0.0 | 96 | 0.0 | 0.375 | 8.7 | LOS A | 1.5 | 10.6 | 0.70 | 0.92 | 0.93 | 41.1 |
| 5 | T1 | 10 | 0.0 | 11 | 0.0 | 0.375 | 22.9 | LOS C | 1.5 | 10.6 | 0.70 | 0.92 | 0.93 | 41.2 |
| 6 | R2 | 36 | 0.0 | 38 | 0.0 | 0.375 | 29.4 | LOS D | 1.5 | 10.6 | 0.70 | 0.92 | 0.93 | 40.8 |
| Approach | | 137 | 0.0 | 144 | 0.0 | 0.375 | 15.2 | LOS C | 1.5 | 10.6 | 0.70 | 0.92 | 0.93 | 41.0 |
| North: Dunns Crossing Rd | | | | | | | | | | | | | | |
| 7 | L2 | 71 | 0.0 | 75 | 0.0 | 0.289 | 4.7 | LOS A | 0.1 | 0.4 | 0.01 | 0.07 | 0.01 | 49.1 |
| 8 | T1 | 481 | 0.0 | 506 | 0.0 | 0.289 | 0.0 | LOS A | 0.1 | 0.4 | 0.01 | 0.07 | 0.01 | 49.6 |
| 9 | R2 | 3 | 0.0 | 3 | 0.0 | 0.289 | 7.0 | LOS A | 0.1 | 0.4 | 0.01 | 0.07 | 0.01 | 48.7 |
| Approach | | 555 | 0.0 | 584 | 0.0 | 0.289 | 0.7 | NA | 0.1 | 0.4 | 0.01 | 0.07 | 0.01 | 49.5 |
| West: Brookside Road | | | | | | | | | | | | | | |
| 10 | L2 | 2 | 0.0 | 2 | 0.0 | 0.029 | 6.1 | LOS A | 0.1 | 0.6 | 0.76 | 0.81 | 0.76 | 40.5 |
| 11 | T1 | 4 | 0.0 | 4 | 0.0 | 0.029 | 19.2 | LOS C | 0.1 | 0.6 | 0.76 | 0.81 | 0.76 | 40.6 |
| 12 | R2 | 1 | 0.0 | 1 | 0.0 | 0.029 | 25.6 | LOS D | 0.1 | 0.6 | 0.76 | 0.81 | 0.76 | 40.3 |
| Approach | | 7 | 0.0 | 7 | 0.0 | 0.029 | 16.3 | LOS C | 0.1 | 0.6 | 0.76 | 0.81 | 0.76 | 40.5 |
| All Vehicles | | 1459 | 0.0 | 1536 | 0.0 | 0.587 | 5.5 | NA | 6.7 | 46.7 | 0.44 | 0.36 | 0.70 | 46.2 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

### Site: 101 [Dunns X-ing / Brookside - 2028 PM (Site Folder: Dunns X-ing / Brookside)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Rd | | | | | | | | | | | | | | |
| 1 | L2 | 2 | 0.0 | 2 | 0.0 | 0.425 | 10.5 | LOS B | 3.2 | 22.7 | 0.51 | 0.21 | 0.72 | 46.3 |
| 2 | T1 | 445 | 0.0 | 468 | 0.0 | 0.425 | 3.2 | LOS A | 3.2 | 22.7 | 0.51 | 0.21 | 0.72 | 46.8 |
| 3 | R2 | 144 | 0.0 | 152 | 0.0 | 0.425 | 10.5 | LOS B | 3.2 | 22.7 | 0.51 | 0.21 | 0.72 | 46.0 |
| Approach | | 591 | 0.0 | 622 | 0.0 | 0.425 | 5.0 | NA | 3.2 | 22.7 | 0.51 | 0.21 | 0.72 | 46.6 |
| East: Brookside Road | | | | | | | | | | | | | | |
| 4 | L2 | 248 | 0.0 | 261 | 0.0 | 0.656 | 13.8 | LOS B | 4.1 | 28.7 | 0.80 | 1.18 | 1.59 | 40.1 |
| 5 | T1 | 11 | 0.0 | 12 | 0.0 | 0.656 | 27.3 | LOS D | 4.1 | 28.7 | 0.80 | 1.18 | 1.59 | 40.2 |
| 6 | R2 | 45 | 0.0 | 47 | 0.0 | 0.656 | 34.3 | LOS D | 4.1 | 28.7 | 0.80 | 1.18 | 1.59 | 39.9 |
| Approach | | 304 | 0.0 | 320 | 0.0 | 0.656 | 17.3 | LOS C | 4.1 | 28.7 | 0.80 | 1.18 | 1.59 | 40.1 |
| North: Dunns Crossing Rd | | | | | | | | | | | | | | |
| 7 | L2 | 27 | 0.0 | 28 | 0.0 | 0.357 | 4.8 | LOS A | 0.0 | 0.3 | 0.01 | 0.02 | 0.01 | 49.4 |
| 8 | T1 | 661 | 0.0 | 696 | 0.0 | 0.357 | 0.0 | LOS A | 0.0 | 0.3 | 0.01 | 0.02 | 0.01 | 49.8 |
| 9 | R2 | 2 | 0.0 | 2 | 0.0 | 0.357 | 7.5 | LOS A | 0.0 | 0.3 | 0.01 | 0.02 | 0.01 | 49.0 |
| Approach | | 690 | 0.0 | 726 | 0.0 | 0.357 | 0.2 | NA | 0.0 | 0.3 | 0.01 | 0.02 | 0.01 | 49.8 |
| West: Brookside Road | | | | | | | | | | | | | | |
| 10 | L2 | 1 | 0.0 | 1 | 0.0 | 0.041 | 6.2 | LOS A | 0.1 | 0.8 | 0.82 | 0.88 | 0.82 | 39.2 |
| 11 | T1 | 5 | 0.0 | 5 | 0.0 | 0.041 | 17.5 | LOS C | 0.1 | 0.8 | 0.82 | 0.88 | 0.82 | 39.3 |
| 12 | R2 | 2 | 0.0 | 2 | 0.0 | 0.041 | 31.0 | LOS D | 0.1 | 0.8 | 0.82 | 0.88 | 0.82 | 39.0 |
| Approach | | 8 | 0.0 | 8 | 0.0 | 0.041 | 19.5 | LOS C | 0.1 | 0.8 | 0.82 | 0.88 | 0.82 | 39.2 |
| All Vehicles | | 1593 | 0.0 | 1677 | 0.0 | 0.656 | 5.4 | NA | 4.1 | 28.7 | 0.35 | 0.32 | 0.58 | 46.4 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# Appendix 13

## Lowes Rd / Dunns Crossing Rd Traffic Model Results – Priority Controlled

## MOVEMENT SUMMARY

### Site: 101 [Dunns X-ing / Lowes - 2028 AM (Site Folder: Dunns X-ing / Lowes)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 2 | T1 | 613 | 0.0 | 645 | 0.0 | 0.416 | 1.2 | LOS A | 1.9 | 13.3 | 0.26 | 0.09 | 0.35 | 48.5 |
| 3 | R2 | 88 | 0.0 | 93 | 0.0 | 0.416 | 9.1 | LOS A | 1.9 | 13.3 | 0.26 | 0.09 | 0.35 | 47.7 |
| Approach | | 701 | 0.0 | 738 | 0.0 | 0.416 | 2.2 | NA | 1.9 | 13.3 | 0.26 | 0.09 | 0.35 | 48.4 |
| East: Lowes Road | | | | | | | | | | | | | | |
| 4 | L2 | 37 | 0.0 | 39 | 0.0 | 0.539 | 9.2 | LOS A | 2.4 | 16.7 | 0.77 | 1.00 | 1.20 | 39.8 |
| 6 | R2 | 149 | 0.0 | 157 | 0.0 | 0.539 | 20.0 | LOS C | 2.4 | 16.7 | 0.77 | 1.00 | 1.20 | 39.6 |
| Approach | | 186 | 0.0 | 196 | 0.0 | 0.539 | 17.9 | LOS C | 2.4 | 16.7 | 0.77 | 1.00 | 1.20 | 39.6 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 7 | L2 | 284 | 0.0 | 299 | 0.0 | 0.303 | 4.7 | LOS A | 0.0 | 0.0 | 0.00 | 0.27 | 0.00 | 47.9 |
| 8 | T1 | 289 | 0.0 | 304 | 0.0 | 0.303 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.27 | 0.00 | 48.4 |
| Approach | | 573 | 0.0 | 603 | 0.0 | 0.303 | 2.4 | NA | 0.0 | 0.0 | 0.00 | 0.27 | 0.00 | 48.1 |
| All Vehicles | | 1460 | 0.0 | 1537 | 0.0 | 0.539 | 4.3 | NA | 2.4 | 16.7 | 0.22 | 0.28 | 0.32 | 47.0 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

### ▽ Site: 101 [Dunns X-ing / Lowes - 2028 PM (Site Folder: Dunns X-ing / Lowes)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 2 | T1 | 402 | 0.0 | 423 | 0.0 | 0.320 | 3.1 | LOS A | 1.9 | 13.3 | 0.38 | 0.09 | 0.48 | 47.2 |
| 3 | R2 | 55 | 0.0 | 58 | 0.0 | 0.320 | 13.6 | LOS B | 1.9 | 13.3 | 0.38 | 0.09 | 0.48 | 46.6 |
| Approach | | 457 | 0.0 | 481 | 0.0 | 0.320 | 4.3 | NA | 1.9 | 13.3 | 0.38 | 0.09 | 0.48 | 47.1 |
| East: Lowes Road | | | | | | | | | | | | | | |
| 4 | L2 | 89 | 0.0 | 94 | 0.0 | 0.131 | 8.4 | LOS A | 0.5 | 3.3 | 0.60 | 0.81 | 0.60 | 44.4 |
| 6 | R2 | 199 | 0.0 | 209 | 0.0 | 0.889 | 47.2 | LOS E | 5.8 | 40.9 | 0.98 | 1.53 | 2.90 | 30.0 |
| Approach | | 288 | 0.0 | 303 | 0.0 | 0.889 | 35.2 | LOS E | 5.8 | 40.9 | 0.86 | 1.31 | 2.19 | 33.4 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 7 | L2 | 206 | 0.0 | 217 | 0.0 | 0.475 | 4.7 | LOS A | 0.0 | 0.0 | 0.00 | 0.12 | 0.00 | 48.6 |
| 8 | T1 | 705 | 0.0 | 742 | 0.0 | 0.475 | 0.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.12 | 0.00 | 49.0 |
| Approach | | 911 | 0.0 | 959 | 0.0 | 0.475 | 1.2 | NA | 0.0 | 0.0 | 0.00 | 0.12 | 0.00 | 48.9 |
| All Vehicles | | 1656 | 0.0 | 1743 | 0.0 | 0.889 | 8.0 | NA | 5.8 | 40.9 | 0.25 | 0.32 | 0.51 | 44.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# Appendix 14

## Lowes Rd / Dunns Crossing Rd Traffic Model Results – Signal Controlled

## MOVEMENT SUMMARY

**Site: 101v [Dunns X-ing / Lowes - 2028 AM (Site Folder: Dunns X-ing / Lowes)]**

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 90 seconds (Site User-Given Cycle Time)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 2 | T1 | 613 | 0.0 | 645 | 0.0 | *0.466 | 7.2 | LOS A | 13.2 | 92.1 | 0.51 | 0.46 | 0.51 | 45.5 |
| 3 | R2 | 88 | 0.0 | 93 | 0.0 | 0.206 | 17.2 | LOS B | 2.2 | 15.5 | 0.57 | 0.70 | 0.57 | 40.0 |
| Approach | | 701 | 0.0 | 738 | 0.0 | 0.466 | 8.5 | LOS A | 13.2 | 92.1 | 0.52 | 0.49 | 0.52 | 44.7 |
| East: Lowes Road | | | | | | | | | | | | | | |
| 4 | L2 | 37 | 0.0 | 39 | 0.0 | 0.113 | 37.6 | LOS D | 1.4 | 10.1 | 0.86 | 0.72 | 0.86 | 32.8 |
| 6 | R2 | 149 | 0.0 | 157 | 0.0 | *0.454 | 40.4 | LOS D | 6.3 | 44.0 | 0.93 | 0.79 | 0.93 | 32.0 |
| Approach | | 186 | 0.0 | 196 | 0.0 | 0.454 | 39.8 | LOS D | 6.3 | 44.0 | 0.92 | 0.78 | 0.92 | 32.2 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 7 | L2 | 284 | 0.0 | 299 | 0.0 | 0.227 | 10.4 | LOS B | 4.9 | 34.4 | 0.41 | 0.66 | 0.41 | 43.4 |
| 8 | T1 | 289 | 0.0 | 304 | 0.0 | 0.220 | 5.8 | LOS A | 5.0 | 34.7 | 0.40 | 0.35 | 0.40 | 46.3 |
| Approach | | 573 | 0.0 | 603 | 0.0 | 0.227 | 8.1 | LOS A | 5.0 | 34.7 | 0.41 | 0.50 | 0.41 | 44.8 |
| All Vehicles | | 1460 | 0.0 | 1537 | 0.0 | 0.466 | 12.3 | LOS B | 13.2 | 92.1 | 0.52 | 0.53 | 0.52 | 42.6 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

## MOVEMENT SUMMARY

**Site: 101v [Dunns X-ing / Lowes - 2028 PM (Site Folder: Dunns X-ing / Lowes)]**

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 90 seconds (Site User-Given Cycle Time)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Dunns Crossing Road | | | | | | | | | | | | | | |
| 2 | T1 | 402 | 0.0 | 423 | 0.0 | 0.311 | 6.7 | LOS A | 7.7 | 53.8 | 0.45 | 0.40 | 0.45 | 45.8 |
| 3 | R2 | 55 | 0.0 | 58 | 0.0 | 0.212 | 19.9 | LOS B | 1.5 | 10.8 | 0.61 | 0.71 | 0.61 | 38.9 |
| Approach | | 457 | 0.0 | 481 | 0.0 | 0.311 | 8.3 | LOS A | 7.7 | 53.8 | 0.47 | 0.43 | 0.47 | 44.8 |
| East: Lowes Road | | | | | | | | | | | | | | |
| 4 | L2 | 89 | 0.0 | 94 | 0.0 | 0.256 | 37.9 | LOS D | 3.5 | 24.8 | 0.88 | 0.76 | 0.88 | 32.7 |
| 6 | R2 | 199 | 0.0 | 209 | 0.0 | *0.573 | 40.6 | LOS D | 8.5 | 59.8 | 0.95 | 0.81 | 0.95 | 32.0 |
| Approach | | 288 | 0.0 | 303 | 0.0 | 0.573 | 39.7 | LOS D | 8.5 | 59.8 | 0.93 | 0.80 | 0.93 | 32.2 |
| North: Dunns Crossing Road | | | | | | | | | | | | | | |
| 7 | L2 | 206 | 0.0 | 217 | 0.0 | 0.167 | 10.5 | LOS B | 3.5 | 24.5 | 0.40 | 0.65 | 0.40 | 43.3 |
| 8 | T1 | 705 | 0.0 | 742 | 0.0 | *0.569 | 8.3 | LOS A | 16.8 | 117.9 | 0.57 | 0.51 | 0.57 | 44.9 |
| Approach | | 911 | 0.0 | 959 | 0.0 | 0.569 | 8.8 | LOS A | 16.8 | 117.9 | 0.53 | 0.55 | 0.53 | 44.5 |
| All Vehicles | | 1656 | 0.0 | 1743 | 0.0 | 0.573 | 14.1 | LOS B | 16.8 | 117.9 | 0.58 | 0.56 | 0.58 | 41.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# Appendix 15

## Dunns Crossing Rd / Goulds Rd / Selwyn Rd Traffic Model Results

## MOVEMENT SUMMARY

Site: 101 [Dunns X-ing / Goulds - 2028 AM (Site Folder: Dunns X-ing / Gould / Selwyn)]

Network: N101 [Dunns / Goulds / Selwyn - 2028 AM (Network Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | DEMAND FLOWS [ Total veh/h | HV ] % | ARRIVAL FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | AVERAGE BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Goulds Road | | | | | | | | | | | | | | |
| 1 | L2 | 254 | 0.0 | 254 | 0.0 | 0.173 | 2.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.37 | 0.00 | 47.0 |
| 2 | T1 | 74 | 0.0 | 74 | 0.0 | 0.173 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.37 | 0.00 | 47.9 |
| Approach | | 327 | 0.0 | 327 | 0.0 | 0.173 | 1.6 | NA | 0.0 | 0.0 | 0.00 | 0.37 | 0.00 | 47.2 |
| North: Goulds Road | | | | | | | | | | | | | | |
| 8 | T1 | 108 | 0.0 | 108 | 0.0 | 0.109 | 0.2 | LOS A | 0.1 | 0.4 | 0.13 | 0.08 | 0.13 | 48.5 |
| 9 | R2 | 17 | 0.0 | 17 | 0.0 | 0.109 | 5.7 | LOS A | 0.1 | 0.4 | 0.13 | 0.08 | 0.13 | 48.3 |
| Approach | | 125 | 0.0 | 125 | 0.0 | 0.109 | 1.0 | NA | 0.1 | 0.4 | 0.13 | 0.08 | 0.13 | 48.4 |
| West: Dunns Crossing Road | | | | | | | | | | | | | | |
| 10 | L2 | 14 | 0.0 | 14 | 0.0 | 0.665 | 7.0 | LOS A | 1.2 | 8.5 | 0.42 | 0.80 | 0.69 | 44.4 |
| 12 | R2 | 375 | 0.0 | 375 | 0.0 | 0.665 | 8.5 | LOS A | 1.2 | 8.5 | 0.42 | 0.80 | 0.69 | 40.7 |
| Approach | | 388 | 0.0 | 388 | 0.0 | 0.665 | 8.4 | LOS A | 1.2 | 8.5 | 0.42 | 0.80 | 0.69 | 40.9 |
| All Vehicles | | 841 | 0.0 | 841 | 0.0 | 0.665 | 4.7 | NA | 1.2 | 8.5 | 0.21 | 0.53 | 0.34 | 44.3 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

Site: 101 [Goulds / Selwyn - 2028 AM (Site Folder: Dunns X-ing / Gould / Selwyn)]

Network: N101 [Dunns / Goulds / Selwyn - 2028 AM (Network Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | DEMAND FLOWS [ Total veh/h | HV ] % | ARRIVAL FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | AVERAGE BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Goulds Road | | | | | | | | | | | | | | |
| 1 | L2 | 1 | 0.0 | 1 | 0.0 | 0.127 | 9.3 | LOS A | 0.2 | 1.3 | 0.49 | 0.98 | 0.49 | 61.4 |
| 2 | T1 | 76 | 0.0 | 76 | 0.0 | 0.127 | 11.1 | LOS B | 0.2 | 1.3 | 0.49 | 0.98 | 0.49 | 55.0 |
| 3 | R2 | 8 | 0.0 | 8 | 0.0 | 0.127 | 16.0 | LOS C | 0.2 | 1.3 | 0.49 | 0.98 | 0.49 | 61.0 |
| Approach | | 85 | 0.0 | 85 | 0.0 | 0.127 | 11.6 | LOS B | 0.2 | 1.3 | 0.49 | 0.98 | 0.49 | 56.1 |
| East: Selwyn Road | | | | | | | | | | | | | | |
| 4 | L2 | 13 | 0.0 | 13 | 0.0 | 0.193 | 7.3 | LOS A | 0.4 | 2.8 | 0.23 | 0.39 | 0.23 | 67.4 |
| 5 | T1 | 119 | 0.0 | 119 | 0.0 | 0.193 | 0.3 | LOS A | 0.4 | 2.8 | 0.23 | 0.39 | 0.23 | 71.8 |
| 6 | R2 | 202 | 0.0 | 202 | 0.0 | 0.193 | 7.0 | LOS A | 0.4 | 2.8 | 0.23 | 0.39 | 0.23 | 65.2 |
| Approach | | 334 | 0.0 | 334 | 0.0 | 0.193 | 4.6 | NA | 0.4 | 2.8 | 0.23 | 0.39 | 0.23 | 68.5 |
| North: Goulds Road | | | | | | | | | | | | | | |
| 7 | L2 | 343 | 0.0 | 343 | 0.0 | 0.479 | 5.2 | LOS A | 1.3 | 9.1 | 0.22 | 0.94 | 0.25 | 56.3 |
| 8 | T1 | 44 | 0.0 | 44 | 0.0 | 0.479 | 8.5 | LOS A | 1.3 | 9.1 | 0.22 | 0.94 | 0.25 | 55.9 |
| 9 | R2 | 96 | 0.0 | 96 | 0.0 | 0.479 | 10.2 | LOS B | 1.3 | 9.1 | 0.22 | 0.94 | 0.25 | 55.6 |
| Approach | | 483 | 0.0 | 483 | 0.0 | 0.479 | 6.5 | LOS A | 1.3 | 9.1 | 0.22 | 0.94 | 0.25 | 56.1 |
| West: Selwyn Road | | | | | | | | | | | | | | |
| 10 | L2 | 49 | 0.0 | 49 | 0.0 | 0.059 | 7.0 | LOS A | 0.0 | 0.0 | 0.01 | 0.29 | 0.01 | 70.4 |
| 11 | T1 | 62 | 0.0 | 62 | 0.0 | 0.059 | 0.0 | LOS A | 0.0 | 0.0 | 0.01 | 0.29 | 0.01 | 74.8 |
| 12 | R2 | 1 | 0.0 | 1 | 0.0 | 0.059 | 7.0 | LOS A | 0.0 | 0.0 | 0.01 | 0.29 | 0.01 | 69.6 |
| Approach | | 113 | 0.0 | 113 | 0.0 | 0.059 | 3.1 | NA | 0.0 | 0.0 | 0.01 | 0.29 | 0.01 | 73.5 |
| All Vehicles | | 1015 | 0.0 | 1015 | 0.0 | 0.479 | 5.9 | NA | 1.3 | 9.1 | 0.22 | 0.69 | 0.24 | 62.5 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

▽ Site: 101 [Dunns X-ing / Goulds - 2028 PM (Site Folder: Dunns X-ing / Gould / Selwyn)]

Network: N101 [Dunns / Goulds / Selwyn - 2028 PM (Network Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | DEMAND FLOWS [ Total veh/h | HV ] % | ARRIVAL FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | AVERAGE BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Goulds Road | | | | | | | | | | | | | | |
| 1 | L2 | 264 | 0.0 | 264 | 0.0 | 0.184 | 2.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.36 | 0.00 | 47.1 |
| 2 | T1 | 85 | 0.0 | 85 | 0.0 | 0.184 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.36 | 0.00 | 47.9 |
| Approach | | 349 | 0.0 | 349 | 0.0 | 0.184 | 1.6 | NA | 0.0 | 0.0 | 0.00 | 0.36 | 0.00 | 47.3 |
| North: Goulds Road | | | | | | | | | | | | | | |
| 8 | T1 | 134 | 0.0 | 134 | 0.0 | 0.085 | 0.3 | LOS A | 0.1 | 0.5 | 0.14 | 0.08 | 0.14 | 48.4 |
| 9 | R2 | 21 | 0.0 | 21 | 0.0 | 0.085 | 5.8 | LOS A | 0.1 | 0.5 | 0.14 | 0.08 | 0.14 | 48.3 |
| Approach | | 155 | 0.0 | 155 | 0.0 | 0.085 | 1.0 | NA | 0.1 | 0.5 | 0.14 | 0.08 | 0.14 | 48.4 |
| West: Dunns Crossing Road | | | | | | | | | | | | | | |
| 10 | L2 | 22 | 0.0 | 22 | 0.0 | 0.685 | 7.5 | LOS A | 1.1 | 7.4 | 0.41 | 0.83 | 0.71 | 44.1 |
| 12 | R2 | 313 | 0.0 | 313 | 0.0 | 0.685 | 9.2 | LOS A | 1.1 | 7.4 | 0.41 | 0.83 | 0.71 | 40.1 |
| Approach | | 335 | 0.0 | 335 | 0.0 | 0.685 | 9.1 | LOS A | 1.1 | 7.4 | 0.41 | 0.83 | 0.71 | 40.5 |
| All Vehicles | | 839 | 0.0 | 839 | 0.0 | 0.685 | 4.5 | NA | 1.1 | 7.4 | 0.19 | 0.50 | 0.31 | 44.5 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## MOVEMENT SUMMARY

Site: 101 [Goulds / Selwyn - 2028 PM (Site Folder: Dunns X-ing / Gould / Selwyn)]

Network: N101 [Dunns / Goulds / Selwyn - 2028 PM (Network Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | DEMAND FLOWS [ Total veh/h | HV ] % | ARRIVAL FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | AVERAGE BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Goulds Road | | | | | | | | | | | | | | |
| 1 | L2 | 1 | 0.0 | 1 | 0.0 | 0.088 | 9.1 | LOS A | 0.1 | 0.9 | 0.48 | 0.98 | 0.48 | 61.4 |
| 2 | T1 | 51 | 0.0 | 51 | 0.0 | 0.088 | 11.3 | LOS B | 0.1 | 0.9 | 0.48 | 0.98 | 0.48 | 54.8 |
| 3 | R2 | 6 | 0.0 | 6 | 0.0 | 0.088 | 15.0 | LOS B | 0.1 | 0.9 | 0.48 | 0.98 | 0.48 | 60.9 |
| Approach | | 58 | 0.0 | 58 | 0.0 | 0.088 | 11.7 | LOS B | 0.1 | 0.9 | 0.48 | 0.98 | 0.48 | 56.1 |
| East: Selwyn Road | | | | | | | | | | | | | | |
| 4 | L2 | 7 | 0.0 | 7 | 0.0 | 0.190 | 7.5 | LOS A | 0.4 | 2.8 | 0.30 | 0.47 | 0.30 | 66.3 |
| 5 | T1 | 76 | 0.0 | 76 | 0.0 | 0.190 | 0.6 | LOS A | 0.4 | 2.8 | 0.30 | 0.47 | 0.30 | 70.4 |
| 6 | R2 | 226 | 0.0 | 226 | 0.0 | 0.190 | 7.2 | LOS A | 0.4 | 2.8 | 0.30 | 0.47 | 0.30 | 63.1 |
| Approach | | 309 | 0.0 | 309 | 0.0 | 0.190 | 5.6 | NA | 0.4 | 2.8 | 0.30 | 0.47 | 0.30 | 65.8 |
| North: Goulds Road | | | | | | | | | | | | | | |
| 7 | L2 | 248 | 0.0 | 248 | 0.0 | 0.500 | 5.9 | LOS A | 1.4 | 10.0 | 0.33 | 0.98 | 0.43 | 54.7 |
| 8 | T1 | 87 | 0.0 | 87 | 0.0 | 0.500 | 9.2 | LOS A | 1.4 | 10.0 | 0.33 | 0.98 | 0.43 | 54.3 |
| 9 | R2 | 111 | 0.0 | 111 | 0.0 | 0.500 | 10.5 | LOS B | 1.4 | 10.0 | 0.33 | 0.98 | 0.43 | 54.1 |
| Approach | | 446 | 0.0 | 446 | 0.0 | 0.500 | 7.7 | LOS A | 1.4 | 10.0 | 0.33 | 0.98 | 0.43 | 54.5 |
| West: Selwyn Road | | | | | | | | | | | | | | |
| 10 | L2 | 73 | 0.0 | 73 | 0.0 | 0.088 | 6.9 | LOS A | 0.0 | 0.0 | 0.00 | 0.29 | 0.00 | 70.6 |
| 11 | T1 | 94 | 0.0 | 94 | 0.0 | 0.088 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.29 | 0.00 | 74.9 |
| 12 | R2 | 1 | 0.0 | 1 | 0.0 | 0.088 | 6.9 | LOS A | 0.0 | 0.0 | 0.00 | 0.29 | 0.00 | 69.7 |
| Approach | | 167 | 0.0 | 167 | 0.0 | 0.088 | 3.1 | NA | 0.0 | 0.0 | 0.00 | 0.29 | 0.00 | 73.6 |
| All Vehicles | | 981 | 0.0 | 981 | 0.0 | 0.500 | 6.5 | NA | 1.4 | 10.0 | 0.27 | 0.70 | 0.32 | 61.7 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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# Appendix E

# Landscape and Urban Design Assessment

# ROLLESTON WEST PLAN CHANGE

## FOR ROLLESTON WEST RESIDENTIAL LIMITED

**16 NOVEMBER 2020**

**PROJECT. 2020_129**

**REVISION C**

# ROLLESTON WEST PLAN CHANGE - URBAN DESIGN STATEMENT

| | |
|---|---|
| Project no: | 2020_129 |
| Document title: | 2020_129 Rolleston West Plan Change_Urban Design Statement_C |
| Revision: | C |
| Date: | 16 November 2020 |
| Client name: | Rolleston West Residential Limited |

Author: David Compton-Moen / Peter McAuley

DOCUMENT HISTORY AND STATUS

| REVISION | DATE | DESCRIPTION | BY | REVIEW | APPROVED |
|---|---|---|---|---|---|
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**DCM URBAN DESIGN LIMITED**

Level 3, 329 Durham Street North
Christchurch 8013

**INOVO PROJECTS LIMITED**

122 Montreal Street
PO Box 7069 Sydenham
Christchurch 8023

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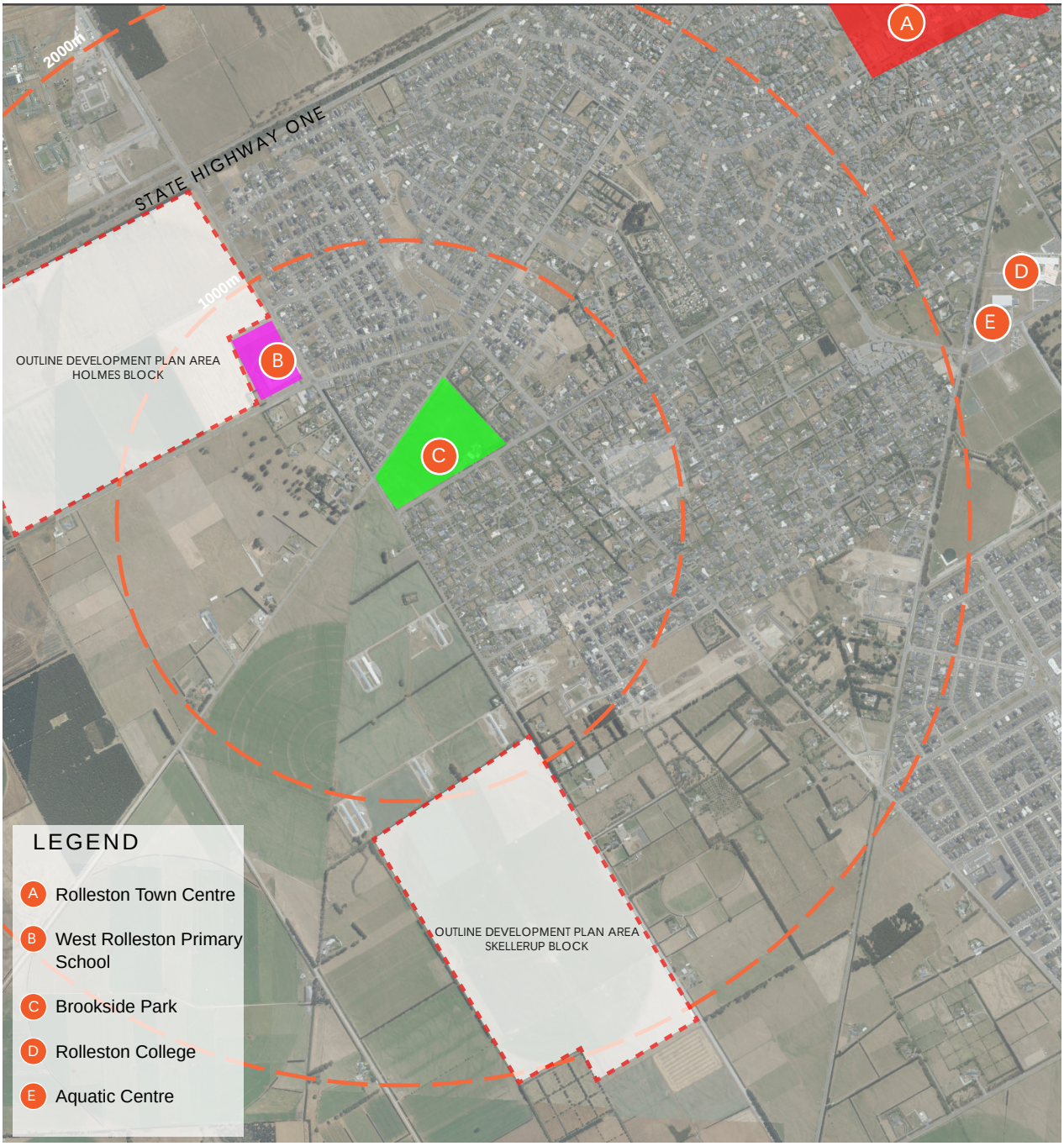
# INTRODUCTION

DCM Urban and Inovo Projects Limited have been commissioned by Rolleston West Residential Limited to prepare an Urban Design Statement and Outline Development Plan (ODP) for approximately 160Ha area, in two blocks, on the western edge of the existing settlement. Input into this plan and statement has also been provided by:

- Novo Group Limited - Planning and Traffic




LOCATION MAP (nts)

# LOCATION AND CONTEXT

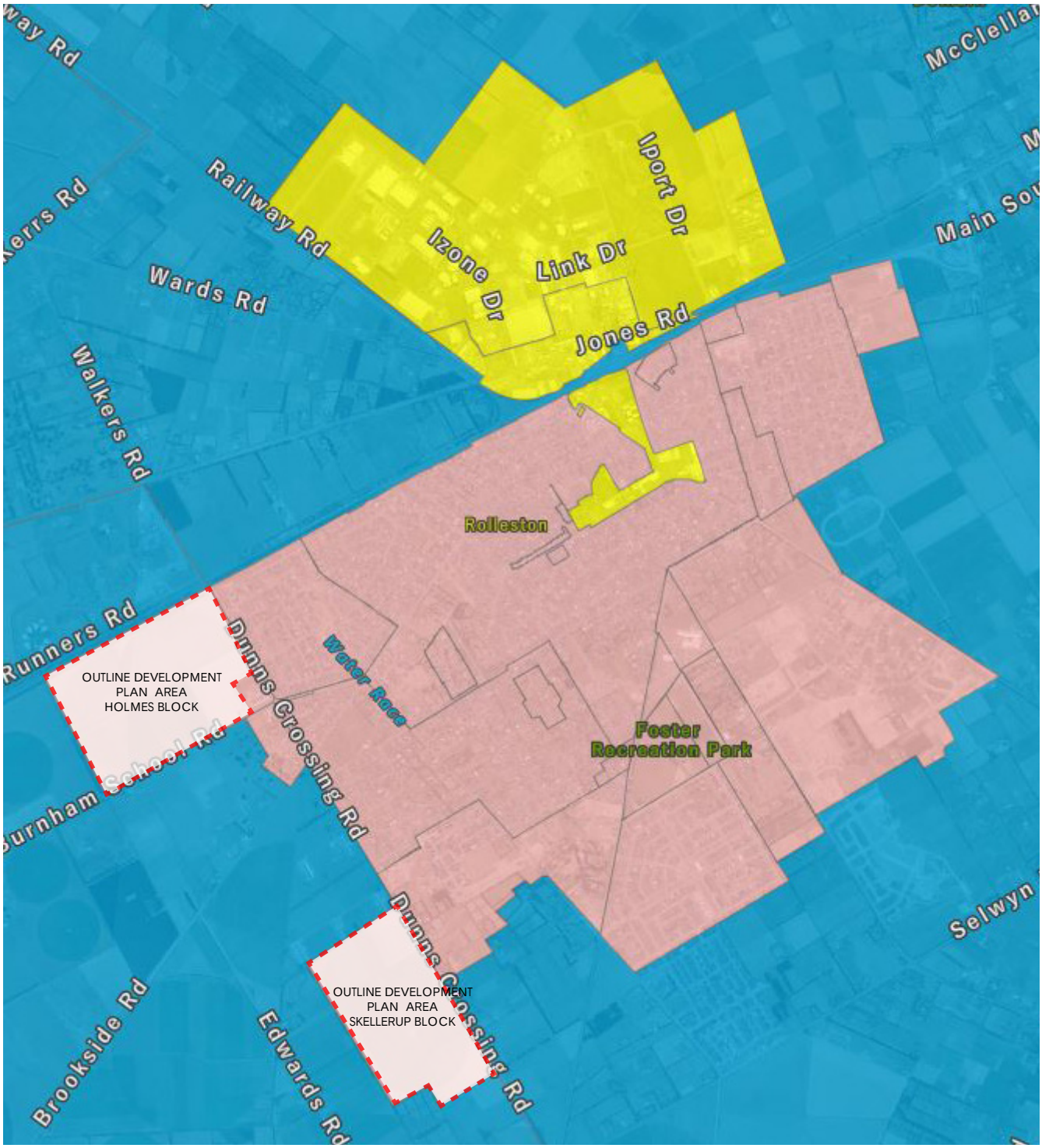
Located on the western edge of Rolleston, the two ODP blocks of Holmes and Skellerup are 2.2km and 2.9km respectively from the town centre. There are several residential developments on the eastern side of Dunns Crossing Road, including Stonebrook, Kajens Country, The Boulevard as well as a recent proposal to rezone the southwestern corner of Farringdon from Rural to Living Z. Adjacent to the Holmes Block, dwellings are of typical suburban bulk and location, while those adjacent to the Skellerup Block have typical rural residential character. These are separated by large fields and exotic vegetation, have an irregular bulk and location, and are often supported by additional infrastructure such as sheds and storage buildings.

Overall, the receiving environment has a rural, semi-open character on the outskirts of residential suburban development. The existing environment has various structures including dwellings, auxiliary structures, power lines and exotic vegetation clustered throughout the landscape typical of rural landscapes.

There are no natural features of site on either block, being relatively flat paddocks with limited vegetation of note. The existing Holmes Block is bound by Dunns Crossing Road to the east and Burnham School Road to the south, while existing Skellerup Block is bound by Dunns Crossing Road to the east and centrally located between Brookside Road to the north and Selwyn Road to the south. To the east of both sites lies the western edge of Rolleston Township where expansion with a typical suburban character increases the number of dwellings, hard surfaces, and infrastructure present in the landscape.

Vegetation types in the receiving environment are predominantly exotic species, with small amounts of native species located near some waterways and paddock boundaries. Vegetation is used predominantly for shelter belts running along the paddock boundaries and includes species such as Pinus radiata, Cupressus macrocarpa, and Eucalyptus varying in height between 7 – 15m. The shelter belts are orientated to block the prevailing winds and are primarily located to delineate property boundaries, around existing dwellings and along parts of the roads. The majority of the site is open grass fields, which is disrupted occasionally by clusters of vegetation, water races, and infrastructure such as sheds and residential dwellings.

The image on the following page was sourced from the Operative Selwyn District Plan, highlighting the current residential and commerical zones in Rolleston. The underlying zone of the two ODP areas is Living 3.




CURRENT RESIDENTIAL & COMMERCIAL ZONES MAP
(source: eplan.selwyn.govt.nz)

# OUTLINE DEVELOPMENT PLAN (ODP) - HOLMES

## LEGEND

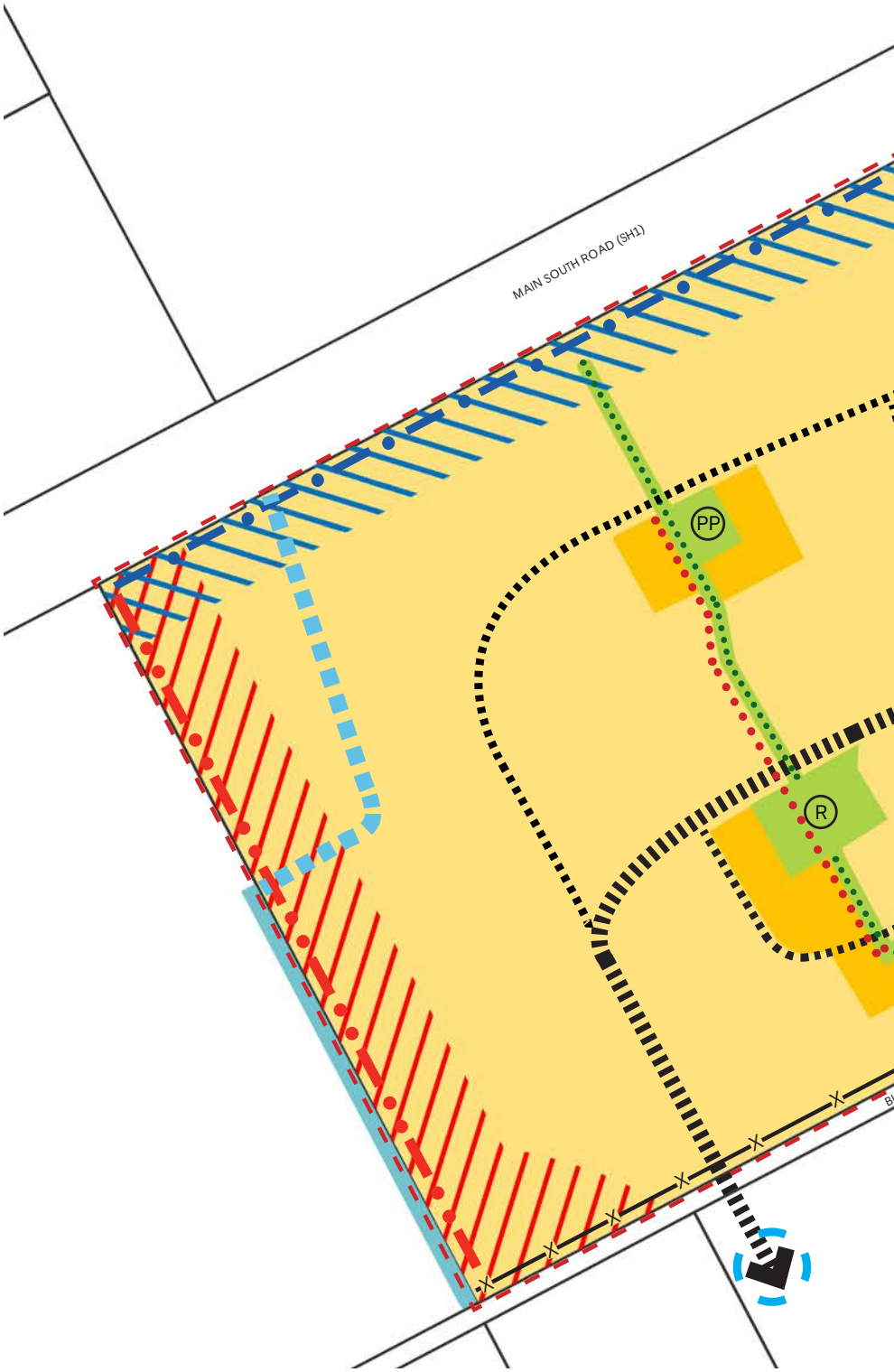
- Plan Change Boundary

**Living Z**

- General Residential Density (Minimum 12 Households/Ha
- Medium Residential Density (Minimum 15 Households/Ha)

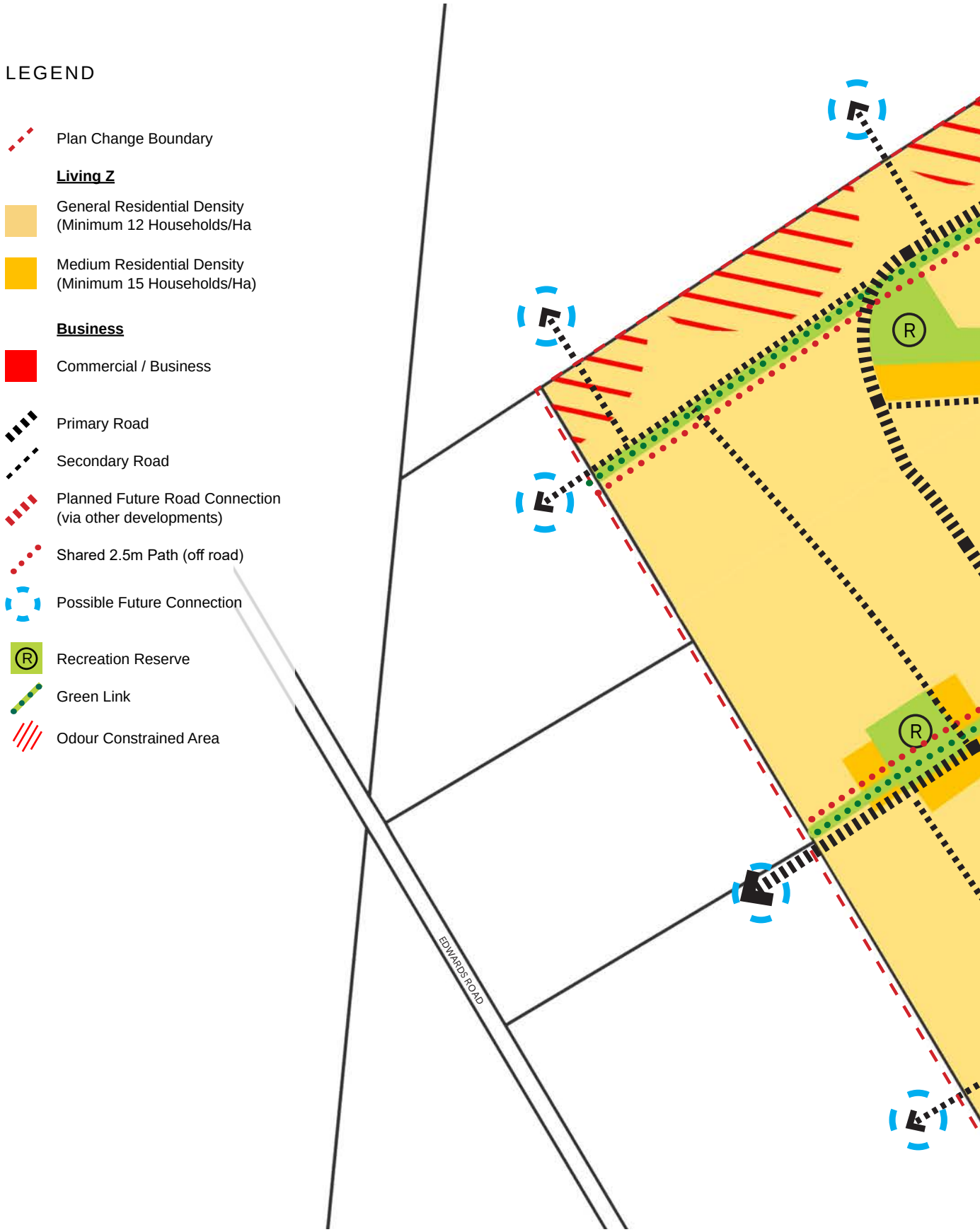
**Business**

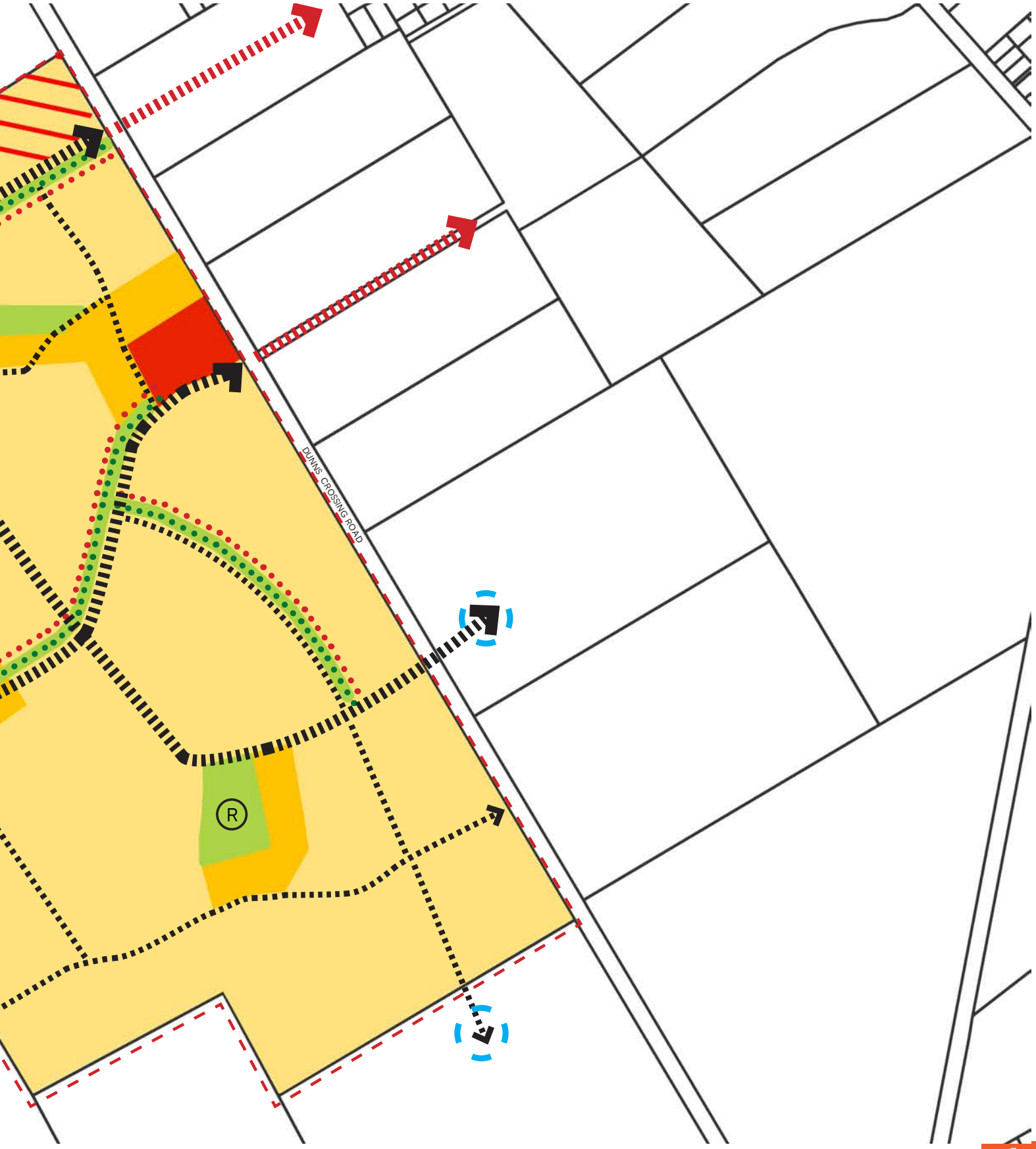
- Commercial / Business
- Primary Road
- Secondary Road
- 2.5m Shared Path (off road)
- Possible Future Connection
- Potential Intersection Upgrade
- Recreation Reserve
- Pocket Park
- Green Link
- Water Race
- Water Race Realigned
- Avoid access onto Burnham School Road from site
- Odour Constrained Area
- Bunding and Dense Planting
- 40m Noise Abatement Setback
- Acoustic Bund or Fencing



NEWMAN ROAD
DUNNS CROSSING ROAD
GRANITE DRIVE
WEST ROLLESTON
PRIMARY SCHOOL
URNHAM SCHOOL ROAD

# OUTLINE DEVELOPMENT PLAN (ODP) - SKELLERUP




DUNNS CROSSING ROAD
R

# LANDUSE AND DENSITY

(CONTEXT, CHARACTER, CHOICE)

The ODP area is designed to achieve a minimum net density of 12 households per hectare with higher density residential units located within Medium density (15hh/Ha) areas adjacent to key open spaces and green corridors. Two residential densities are proposed within the ODP being Medium Density Small Lot and General Residential. The aim is to create diversity and variety of housing typology without compromising lifestyle. The provision of smaller residential lot sizes are recognised as an important method to reduce sale prices and meet the demands of a greater proportion of the community, particularly first home buyers seeking a warm, energy efficient home that meets modern lifestyle needs. The density provides for a mix of dwelling types and lot sizes to cater to a wide range of the residential market. It allows for people of different ages and incomes to mix and create a diverse community, as well as for people to move within the development as their needs change.

| LANDUSE | MINIMUM INDIVIDUAL LOT SIZE | AVERAGE LOT SIZE |
|---|---|---|
| Living Z - Low Density | 500m$^2$ | 600m$^2$ (minimum) |
| Living Z - Medium Density (small lot) | 400m$^2$ | 500m$^2$ (maximum) |

The ODP adopts two zone types from the District Plan, being: Living Z, and Business. The Living Z zone is a natural extension of the existing Stonebrook and Farringdon developments. Small commercial areas, or neighbourhood shops, are proposed in each block on key intersections with the proposed primary road. These developments will be designed to serve the new community with day to day products, with likely tenants being a dairy, takeaways and a café.

KEY ASPECTS

- Diversity of house size and lot size to provide choice
- Provision of higher density with higher amenity areas
- Small commerical areas providing day to day amenities

LEGEND

Study Boundary

LIVING Z
General Residential Density (Minimum 12 Households/Ha)

Medium Residential Density (Minimum 15 Households/Ha)

BUSINESS
Commercial / Business

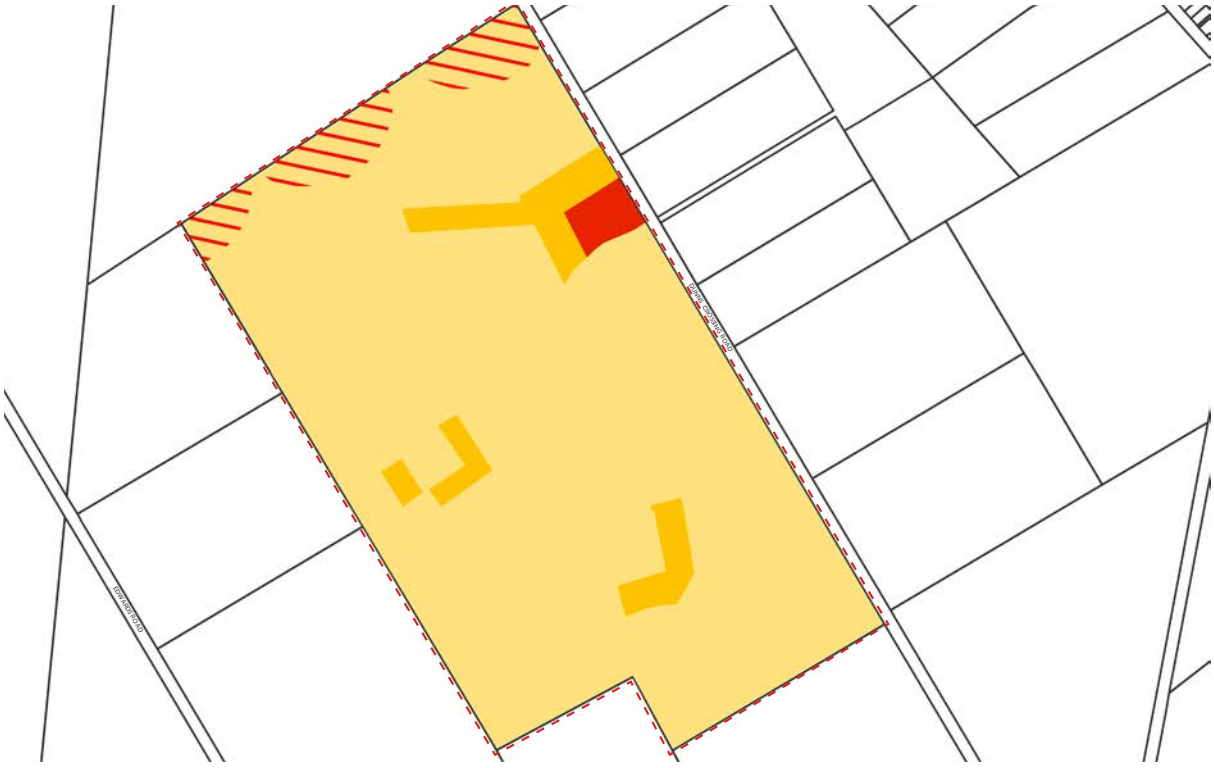
Odour Constrained Area

Bunding and Dense Planting

40m Noise Abatement Setback

Acoustic Bund or Fencing

HOLMES BLOCK (nts)




SKELLERUP BLOCK (nts)

## LANDUSE AND DENSITY MAPS (nts)

# MOVEMENT AND CONNECTIVITY

(CHOICE, CONNECTIONS, CUSTODIANSHIP AND COLLABORATION)

Walkability and connectivity are key principles of the ODP with a hierarchy of street types and connections provided throughout the area. The aim of the movement network is to provide a range of modal options for residents, to reduce car-dependancy for short local trips while recognising private vehicle use is necessary for longer trips. The ODP encourages connectivity using primary and secondary routes running through the area from west to east, with primary connections from Dunns Crossing Road to adjoining major roads . The routes will connect through to existing roads where possible in Stonebrook and any future subdivisions to the east of the Skellerup Block. The primary road route will include a 2.5m wide minimum shared path separate from the main carriageway, and is likely to function as a collector road. The development of housing in this location would be developed to minimise interruption to pedestrian/cycle/vehicle movements by encouraging the use of consolidated vehicle crossings or laneways depending on the adjoining typology. Both primary and secondary routes will provide pedestrian and cycle facilities on both sides of the road, street trees and parking.

Smaller tertiary streets (not shown) or local/neighbourhood streets will ideally run north-south to create a highly connected and permeable neighbourhood. These roads are not shown to allow future design flexibility at the final subdivision stage. The design of the local streets will encourage slow vehicle movements combined with pedestrian and cycle facilities, either separate or shared depending on the design of the street. The layout of the blocks will have a predominantly north-south orientation where possible to maximise solar gain into rear yards (outdoor living spaces) of all properties.

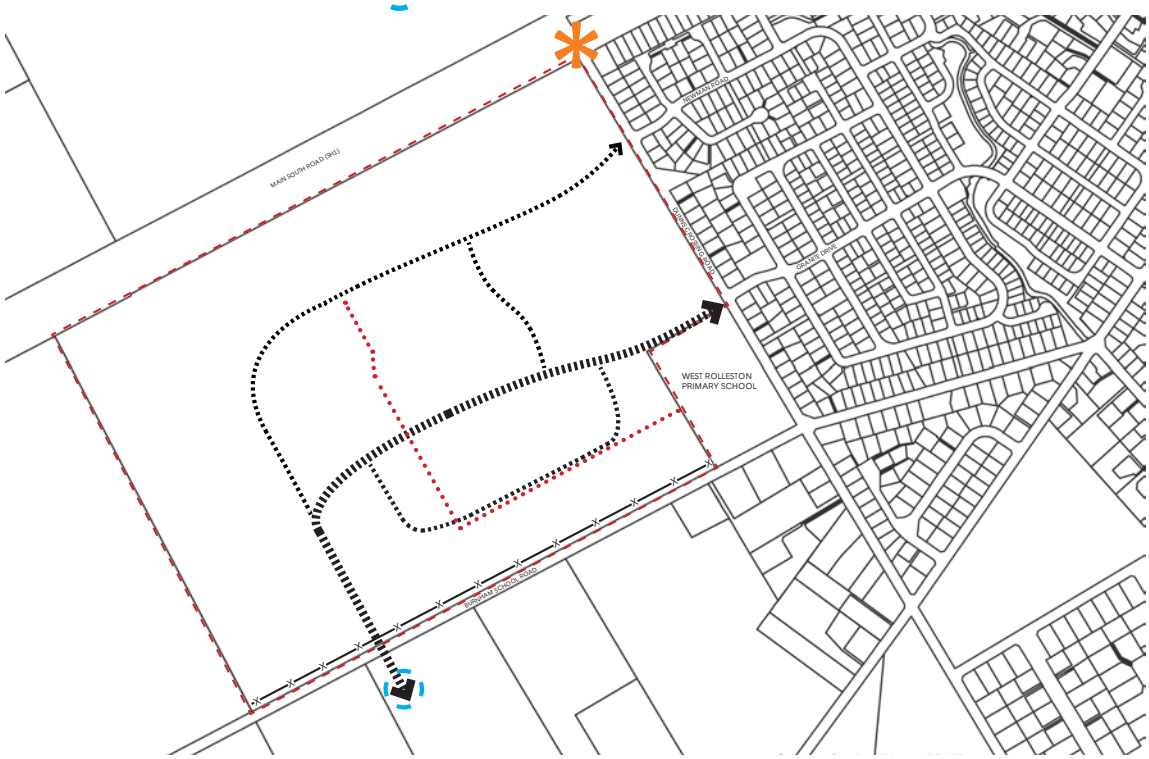
Supporting the road network, off road pedestrian and cycle paths connect through to existing networks.

KEY ASPECTS

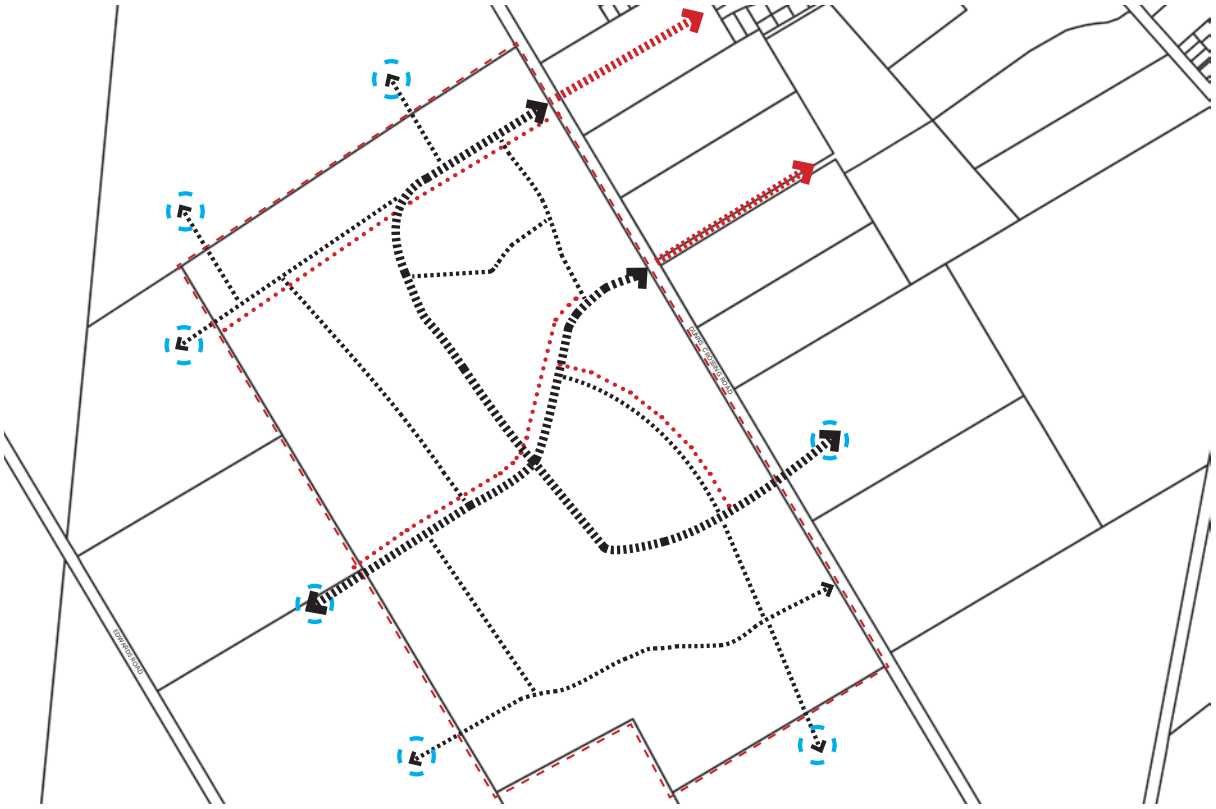
- Street heirarchy providing different modal allocation
- Possible future connections with adjoining properties
- A well-connected network which combines with the green network and existing facilities connecting to key destinations (school, parks, childcare, town centre)
- A high level of legibility created through street heirarchy
- Prioritising walking and cycling with a mix of on-road, separate, and off-road facilities to promote active transport modes
- Direct access onto Burham School Road for individual properties should be avoided
- Streets with a high level of amenity

LEGEND

- Study Boundary
- Primary Road
- Planned Future Road Connection (via other developments)
- Secondary Road
- 2.5m Shared Path (off road)
- Possible Future Connection
- Avoid direct access onto Burham School Road from individual properties
- Potential Intersection Upgrade




HOLMES BLOCK (nts)




SKELLERUP BLOCK (nts)

## MOVEMENT AND CONNECTIVITY MAPS (nts)

# BLUE AND GREEN / OPEN SPACE NETWORK

(Choice, Connections, Custodianship and Collaboration)
The Green network proposes several local reserves and pocket parks to provide amenity to a large number of future residents, linked by a green network. The network also combines with the movement network to provide shared off-road facilities connecting through to West Rolleston Primary School and other amenities.

The ODP proposes five additional Neighbourhood reserves within the project boundaries to provide amenity for residents, the majority of residents being within a 5minute walk, or 500m radius of the spaces. It is likely the sizes of the reserves will range between 3,000m$^2$ and 6,000m$^2$ with the exact size and position of these reserves being determined at the time of subdivision. These reserves will be 'tied' to the location of higher density developments, providing amenity for residents on smaller sections.

Linking future residents of the Holmes Block to the existing West Rolleston Primary School, green links 5-10m wide are proposed. It is not anticipated that a Sport and Recreation Park (2.5Ha or more) is required within the study area, given the site's close proximity to Brookside Reserve and Foster Park.

The blue network, consisting of one water race, is proposed to be diverted and realigned to the western boundary of the Holmes Block site.

KEY ASPECTS

- Integrating green and movement networks to create a high level of connectivity, amenity and active travel options
- Provides sufficient open space for future residents at regular intervals
- Provides a significant link to West Rolleston Primary School

LEGEND

Study Boundary

Green Link

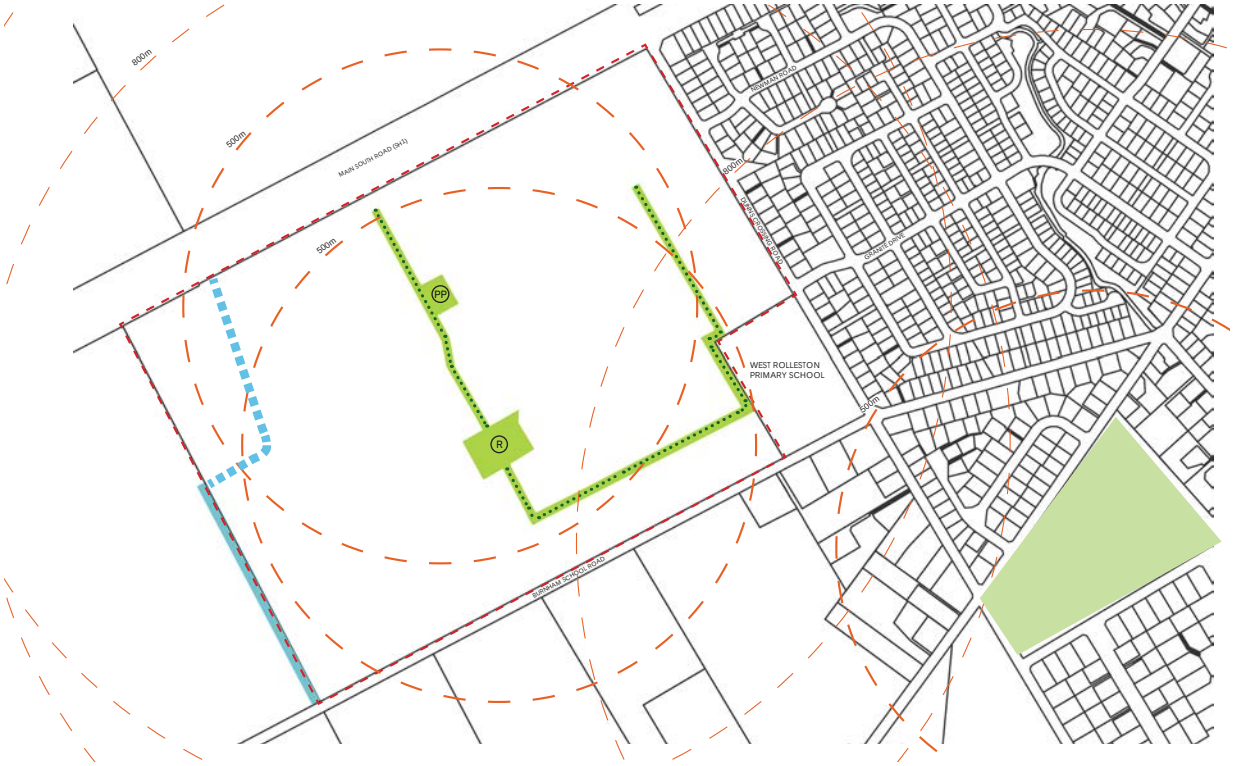
500m and 800m Walkable Catchment

Water Race Realigned

Recreation Reserve

Existing Green Space

Water Race




HOLMES BLOCK (nts)

SKELLERUP BLOCK (nts)

## BLUE AND GREEN / OPEN SPACE MAP (nts)

# SUMMARY AND CONCLUSIONS

The proposed Rolleston West Plan Change blocks are a natural extension of existing residential development occuring to the west of Stonebrook and Farringdon in Rolleston. Covering an area of approximately 160Ha, the ODPs will provide a mix of house and lot sizes in a location which is well served by existing and future amenities. A strong green and movement network provides a base for the development, recognising the residential character of the receiving environment.

The ODP's will:

- Provide a diversity of house size and lot size to provide choice
- Locate higher density with higher amenity areas
- Create a street heirarchy providing different modal allocation
- Continue a well-connected network which combines with the green network and existing facilities connecting to key destinations (school, parks, childcare, town centre)
- Create a high level of legibility created through street heirarchy
- Prioritise walking and cycling with a mix of on-road, separate, and off-road facilities to promote active transport modes
- Avoid direct access onto Burham School Road for individual properties
- Create streets with a high level of amenity
- Provide a quantity of greenspace and facilities appropriate for the future population
- Integrate the green and movement networks to create a high level of connectivity, amenity and active travel options
- Encourage the use of low impact design techniques including grass swales and soakage pits

## URBAN DESIGN PRINCPLES

The design principles that underpin these ODP's are in line with the Ministry for the Environment's design guide for urban New Zealand "People Places Spaces" which is endorsed by the 'New Zealand Urban Design Protocol'.

| PRINCIPLE | PURPOSE |
|---|---|
| Consolidation and dispersal | Density and Landuse - To promote higher-intensity development around existing or new nodes and lower density on the periphery. This allows local communities, businesses and public transport to be strengthened and resource efficiencies achieved, while reducing environmental impacts on peripheral areas. |
| Integration and connectivity | Movement Networks – To promote development that is integrated and connected with its surrounding environment and community. This facilitates ease of access, economy of movement and improved social interaction. |
| Diversity and adaptability | Variation in typology and lot size - To promote choice through the provision of a diverse mix of compatible activities and uses, so built environments can adapt over time. This facilitates the ability to respond efficiently to social, technical and economic changes. |
| Legibility and identity | Strong Green Network - To promote environments that are easily understood by their users, and that display a strong local identity and appropriate visual character. This facilitates an enhanced usage, enjoyment and pride in local places. |
| Environmental responsiveness | Strong Green Network - To promote urban environments that are responsive to natural features, ecosystems, reduced energy usage and waste production. |

# ROLLESTON WEST PLAN CHANGE, ROLLESTON

ROLLESTON WEST RESIDENTIAL LIMITED

Landscape and Visual Impact Assessment

Project No. 2020_129 | C

# ROLLESTON WEST PLAN CHANGE LVIA

| | |
|---|---|
| Project no: | 2020_129 |
| Document title: | Landscape and Visual Impact Assessment |
| Revision: | C |
| Date: | 16 November 2020 |
| Client name: | Rolleston West Residential Limited |
| Author: | Dave Compton-Moen |
| File name: | \\GOOSE\Storage\4_DCM - Projects\2020_129 Carters Rolleston West Plan Change\3_Working Files\5_Word\2020_129 Carter Rolleston West Plan Change_LVIA.docx |

## DOCUMENT HISTORY AND STATUS

| REVISION | DATE | DESCRIPTION | BY | REVIEW | APPROVED |
|---|---|---|---|---|---|
| A | 09/11/2020 | LVIA | SB/DCM | DCM | |
| B | 12/11/2020 | LVIA | SB/DCM | DCM | |
| C | 16/11/2020 | MINOR AMENDMENT | SB | DCM | |


## DCM URBAN DESIGN LIMITED

Level 3, 329 Durham Street North

Christchurch 8013



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# 1. INTRODUCTION AND PROPOSAL

DCM urban has been commissioned by Rolleston West Residential Limited to prepare a Landscape and Visual Impact Assessment for a proposed Plan Change to provide a greater area of residential development in Rolleston West. The proposal seeks to create two new zones as an extension of the existing settlement of Rolleston. The areas, covering a total approximate area of 160ha in two blocks, are currently zoned Living 3 under the Selwyn District Plan. The proposal seeks to establish an Outline Development Plan (ODP) for each of the two areas and include both Living Z and Business 1 Zones, allowing for approximately 2,100 new households. The ODP's are shown on page 3 and 4 of the attached figures.

# 2. METHODOLOGY

## 2.1 INTRODUCTION

The landscape and visual impact assessment considers the likely effects of the proposal in a holistic sense. There are three components to the assessment:

1. Identification of the receiving environment and a description of the existing landscape character, including natural character;
2. The landscape assessment is an assessment of the proposal against the existing landscape values;
3. The visual impact assessment is primarily concerned with the effects of the proposal on visual amenity and people, evaluated against the character and quality of the existing visual catchment.

The methodology is based on the Landscape Assessment and Sustainable Management 10.1, (NZILA Education Foundation), dated 2.11.2010 and Visual Assessment Best Practice Methodologies (Lisa Rimmer) dated 4.11.2007.

## 2.2 LANDSCAPE DESCRIPTION AND CHARACTERISATION

Landscape attributes fall into 3 broad categories: biophysical features, patterns and processes; sensory qualities; and spiritual, cultural and social associations, including both activities and meanings.

- Biophysical features, patterns and processes may be natural and/or cultural in origin and range from the geology and landform that shape a landscape to the physical artefacts such as roads that mark human settlement and livelihood.
- Sensory qualities are landscape phenomena as directly perceived and experienced by humans, such as the view of a scenic landscape, or the distinctive smell and sound of the foreshore.
- Associated meanings are spiritual, cultural or social associations with particular landscape elements, features, or areas, such as tupuna awa and waahi tapu, and the tikanga appropriate to them, or sites of historic events or heritage. Associative activities are patterns of social activity that occur in particular parts of a landscape, for example, popular walking routes or fishing spots. Associative meanings and activities engender a sense of attachment and belonging.

Describing the landscape character is a process of interpreting the composite and cumulative character of a landscape, i.e. how attributes come together to create a landscape that can be distinguished from other landscapes. International best practice in characterisation has two dimensions of classification: the identification of distinctive types of landscape based on their distinctive patterns of natural and cultural features, processes and influences; and their geographical delineation. The characterisation of a landscape is not to rank or rate a landscape, as all landscapes have character, but determine what landscape attributes combine to give an area its identity, and importantly to determine an area's sensitivity, resilience or capacity for change.

**Table 1: Continuum of Natural Character**



| Natural | Near-natural | Semi-natural (including pastoral agriculture and exotic forests) | Agricultural (arable and intensive cropping) | Near-cultural | Cultural |
|---|---|---|---|---|---|
| Very high-pristine | High | Moderate High | Moderate / Moderate-low | Low | Very Low-nil |

## 2.3 LANDSCAPE VALUES

Following the descriptive phase of landscape assessment, an evaluative phase is undertaken whereby values or significance is ascribed to the landscape.

Where Planning Documents have identified Outstanding Natural Features or Landscapes, the objectives, policies, and rules contained within the plan are used as the basis for landscape significance or value, and it is these values which the proposal is assessed against. Where there is some uncertainty of the landscape value, such as when the District Plan has a broad description of an Outstanding Natural Landscape (ONL), but it is not site specific, or the site neighbours an ONL, it is often necessary to complete an assessment against the values of the District Plan for completeness sake. Most district plans have policies or objectives which are relevant to Landscape and Natural Character if proposed in a rural or sensitive environment.

An accepted approach, where the landscape value of the site is not identified in the District Plan under Section 6(b) of the RMA, is to use criteria identified in Wakatipu Environmental Society Inc. & Ors v QLDC [2000] NZRMA 59 (generally referred to as the Amended Pigeon Bay criteria). The assessment criteria have been grouped into 3 broad categories or 'landscape attributes' which are to be considered:

1. Biophysical elements, patterns and processes;
2. Associative meaning and values including spiritual, cultural or social associations; and
3. Sensory or perceptual qualities.

## 2.4 VISUAL ASSESSMENT METHODOLOGY

In response to section 7(c) of the RMA, an evaluation is undertaken to define and describe visual amenity values. As with aesthetic values, with which amenity values share considerable overlap, this evaluation was

professionally based using current and accepted good practice. Amenity values are defined in the Act as *"those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes."* The visual assessment looks at the sensitivity of receptors to changes in their visual amenity through the analysis of selected representative viewpoints and wider visibility analysis. It identifies the potential sources for visual effect resulting from the Proposal and describes the existing character of the area in terms of openness, prominence, compatibility of the project with the existing visual context, viewing distances and the potential for obstruction of views.[1]

The visual impact assessment involves the following procedures:

- Identification of key viewpoints: A selection of key viewpoints is identified and verified for selection during the site visit. The viewpoints are considered representative of the various viewing audiences within the receiving catchment, being taken from public locations where views of the proposal were possible, some of which would be very similar to views from nearby houses. The identification of the visual catchment is prepared as a desktop study in the first instance using Council GIS for aerials and contours. This information is then ground-truthed on site to determine the key viewpoints and potential audience. Depending on the complexity of the project a 'viewshed' may be prepared which highlights the 'Theoretical Zone of Visual Influence' (TZVI) from where a proposal will theoretically be visible from. It is theoretical as the mapping does not take into account existing structures or vegetation so is conservative in its results (given the scale and form of the proposal, the creation of a TZVI was not considered necessary).
- Assessment of the degree of sensitivity of receptors to changes in visual amenity resulting from the proposal: Factors affecting the sensitivity of receptors for evaluation of visual effects include the value and quality of existing views, the type of receiver, duration or frequency of view, distance from the proposal and the degree of visibility. For example, those who view the change from their homes may be considered highly sensitive. The attractiveness or otherwise of the outlook from their home will have a significant effect on their perception of the quality and acceptability of their home environment and their general quality of life. Those who view the change from their workplace may be considered to be only moderately sensitive as the attractiveness or otherwise of the outlook will have a less important, although still material, effect on their perception of their quality of life. The degree to which this applies also depends on factors such as whether the workplace is industrial, retail or commercial. Those who view the change whilst taking part in an outdoor leisure activity may display varying sensitivity depending on the type of leisure activity and a greater sensitivity to those commuting. For example, walkers or horse riders in open country on a long-distance trip may be considered to be highly sensitive to change while other walkers may not be so focused on the surrounding landscape. Those who view the change whilst travelling on a public thoroughfare will also display varying sensitivity depending on the speed and direction of travel and whether the view is continuous or occasionally glimpsed.
- Identification of potential mitigation measures: These may take the form of revisions/refinements to the engineering and architectural design to minimise potential effects, and/or the implementation of landscape design measures (e.g. screen tree planting, colour design of hard landscape features etc.) to alleviate adverse urban design or visual effects and generate potentially beneficial long-term effects.

[1] Reference: NZILA Education Foundation - Best Practice Guide – Landscape Assessment and Sustainable Management/ Best Practice Guide – Visual Simulations (2.11.2010)

- Prediction and identification of the effects during operation without mitigation and the residual effects after the implementation of the mitigation measures.

## 2.5 EFFECTS METHODOLOGY

Analysis of the existing landscape and visual environment is focused upon understanding the functioning of how an environment is likely to respond to external change (the proposal). The assessment assesses the resilience of the existing character, values or views and determines their capacity to absorb change. The proposal is assessed in its 'unmitigated' form and then in its mitigated form to determine the likely residual effects. The analysis identifies opportunities, risks, threats, costs and benefits arising from the potential change.

Assessing the magnitude of change (from the proposal) is based on the NZILA Best Practice Guide – Landscape Assessment and Sustainable Management (02.11.10) with a seven-point scale, being:

EXTREME / VERY HIGH / HIGH / MODERATE / LOW / VERY LOW / NEGLIGIBLE

In determining the extent of adverse effects. taking into account the sensitivity of the landscape or receptor combined with the Magnitude of Change proposed, the level of effects is along a continuum to ensure that each effect has been considered consistently and in turn cumulatively. This continuum may include the following effects (based on the descriptions provided on the Quality Planning website):

- **Indiscernible Effects** No effects at all or are too small to register.
- **Less than Minor Adverse Effects** Adverse effects that are discernible day-to-day effects, but too small to adversely affect other persons.
- **Minor Adverse Effects** Adverse effects that are noticeable but will not cause any significant adverse impacts.
- **More than Minor Adverse Effects** Adverse effects that are noticeable that may cause an adverse impact but could be potentially mitigated or remedied.
- **Significant Adverse Effects that could be remedied or mitigated** An effect that is noticeable and will have a serious adverse impact on the environment but could potentially be mitigated or remedied.
- **Unacceptable Adverse Effects** Extensive adverse effects that cannot be avoided, remedied or mitigated.

The following table assists with providing consistency between NZILA and RMA terms to determine where effects lie.

| NZILA Rating | Extreme | Very High | High | Moderate | | | Low | Very Low | Negligible |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Moderate-High | Moderate | Moderate-Low | | | |
| RMA Effects Equivalent | Unacceptable | Significant | | More than Minor | | Minor | Less than Minor | | Indiscernible |

The NZILA rating of 'Moderate' has been divided into 3-levels as a 'Moderate' magnitude of change to always result in either 'More than Minor' or 'Minor' effects but maybe one or the other depending on site conditions, context, sensitivity or receiving character and its degree of change. Identification of potential

mitigation or offsetting measures: These may take the form of revisions/refinements to the engineering and architectural design to minimise potential effects, and/or the implementation of landscape design measures (e.g. screen tree planting, colour design of hard landscape features etc.) to alleviate adverse urban design or visual effects and/or generate potentially beneficial long-term effects.

Prediction and assessment identification of the residual adverse effects after the implementation of the mitigation measures. Residual effects are considered to be five years after the implementation of the proposed mitigation measures, allowing for planting to get established but not to a mature level.

## 2.6 PHOTOGRAPHY METHODOLOGY

All photos are taken using a SONY A6000 digital camera with a focal length of 50mm. No zoom was used. In the case of stitched photos used as the viewpoint images, a series of 4 portrait photos were taken from the same position to create a panorama. The photos were stitched together automatically in Adobe Photoshop to create the panorama presented in the figures.

## 2.7 STATUTORY DOCUMENTS

Relevant statutory documents in terms of Landscape Values and Visual Amenity are referred to below are the Resource Management Act 1991, and the Selwyn District Plan.

### 2.7.1 Resource Management Act 1991

Section 6 of the RMA identifies matters of national importance:

> *"In achieving the purpose of this Act, all persons exercising functions and powers under it, it relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:*

*s.6 (a)* *The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use and development;*

*s.6 (b)* *The protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development;*

*s.6 (c)* *The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna."*

Other matters are included under Section 7:

> *"In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to-*

*(c)* *The maintenance and enhancement of amenity values."*

### 2.7.2 Selwyn District Plan

Under the Selwyn District Plan, the sites are zoned Living 3.

The Selwyn District Plan recognises Outstanding Natural Landscapes (ONL) and Visual Amenity Landscapes (VAL) but the proposal is not located in either an ONL or VAL. There are several policies in the Rural Objectives and Policies of the Selwyn District Plan which relate to Landscape Values and amenity which have been addressed in 3.3 below.

# 3. ASSESSMENT OF EFFECTS

## 3.1 EXISTING SITE CHARACTER

The receiving environment of the Lower Canterbury Plains is characterised by large open paddocks, with boundaries often delineated by well-established shelter belts of exotic species and rural dwellings surrounded by large trees. The relatively flat landforms flow from the base of the Southern Alps to the Port Hills in an assortment of agricultural fields, criss-crossed with roadways and shelterbelts. The existing northern site (Holmes Block) is bound by Dunns Crossing Road to the east and Burnham School Road to the south, while existing southern site (Skellerup Block) is bound by Dunns Crossing Road to the east. To the east of both sites lies the western edge of Rolleston Township where expansion with a typical suburban character increases the number of dwellings, hard surfaces, and infrastructure present in the landscape. The proposal is located on relatively flat topography, on sites which are typical of rural properties within the Canterbury Plains and includes shelterbelt plantings and structures associated with rural activities. Overall, the topographical attributes of the receiving environment are low with no defining features.

The existing land type of the Lower Canterbury Plains was acknowledged by Boffa Miskell in the Canterbury Regional Landscape Study Review (2010) as forming part of the L2 – Lower Plains Land Type. A landscape formed from low angle coalescing outwash fans and associated low terraces of the major rivers that slice through the plains, comprising Pleistocene glacial outwash gravels and minor inland dune belts.

Vegetation types in the receiving environment are predominantly exotic species, with small amounts of native species located near some waterways and paddock boundaries. Vegetation is used predominantly for shelter belts running along the paddock boundaries and includes species such as Pinus radiata, Cupressus macrocarpa, and Eucalyptus varying in height between 7 – 15m. The shelter belts are orientated to block the prevailing winds and are primarily located to delineate property boundaries, and along parts of the roads. The majority of the sites are open grass fields, which is disrupted occasionally by clusters of vegetation, and a water race in the Holmes Block north west corner.

Indigenous vegetation has been identified in the Canterbury Regional Landscape Study as being reduced to small, isolated, and scattered remnants because of the large-scale land use changes seen throughout the plains. This has resulted in 0.5% of the plains supporting native vegetation. This is seen in the existing vegetation patterns found on site, comprising largely of exotic species, which have been used for their ability to fulfil a role as fast growing shelterbelts. This is typical of the rural setting surrounding the site. Overall, the vegetation cover in the area has a low sensitivity to change, given the high level of fast growing introduced exotic species.

In terms of sensory qualities, the flat open geometric fields are back dropped by the Southern Alps to the west and the Port Hills to the east. Expansive views are often possible intermittently, being screened by existing development and shelterbelts. The infrastructure and shelter belts, though disrupting the continual views, have become integral to the rural aesthetic and identity. The natural characteristic of the environment is considered to

be modified, with a rural character as opposed to a natural character. The land surrounding the proposed site mirrors the overall character of the region.

In terms of built form, dwellings and farm structures are common throughout the area. The scale, character, form, and materiality of these structures vary throughout the receiving environment. There are a number of existing dwellings adjacent to the proposal along Dunns Crossing Road, including Stonebrook, Kajens Country and The Boulevard subdivisions. Adjacent to the northern site (Holmes Block) dwellings are of typical suburban bulk and location, while those adjacent to the southern site (Skellerup Block) have typical rural residential character. These are separated by large fields and exotic vegetation, have an irregular bulk and location, and are often supported by additional infrastructure such as sheds and storage buildings. Holmes Block site is approximately 1.2km to the west of Rolleston Township and less than 25m from existing medium density development. Skellerup Block is approximately 2.5km to the south east of Rolleston Township and less than 50m from existing medium density development.

Overall, the receiving environment has a rural, semi-open character on the outskirts of rural suburban development. The existing environment has various structures including dwellings, auxiliary structures, power lines and exotic vegetation clustered throughout the landscape typical of rural landscapes.

## 3.2 EFFECTS ON LANDSCAPE CHARACTER

Landscape character is the combination and composition of biophysical elements such as topography, vegetation, built form and sensory qualities perceived by humans. Landscape character is also spiritual, cultural, and social associations.

The character of the receiving environment is semi-open, rural and is used principally for agricultural purposes. The proposed development modifies the landscape from one that is semi-open and agricultural in character to one that is denser and more suburban in nature, where infrastructure and amenities are more concentrated. Aspects of rural character can and will be maintained through the mitigation of fencing types/position and landscape planting. The character of existing housing is typically single storey detached dwellings, which the proposal intends to continue, albeit at a higher density.

Natural character is highly modified, having been cleared for agricultural use. This is reflective in the lack of native vegetation present in the wider area. Existing amenity of the natural landscape is to be enhanced and retained through the planting and development of green corridors through the proposal.

Overall, the character and land use of the area will shift from open and agriculturally focused to a more concentrated, high amenity development. Through mitigation measures, open character will be retained and enhanced, where possible.

## 3.3 EFFECTS ON LANDSCAPE VALUES

**NATIONAL POLICY STATION – URBAN DEVELOPMENT**

*Policy 8: Local authority decisions affecting urban environments are responsive to plan changes that would add significantly to development capacity and contribute to well-functioning urban environments, even if the development capacity is:*

a. *unanticipated by RMA planning documents; or*

b. *out-of-sequence with planned land release.*

The proposed plan change areas are considered to naturally extend existing residential development at Rolleston. At the edge of existing residential settlement, the continuation of residential dwellings at a similar density is likely to be seen as an anticipated natural extension when compared to the broader context. While the proposed density is higher than the existing living 3 land use, the proposed plan change retains similar levels of density when compared to surrounding development in Stonebrook and Farringdon. It is considered appropriate for its setting on the edge of the township when considering the significant addition to development capacity that contributes to well-functioning urban environments. It is considered that the Plan Change areas are in-sequence developments adding to developments capacity of Rolleston, while retaining a similar level to existing surrounding development.

**SELWYN DISTRICT PLAN – TOWNSHIP VOLUME**

The proposed plan change areas are both zoned Living 3. The Selwyn District Plan has identified Outstanding Natural Landscapes and Features. The ODP is not located within a Landscape of value. The Objectives and Policies which are considered relevant to this Plan Change from a Landscape perspective follow:

***Objective B4.1.1***

*A range of living environments is provided for in townships, while maintaining the overall 'spacious' character of Living zones, except within Medium Density areas identified in an Outline Development Plan where a high quality, medium density of development is anticipated.*

The proposed plan change has given careful consideration and application of design treatment to such matters as road hierarchy, diversity of density, spatial layout, and existing and proposed green and blue networks to help the retention of the open and spacious rural character. An overall 'spacious' character is likely to be maintained even with the increased density.

***Policy B4.1.10***

*Ensure there is adequate open space in townships to mitigate adverse effects of buildings on the aesthetic and amenity values and "spacious" character.*

The Plan Change includes green corridors and pedestrian connections through the development to retain a high level of public amenity and connectivity. There are limited 'features' of note within the Plan Change areas but green links are proposed, linking public open spaces, commercial amenities and schools using off-road facilities.

***Policy B4.1.11***

*Encourage new residential areas to be designed to maintain or enhance the aesthetic values of the township, including (but not limited to):*

- *Retaining existing trees, bush, or other natural features on sites; and*
- *Landscaping public places.*

There are no natural features in either of the two plan change areas. Existing 3m strips of native vegetation along the proposal boundaries will be retained and incorporated into green networks where possible, though some juvenile vegetation may be removed to aid accessibility and open character. The green network is to be landscaped to a high level of amenity, ensuring an open character is maintained. This also allows a high level of natural surveillance over the public space.

***Policy B4.2.4***

*Encourage the retention of natural, cultural, historic, and other features within a subdivision and for allotment boundaries to follow natural or physical features, where it maintains the amenity of an area.*

There are no natural, cultural or historic features of note within the Plan Change areas.

***Policy B4.2.10***

*Ensure that new residential blocks are small in scale, easily navigable and convenient to public transport services and community infrastructure such as schools, shops, sports fields and medical facilities, particularly for pedestrians and cyclists.*

The proposed plan change, though not displaying local roading, promotes the ability for residential blocks to have a north – south aspect and varying between 800 – 1200m. This provides block lengths that are small in scale to allow for walkability and easy navigation without overly relying on roading. The use of green networks throughout the sites also encourage a high degree of connectivity and permeability within and in/out of the proposal, with focus around connectivity to Rolleston West Primary School and Brookside Park. Off-road shared paths further encourage alternative modes of transport such as cycling and walking. Proposed community infrastructure has been centralised around open space networks and key nodes within the development, while existing community infrastructure and green open spaces are located within 1.5km of the proposals.

***Policy B4.2.12***

*Ensure that subdivision designs encourage strong, positive connections between allotments and the street and other features, whilst avoiding rear allotments where practical.*

Possible future connections to surrounding developments are included in the proposed plan change, helping to foster positive connections to existing development. Higher density units open onto high amenity spaces building on the positive relationships associated with these land uses. Allotments along Burnham School Road avoid access onto the road by facing internally providing for a stronger relationship to internal streets.

***Policy B4.3.2***

*In areas outside the Greater Christchurch area, require any land rezoned for new residential or business development to adjoin, along at least one boundary, an existing Living or Business zone in a township, except that low density living environments need not adjoin a boundary provided they are located in a manner that achieves a compact township shape.*

Both sites are zoned for residential purposes.

***Policy B4.3.3***

*Avoid zoning patterns that leave land zoned Rural surrounded on three or more boundaries with land zoned Living or Business.*

The proposed plan change adjoins existing Living Zones to the east. The proposal does not leave rural zoned land with three or more boundaries against living or business zones.

## 3.4 EFFECTS ON VISUAL AMENITY

The visual context of the receiving environment is considered to be a 1km offset from the edge of the proposed development. This distance has been used due to the receiving environment's flat topography, resulting in views from further away either not being possible or being indiscernible at distance. A series of key viewpoints were selected to show a representative sample of the likely visual effects which could result from the proposal (refer to Appendix 1 for the relevant photos). Viewpoints are generally located on public land, and where possible located as close as possible to existing or proposed residential dwellings. In assessing the potential effect of a proposal, the quality and openness of the view is considered These were as follows:

1) View south west from 406 Dunns Crossing Road
2) View north west from 344 Dunns Crossing Road
3) View north west from 75 Burnham School Road
4) View north east from 65 Burnham School Road
5) View south west from 203 Dunns Crossing Road
6) View north west from 90 Dunns Crossing Road
7) View north east from 152 Edwards Road
8) View south east from 152 Edwards Road

In assessing the potential effects on visually sensitive receptors, the key viewpoints outlined above have been used as a reference point where it is considered that the effects are likely to be similar to the viewpoint and for a group of viewers. The viewpoint is a representative view, as close as possible to the view likely to be experienced from a private residence or property but obtained from a public location.

The following table outlines the potential visual effects each Visually Sensitive Receptor might receive. The effects take into account the likely sensitivity of the receptor (based on type), combined with the likely magnitude of effects (a combination of distance from the proposal and degree of change) to determine what the likely residual effects from the proposal will be.

## Table 2: Assessment of Effects on Visually Sensitive Receptors

| Viewpoint | Visually Sensitive Receptors (VSR) | Distance from Proposal (m) | Type of View (open, partial, screened) | Description of existing view (from public location) | Sensitivity of VSR | Magnitude of Change | Description of Effects |
|---|---|---|---|---|---|---|---|
| 1. View south west from 406 Dunns Crossing Road | Vehicle users along Dunns Crossing Road<br>Residents along Dunns Crossing Road | <50m | Open | The view from this point is of large open grassed paddocks, with boundaries delineated by open style post and wire fencing. Mature exotic trees frame the view to the right, creating a screen from State Highway 1. Established vegetation and shelterbelts form the skyline in the distance. Infrastructure related to rural activity is present throughout the view, including central pivot irrigation, sheds, and residential dwellings. | Low<br>High | Low | The proposed plan change area is openly visible. While development of dwellings will likely reduce the open character of the landscape, the management of roadside fencing and landscaping will retain a sense of openness. The implementation of acoustic treatment along SH1 will mitigate some visual effects of the development and maintain the integrity of the road. Given the nature of the surrounding environment the proposal will appear as a natural extension of existing development. |
| 2. View south west from 344 Dunns Crossing Road | Vehicle users along Dunns Crossing Road<br>Residents along Dunns Crossing Road | <50m | Open | The existing view from this location has open sightlines over the proposed site. The view has a typical open character, consisting mainly of open grass fields with open style post and wire fencing which delineate boundaries. Mature shelterbelts in the distance form the skyline and create a boundary between the rural land and State Highway 1. Infrastructure such as power lines and central pivot irrigation is open visible. | Low<br>High | Low | Views of the proposal from this location are open. Incorporating existing infrastructure along Dunns Crossing Road into the development helps absorb the level of change. The character of this view would change from more open and rural in nature to a more dense, suburban development. Given the surrounding level of permitted baseline development surrounding the proposed site, including commercial activity, the proposal will appear as a natural extension of development. |
| 3. View north west from 75 Burnham School Road | Vehicle users along Burnham School Road | <50m | Open | This viewpoint has open views across the proposed site. The foreground is dominated by vegetation. Exotic shelterbelts frame the view to the right, while juvenile native planting frames the left as it runs adjacent to the fence line. Post and wire fencing delineates paddock boundaries, often sporadically lined with gorse. Mature vegetation forms the skyline in the distance. Irrigation infrastructure is present in the distant view. | Low | Low | The proposed plan change area is openly visible. Dwellings along Burnham School Road will retain a sense of openness through the management of boundary fencing and landscaping. The overall character of this view will shift form one open and rural in character to one that is suburban and higher in amenity. Development will form the skyline of this view. |
| 4. View north east from 65 Burnham School Road | Vehicle users along Burnham School Road | <50m | Open | Views from this location openly look across the proposed site. Post and wire fencing spans the foreground and is lined with juvenile native planting. Central pivot irrigators are visible and stretch across the open grass paddocks in the distance. Mature shelterbelts and exotic vegetation is present and forms the skyline in the background of the view. Existing development is visible on the horizon, beyond the proposed site. | Low | Low | The proposal is openly visible from this view. Fencing along the boundaries of Burnham School Road will be managed to promote a more open character. The character of this view would change from more open and rural in nature to a more dense, suburban development. Development will form the skyline. The proposal will appear as a natural extension of the development visible in the background of the view. |
| 5. View south west from 203 Dunns Crossing Road | Vehicle users along Dunns Crossing Road | <50m | Open | This viewpoint looks onto the proposed site over open grass fields. Post and wire fencing spans the foreground of the view and is lined with juvenile native vegetation. The background of the view is dominated by exotic shelterbelts and mature vegetation. Infrastructure such as power lines and central pivot irrigation are openly visible. | Low | Low | Views of the proposal from this location are open. Incorporating existing infrastructure along Dunns Crossing Road into the development helps absorb the level of change. The character of this view would change from more open and rural in nature to a more dense, suburban development. Area of more intensive development, such as commercial zones and medium density development, are clustered together to not only provide amenity in a centralised location, but to reduce the overall visual impact in the broader context of the site. |
| 6. View north east from 90 Dunns Crossing Road | Vehicle users along Dunns Crossing Road | <50m | Open | Views from this point are open looking from Dunns Crossing Road across the proposed site. Open style post and wire fencing is frequent through the view, delineating boundaries. Juvenile native vegetation spans the fence line adjacent to the road, alongside power lines. Established shelterbelts and exotic vegetations is present in the distance, forming the skyline above open grass fields. Central pivot irrigation is present and spans the background of the view. | Low | Low | The proposal is openly visible from this view. While the development of dwellings reduces the open character of the landscape, the management of fencing along the Dunns Crossing Road boundary will retain a sense of openness. Incorporating existing infrastructure along Dunns Crossing Road into the development helps absorb the level of change. The character of the view would change from one more rural in nature to one more suburban. . |
| 7. View north east from 152 Edwards Road | Vehicle users along Edwards Road | 50-100m | Screened | This viewpoint looks across Edwards Road to the proposed site. Views are currently screened and dominated by established, exotic shelterbelts. Power line infrastructure is openly visible and spans the length of Edwards Road, breaking into the skyline. The narrow shingle road is lined on either side by mature vegetation, with large grass berms separating the two. | Low | Low | From this location the proposed plan change area will be openly visible. The character of this view is likely to change from one rural in character to one that is denser and more suburban in nature. There is anticipated to be little change in open character of the site as it changes from screened views of vegetation to open views of suburban development. |
| 8. View south east from 152 Edwards Road | Vehicle users along Edwards Road | 50-100m | Open | Open views from this point look directly onto the proposed site. Post and wire fencing is visible and delineates the boundaries of open grass fields. The background of the view is dominated by mature vegetation, breaking into the skyline. A large grass berm spans the length of Edwards Road. | Low | Low | From this view there are open views over the development. A sense of openness will be retained through the management of fencing and landscaping for dwellings along Edwards Road. The character of this view would change from more open and rural in nature to a more dense, suburban development. Development will form the skyline. Given the surrounding level of permitted baseline development surrounding the proposed site, including commercial activity, the proposal will appear as a natural extension of development. |

## 3.5 SUMMARY OF EFFECTS ON VISUAL AMENITY

The likely visual effects are described above in the Assessment of Effects table.

The proposal would result in an overall change in character from open and rural to one that is more dense and suburban in nature but is anticipated to a degree with the current Living 3 zoning. The receiving environment is to maintain aspects of openness through the restoration and retention of green corridors and providing connectivity and accessibility throughout the wider site. Management of fencing and bulk and location of the development will also help create a sense of openness throughout the site. The highest likely effects after mitigation will be experienced by those residential properties closest to the proposal, along Dunns Crossing Road. Though there is a change from rural to suburban, from this location the magnitude of change is considered low as the proposal is an extension of the existing development present on the other side of Dunns Crossing Road. Motorists have a temporary view of the development and are anticipated to expect change in land from rural to suburban as they travel to/from Rolleston township.

Overall, the scale and bulk and location of the proposal would allow it to appear as a natural extension of existing development within Rolleston, with an anticipated low magnitude of change.

# 4. MITIGATION MEASURES

The following mitigation measures are suggested to either avoid, remedy, or mitigate any potential effects on Urban Design, Landscape Character, Landscape Values and/or Visual Amenity from the proposed Plan Change:

| | |
|---|---|
| MM1 | Provide a diversity of house size and lot size to provide choice, with higher density development located close to high amenity and business areas.<br>• This is provided for through the proposed location of low and medium density housing. |
| MM2 | Create streets which have a high level of amenity, provide for different modal allocation, and allow for an efficient use of land by having a street hierarchy with different road reserve widths depending on their classification. Encourage the use of low impact design techniques including grass swales and detention basins<br>• These considerations would be addressed through the detailed design and consenting of any subdivision proposal(s) within the plan change areas. |
| MM3 | Create a well-connected walking and cycling network which combines with the green / blue network and existing facilities connecting to key destinations (school, childcare, town centre), prioritising walking and cycling with a mix of on-road, separate, and off-road facilities to promote active transport modes<br>• Key connections are identified on the ODPs and may be supplemented through additional connections provided for at the time of subdivision consent. |
| MM4 | Avoid direct vehicle access onto Burnham School Road for individual properties to allow for a high-quality landscape treatment along this corridor and minimize potential effects on this road. |

| | |
|---|---|
| MM5 | Provide a quantity of greenspace and facilities appropriate for the future population with green links extending through the plan change area and connecting with adjoining residential and rural areas.<br>• This is provided for on the ODPs. |
| MM6 | Solid fencing should preferably be restricted to rear and side yards to retain an open character along streets and existing roads or at a minimum front boundary fencing will have restrictions. Side fencing should not extend forward of the front wall closest to the street of a house or would need to be limited in height.<br>• This is a matter that would be incorporated into developer covenants that manage and implement specific design outcomes sought within the plan change areas. |

# 5. C O N C L U S I O N S

In terms of the National Policy Statement: Urban Development, Policy 8, the proposed Plan Change will add significant residential capacity with a proposed density ranging between 12 and 15 hh/Ha. This is higher than the recommended density in the Township objectives and policies for the Living Z zone, but is considered appropriate to meet the outcomes desired by the NPS:UD (2020). Any amenity effects on existing and future residents can be successfully mitigated through the proposed mitigation measures.

In terms of landscape character and values of the area, subject to the mitigation measures proposed, the proposal will result in an acceptable magnitude of change on the existing rural landscape character and values. The existing character of the Plan Change areas are already highly modified with no natural features of note. The partially open character of the site will change to a character which is more compartmentalised into smaller units, but which can be partially mitigated through fencing controls and landscape planting to retain a high level of amenity. This change to the open character is already anticipated in the current Living 3 zoning.

In terms of visual amenity, the adjacent rural properties will experience a change in the openness of views across the space. Adjoining suburban residential properties, current and future, overlooking the Plan Change areas will have a mix of open, partial, and screened views of future development. Changes to experience by these residents are considered Low given the character of existing views and existing boundary treatment.

APPENDIX ONE - LANDSCAPE AND VISUAL IMPACT ASSESSMENT FIGURES

# ROLLESTON WEST PLAN CHANGE

**FOR ROLLESTON WEST RESIDENTIAL LIMITED**

**16 NOVEMBER 2020**

REVISION C

dcm URBAN

**ROLLESTON WEST PLAN CHANGE**

Project no: 2020_129
Document title: LANDSCAPE AND VISUAL IMPACT ASSESSMENT
Revision: C
Date: 16 NOVEMBER 2020
Client name: Rolleston West Residential Limited

Author: David Compton-Moen
File name: \\GOOSE\Storage\4_DCM - Projects\2020_129 Carters Rolleston West Plan Change\3_Working Files\3_InDesign\ 2020_129 Carter Rolleston West Plan Change_LVIA_B.indd

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| C | 16/11/2020 | Minor Amendment | SB | DCM | |

**DCM URBAN DESIGN LIMITED**

Level 3, 329 Durham Street North
Christchurch 8013

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LEGEND

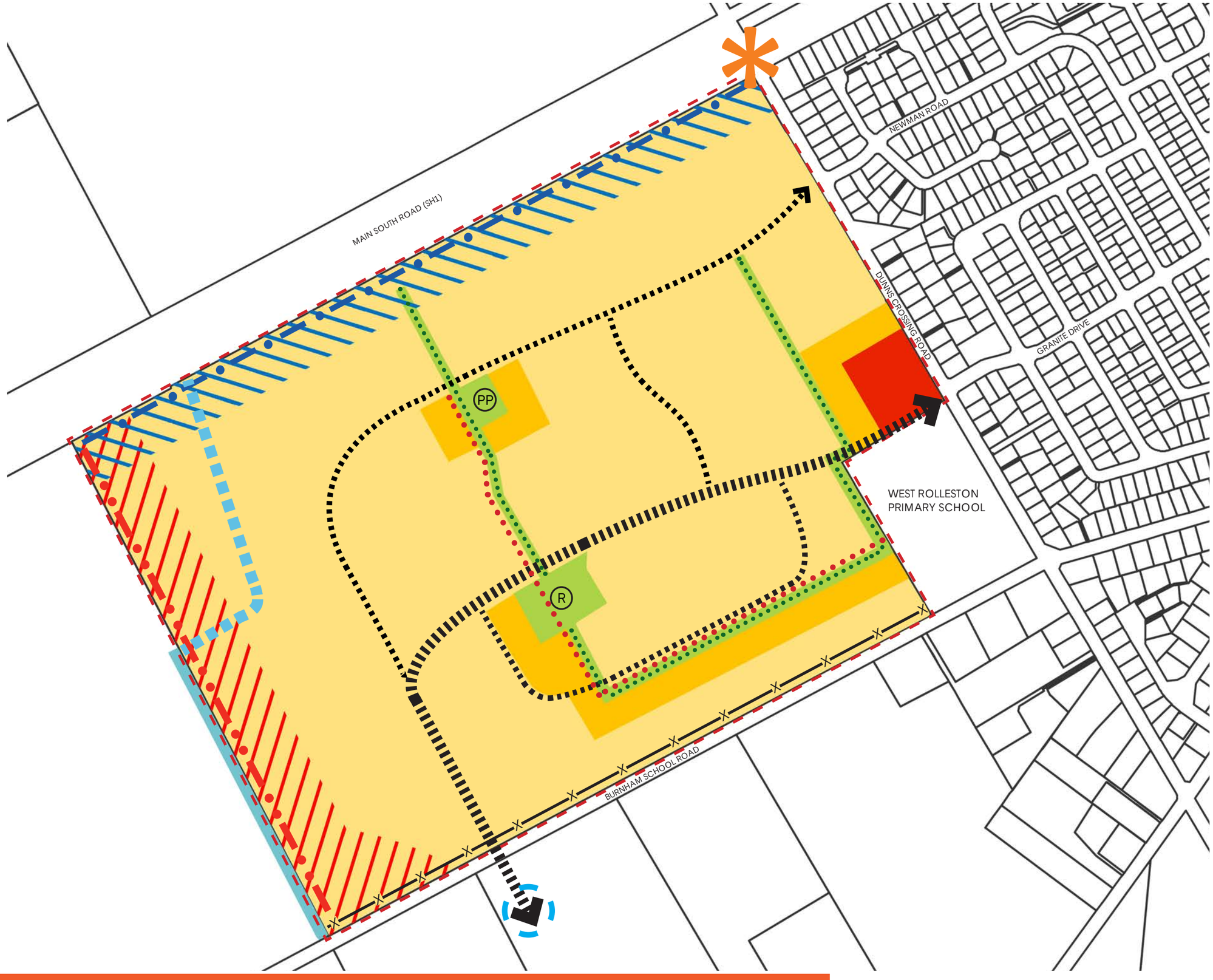
- Plan Change Boundary

**Living Z**

- General Residential Density (Minimum 12 Households/Ha
- Medium Residential Density (Minimum 15 Households/Ha)

**Business**

- Commercial / Business
- Primary Road
- Secondary Road
- 2.5m Shared Path (off road)
- Possible Future Connection
- Potential Intersection Upgrade
- Recreation Reserve
- Pocket Park
- Green Link
- Water Race
- Water Race Realigned
- Avoid access onto Burnham School Road from site
- Odour Constrained Area
- Bunding and Dense Planting
- 40m Noise Abatement Setback
- Acoustic Bund or Fencing




A. OUTLINE DEVELOPMENT PLAN

LEGEND

Plan Change Boundary

**Living Z**

General Residential Density
(Minimum 12 Households/Ha

Medium Residential Density
(Minimum 15 Households/Ha)

**Business**

Commercial / Business

Primary Road

Secondary Road

Planned Future Road Connection
(via other developments)

Shared 2.5m Path (off road)

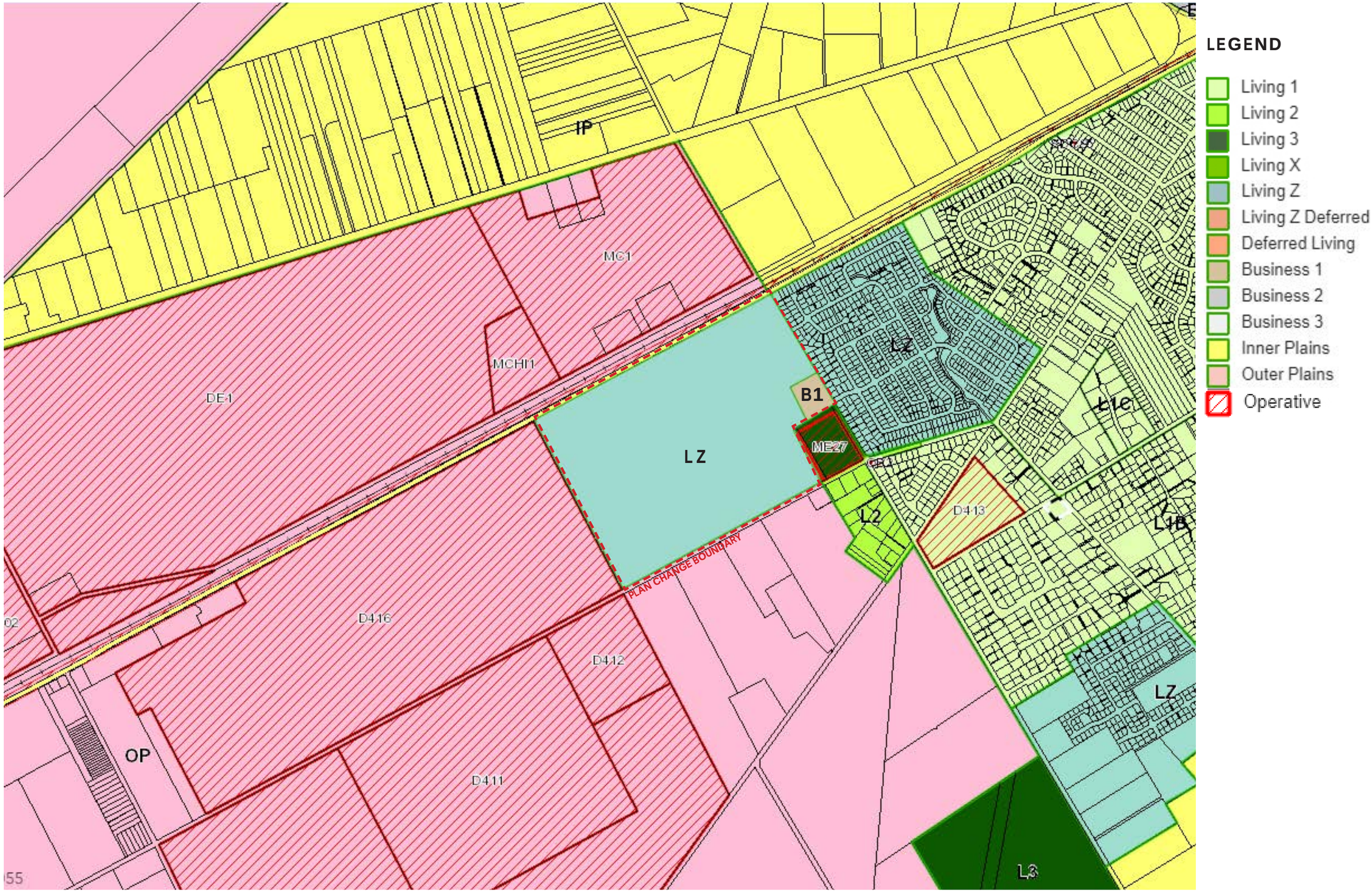
Possible Future Connection

Recreation Reserve

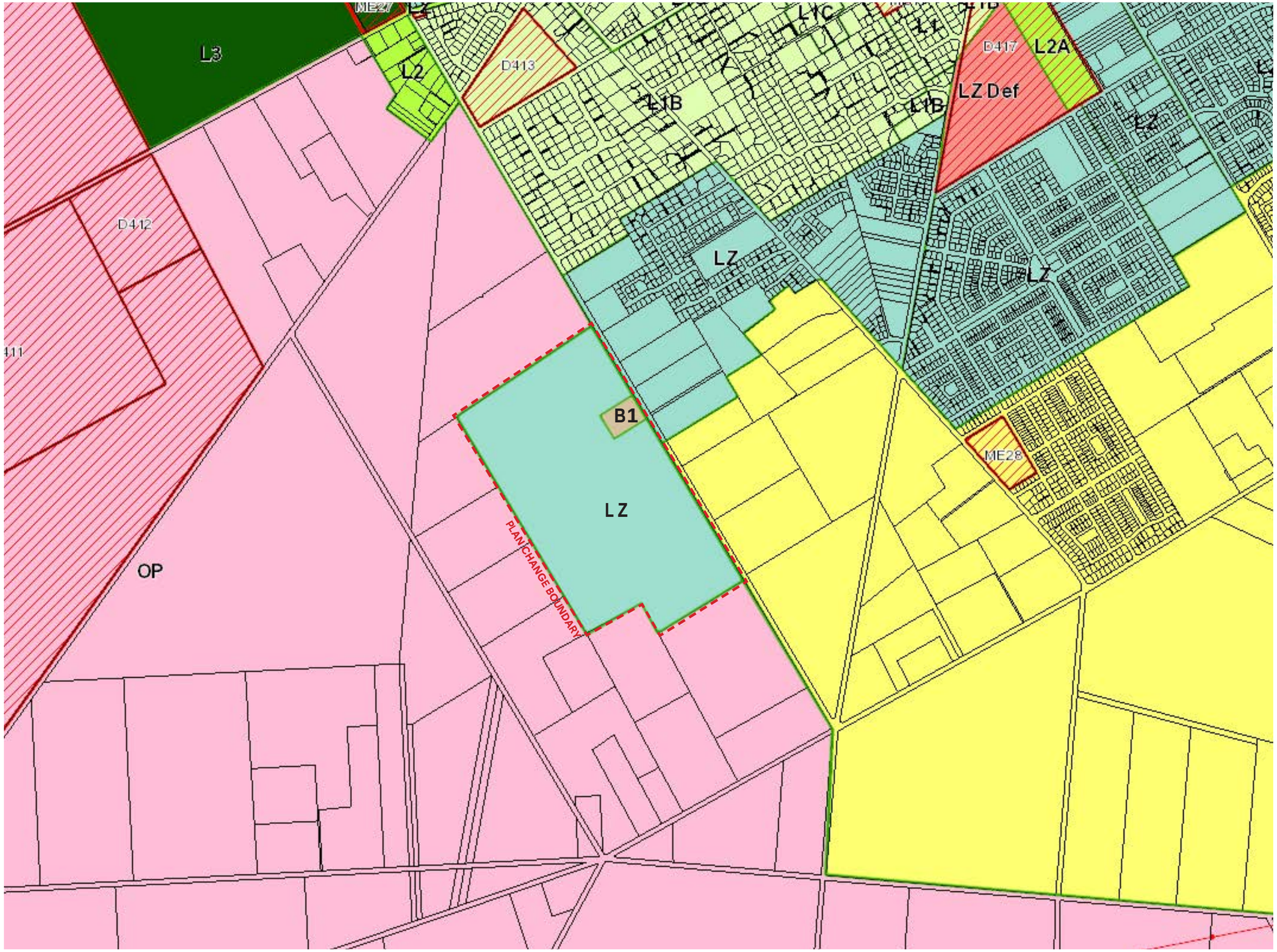
Green Link

Odour Constrained Area

A. OUTLINE DEVELOPMENT PLAN



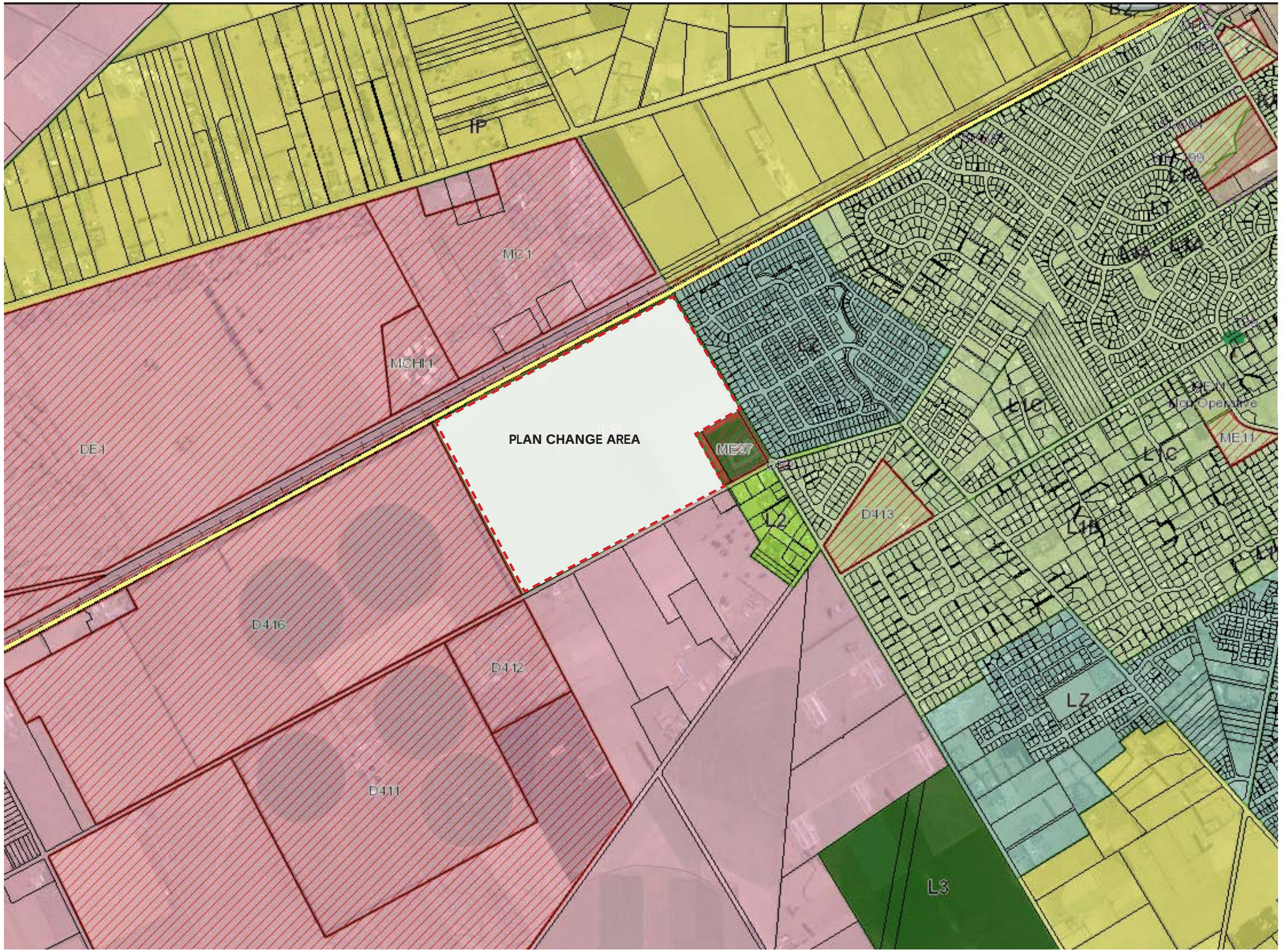

*Map / image source: Selwyn District Council*

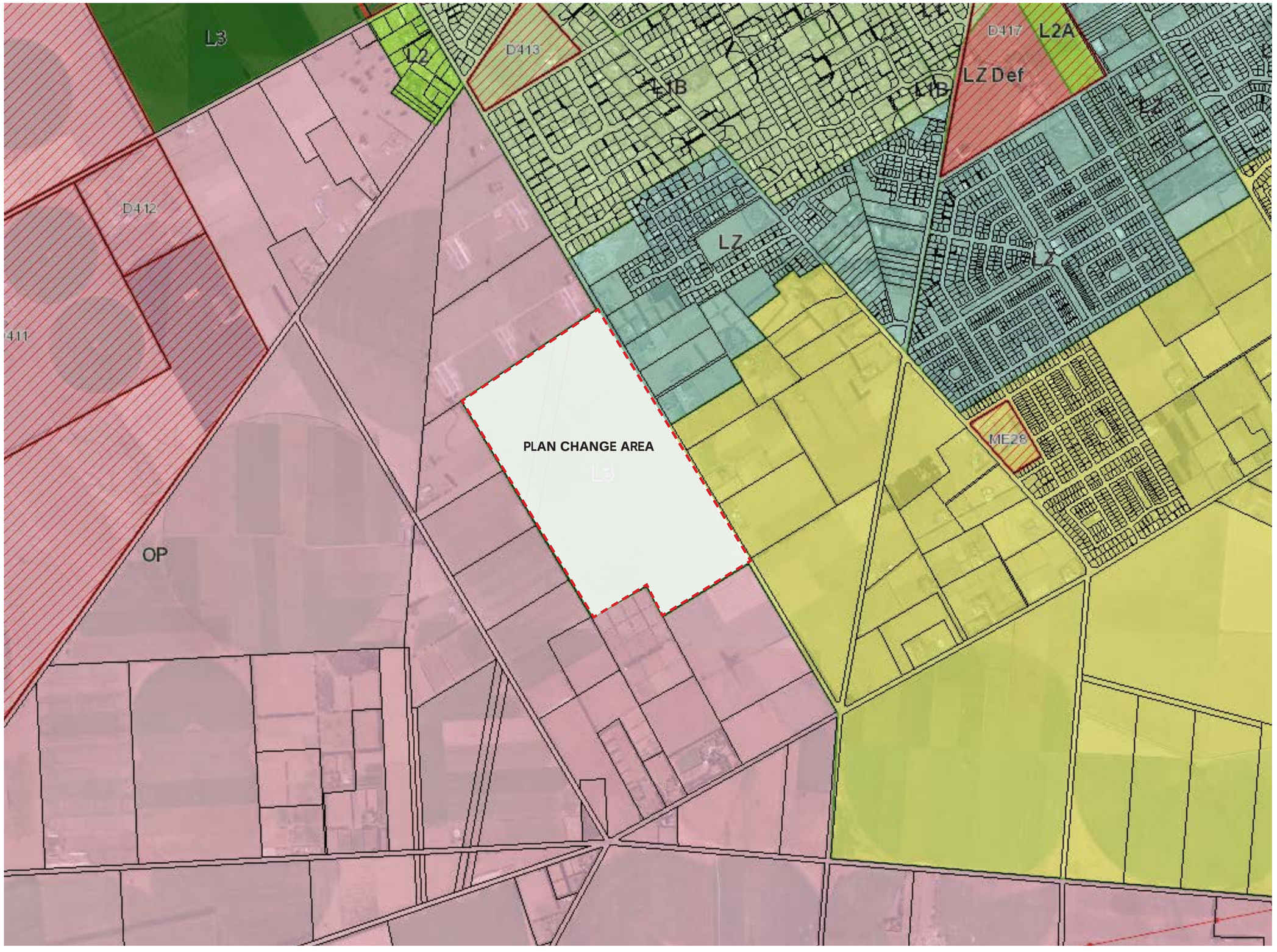



LEGEND

- Living 1
- Living 2
- Living 3
- Living X
- Living Z
- Living Z Deferred
- Deferred Living
- Business 1
- Business 2
- Business 3
- Inner Plains
- Outer Plains
- Operative

*Map / image source: Selwyn District Council*


PLAN CHANGE AREA
IP
MC1
MCH1
DE1
ME27
L2
D413
L1C
L1
ME11
Non Operative
L1
L2
L2
L2




*Map / image source: Selwyn District Council*

## LEGEND

### CHARACTER PHOTOS

- A West Rolleston Primary School
- B Residential Development in Stonebrook
- C Existing Planting Along SDC WWTP Land
- D State Highway 1 and Bund

### VIEWPOINT LOCATIONS

1. View South West from 406 Dunns Crossing Road
2. View North West from 344 Dunns Crossing Road
3. View North West from 75 Burnham School Road
4. View North East from 65 Burnham School Road

**A. LOCATION MAP FOR CHARACTER PHOTOS AND KEY VIEWPOINTS**

A Primary School - West Rolleston Primary School has around 400 students ranging from Year 1 to Year 8. The predominant mode of transport to the school by students and parents is by walking, bike or scooter. This is due to the school's close proximity to neighbouring residential developments.

B Residential Development - Existing housing within Stonebrook is predominantly single storey, 3-4 bedrooms with double garage on lots typically ranging from 400m² to 800m². There are a variety of materials, colours and forms present throughout the development.

C Blue Network - There is one water race running through and adjacent to the Holmes Block. These are typical in agricultural land and are an integral element for livestock and overall viability of the land.

D State Highway - State Highway 1 is the primary route running the length of the South Island, resulting in high levels of traffic daily. Bunding has been implemented adjacent to existing residential development to provide a buffer to aid privacy and noise pollution.

## LEGEND

### CHARACTER PHOTOS

- E Residential Development in Faringdon
- F Chicken Farms
- G Rural Residential / Planting
- H Edwards Road

### VIEWPOINT LOCATIONS

- 5 View South West from 203 Dunns Crossing Road
- 6 View North West from 90 Dunns Crossing Road
- 7 View North East from 152 Edwards Road
- 8 View South East from 152 Edwards Road

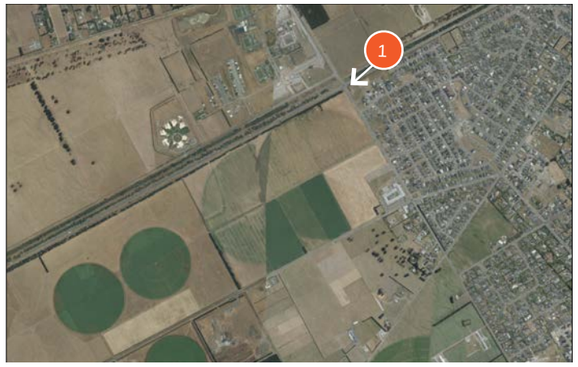
**A. LOCATION MAP FOR CHARACTER PHOTOS AND KEY VIEWPOINTS**

E Residential Development - Existing housing within Faringdon is predominantly single storey, 3-4 bedrooms with a double garage on lots typically ranging from 270m² to 800m². There are a variety of materials, colours and forms present throughout the development.

F Land Use - Approximately 40ha of rural land is occupied for chicken farming, surrounded by dairy farms equipped with central pivot irrigation. The property consists of several sheds around 100m in length, illustrating the diversity of structures and associated land use within surrounding landscapes.

G Rural Residential - Properties are typically screened by mature vegetation and are setback from the roadside. Housing changes between single and double storey and has a vareity of colours and styles present. Vegetation around the dwellings is predominantly exotic and is sporadically clustered.

H Rural Roading - Edwards Road is a typical narrow gravel road, consistent with other rural roads throughout the wider area. The road runs between Selwyn Road and Brookside Road and has low levels of vehicle use.




*A. IMAGE LOCATION*

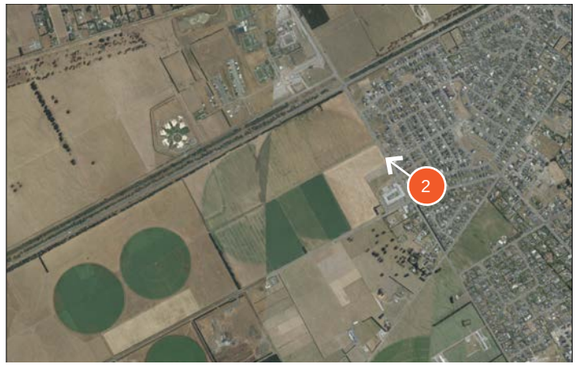
APPROXIMATE PROPOSAL LOCATION

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

# VP1 - VIEW SOUTH WEST FROM 406 DUNNS CROSSING ROAD

ROLLESTON WEST PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 4th November 2020 at 9:23 am
Height of 1.7 metres
Photos merged in Photoshop CS to create panorama




*A. IMAGE LOCATION*

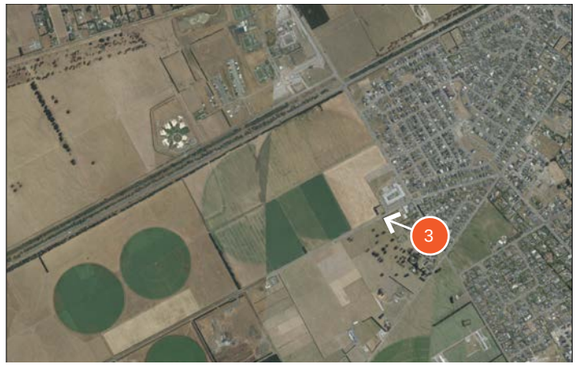
APPROXIMATE PROPOSAL LOCATION

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

# VP2 - VIEW NORTH WEST FROM 344 DUNNS CROSSING ROAD

ROLLESTON WEST PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 4th November 2020 at 8:29 am
Height of 1.7 metres
Photos merged in Photoshop CS to create panorama




*A. IMAGE LOCATION*

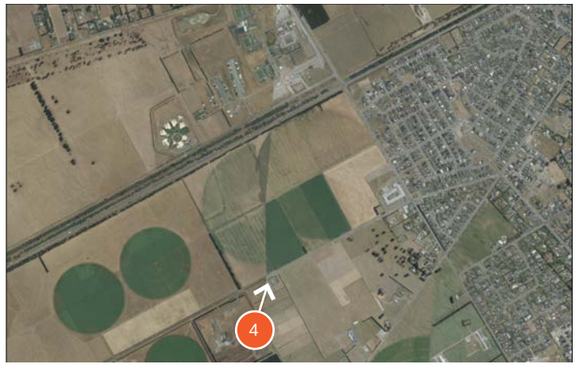
APPROXIMATE PROPOSAL LOCATION

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

# VP3 - VIEW NORTH WEST FROM 75 BURNHAM SCHOOL ROAD

ROLLESTON WEST PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 4th November 2020 at 9:12 am
Height of 1.7 metres
Photos merged in Photoshop CS to create panorama




*A. IMAGE LOCATION*

APPROXIMATE PROPOSAL LOCATION

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

# VP4 - VIEW NORTH EAST FROM 65 BURNHAM SCHOOL ROAD

ROLLESTON WEST PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 4th November 2020 at 9:15 am
Height of 1.7 metres
Photos merged in Photoshop CS to create panorama

*A. IMAGE LOCATION*

APPROXIMATE PROPOSAL LOCATION

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

# VP5 - VIEW SOUTH WEST FROM 203 DUNNS CROSSING ROAD

ROLLESTON WEST PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 4th November 2020 at 8:38 am
Height of 1.7 metres
Photos merged in Photoshop CS to create panorama

*A. IMAGE LOCATION*

APPROXIMATE PROPOSAL LOCATION

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

# VP6 - VIEW NORTH WEST FROM 90 DUNNS CROSSING ROAD

ROLLESTON WEST PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 4th November 2020 at 8:44 am
Height of 1.7 metres
Photos merged in Photoshop CS to create panorama

*A. IMAGE LOCATION*

APPROXIMATE PROPOSAL LOCATION

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

# VP7 - VIEW NORTH EAST FROM 152 EDWARDS ROAD

ROLLESTON WEST PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 4th November 2020 at 8:49 am
Height of 1.7 metres
Photos merged in Photoshop CS to create panorama

*A. IMAGE LOCATION*

APPROXIMATE PROPOSAL LOCATION

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

# VP8 - VIEW SOUTH EAST FROM 152 EDWARDS ROAD

ROLLESTON WEST PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 4th November 2020 at 8:54 am
Height of 1.7 metres
Photos merged in Photoshop CS to create panorama

# Appendix F

# Ecological Assessment

Aquatic Ecology

Phone: (03) 366-4070
Cell: 021 022-62517
Email: mark@ael.org.nz
Internet: www.ael.org.nz

12 November 2020

Bruce Van Duyn
Carter Group
PO Box 2726
Christchurch

Dear Bruce

**Ecological values in two Rolleston Blocks (Rolleston West Residential Ltd.)**

Thank you for your email dated 3rd November.

I have undertaken a desktop consideration of ecological values, as it pertains to aquatic values, in the vicinity of the two described lots, described below as the Holmes Block and the Skellerup Block. Both are currently zoned as Rural Residential and are proposed to be rezoned to Living Z. I have accessed the New Freshwater Fish Database, the Paparoa Irrigation raceway network (Agriculture N.Z. Ltd 1997), and our own recent ecological investigations in the vicinity.

Waterways in both blocks are fed by a large (43000 Ha) constructed historic (1887) irrigation system originally for stock water, and more recently for irrigation (Agriculture N.Z. Ltd 1997). The water rises from a large, screened intake fed from the mainstem of the Waimakariri River at the end of Intake Road. In turn, these 2 blocks, and the raceway along Tennyson Street, Rolleston, are fed by a major irrigation race with flows southwards along Sandy Knolls Road (App. I. Fig. i).

**Holmes Block**

The irrigation raceway passes through the Holmes Block in the west corner of the property before it turns west and crosses into land owned by Selwyn District Council (App. I. Fig. ii). The raceway has recent (March 2020) Google Streetview® photos available, looking downstream from SH1 (Main South Road) (App. I. Fig. iii), and another recent Streetview® photo is available looking upstream from Burnham School Road (App. I. Fig. iv). In addition, a recent site visit provided photos presented in App. II. The raceway appears to be within the swinging arc of a pivot irrigator. To prevent impediment of the irrigator the waterway appears to be unfenced and has a buffer of a few metres of grassy vegetation (App. II, Fig. i). The raceway is shallow and has a gravel base in most reaches (App. II, Fig. ii), and culverted where it corners by 90$^{o}$ within the Block.

This raceway is likely to have similar water chemistry as the parallel raceway which flows along the roadside of Tennyson Street, 3.5 km to the north-east, and appears to be of a similar width and nature of flow. A c. 340 m reach of the Tennyson St raceway was subjected to fish removal in February 2020, prior to piping (Downer contract). The fish catch over this reach is tabulated below (Table 1). I have digitally measured the length of channel which flows through the west corner of the Holmes Block (c. 458 m). I would expect the fish fauna to be similar to that in the Tennyson Street raceway and may be composed of as many as 151 fish, none of which have a significant conservation status. The shallow stony nature would particularly suit upland bully, which would spawn on the local cover substrate, and use them for refuge (Jowett & Boustead 2001). The lack of overhanging bank cover would restrict numbers of juvenile brown trout to a possibly lower catch projection than in Table 1.

Of these fish, the shortfin eel is a sea migrant, with juveniles which will be entrained through the fish screen at Intake Road, on the Waimakariri River. The upland bully probably the most common and well-distributed freshwater fish in New Zealand (McDowall 1990), and does not require sea access or therefore passage through the Waimakariri intake. Instead, it will spawn on cobbles and other hard items in its resident habitat. The common bully can adopt either a sea-migratory life-stage, or within inland ponds and lakes, a non-migratory lifecycle. Based on my experience, brown trout are well-distributed in the Paparua Irrigation Raceway network, especially where there is fast flow and hard substrates. It is likely the fish spawn in gravel reaches where these are available. The maximum size of brown trout in the raceway complex will be limited by the small size of available habitats.

Ecological values centred around aquatic invertebrates, certainly in terms of biodiversity, are likely to be already compromised by existing issues related to the habitats use as a raceway. These include dispersal issues caused by road culverts, the lack of riparian vegetation to support flighted lifestages, excessive weed removal and bed dredging, adjacent herbicide and pesticide use, and lack of physical habitat variation (Hudson & Harding 2004).

**Table 1.** Fish census in a nearby raceway, and approximate numbers in a selected reach in the Holmes Block (yellow ring in App. I. Fig. ii).

| Fish Species | Conservation Status (Dunn *et al.* 2017) | No. caught | Population estimate for Holmes Block west corner |
|---|---|---|---|
| Upland bully | Not threatened | 89 | 120 |
| Brown trout | introduced | 20 | 27 |
| Shortfin eel | Not threatened | 2 | 3 |
| Common bully | Not threatened | 1 | 1 |
| | | **112** | **151** |

**Skellerup Block**

This block is at the terminus of a minor irrigation feed, with a pathway depicted in App. I. Fig. v. I understand this waterway is beyond the western boundary of the block but will provide comments anyway. There is a Google Streetview® photo where the waterway diverts away from Edwards Road (App. I. Fig. vi), which depicts a perennial channel with good fish cover elements. Based on the latest Google aerial imagery, the channel adjacent to the Skellerup Block is well fenced from dairying land use, with a vegetated buffer strip on the west bank of approximately 7 m. The raceway departs away from the Skellerup Block in the south-west corner, and apparently, goes to ground before it reaches Selwyn Road.

I would expect the fish fauna to be similar to that for the Holmes Block, with a potentially higher total fish abundance due to greater depth and fish refuge. Shortfin eel habitat, in particular, is higher, but recruitment into the reach is severely restricted by the Waimakariri intake screen. Eel recruitment to the Skellerup Block is also restricted by its location far from the intake, where entrained juveniles have adopted resident habitats further upstream and closer to the intake. If present at all, shortfin eel numbers would be greater in reaches with sluggish flow and where there is marked depth of soft sediment (Jellyman *et al.* 2003). This waterway has stable banks, and it is possible freshwater crayfish (koura) are also present.

It is my understanding that this waterway would be protected by the District Plan's 10m waterbody setback for earthworks and development and would be largely undisturbed by any potential residential development of the adjacent land.

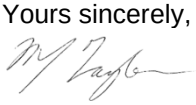
**Summary**

The only aquatic habitat with potentially some ecological value is the raceway which passes through the western corner of the Holmes Block. Due to the screening of the inflow at the Waimakariri River intake, and the distance from the sea, fish diversity and abundance is expected to be low. Invertebrate biodiversity is already likely to be compromised for multiple reasons associated with the existing raceway management.

It is likely that there is a number of common fish species in the raceway reach through the Holmes Block, but these are likely to have little or no conservation value.

Overall, from a plan change/rezoning perspective, if the development adheres to the 10m waterbody setback rules the likelihood of negative ecological impacts are low.

Yours sincerely, Mark Taylor



## References:


Agriculture N.Z. Ltd, G. P. L., Pattle Delamore Partners Ltd 1997. Paparua Water Race; system review. Christchurch. *No*. 83 p.

Dunn, N. R.; Allibone, R. M.; Closs, G. P.; Crow, S.; David, B. O.; Goodman, J. M.; Griffiths, M.; Jack, D.; Ling, N.; Waters, J. M.; Rolfe, J. R. 2017. Conservation Status of New Zealand freshwater fishes, 2017. Department of Conservation, Wellington. *No*. 15 p.

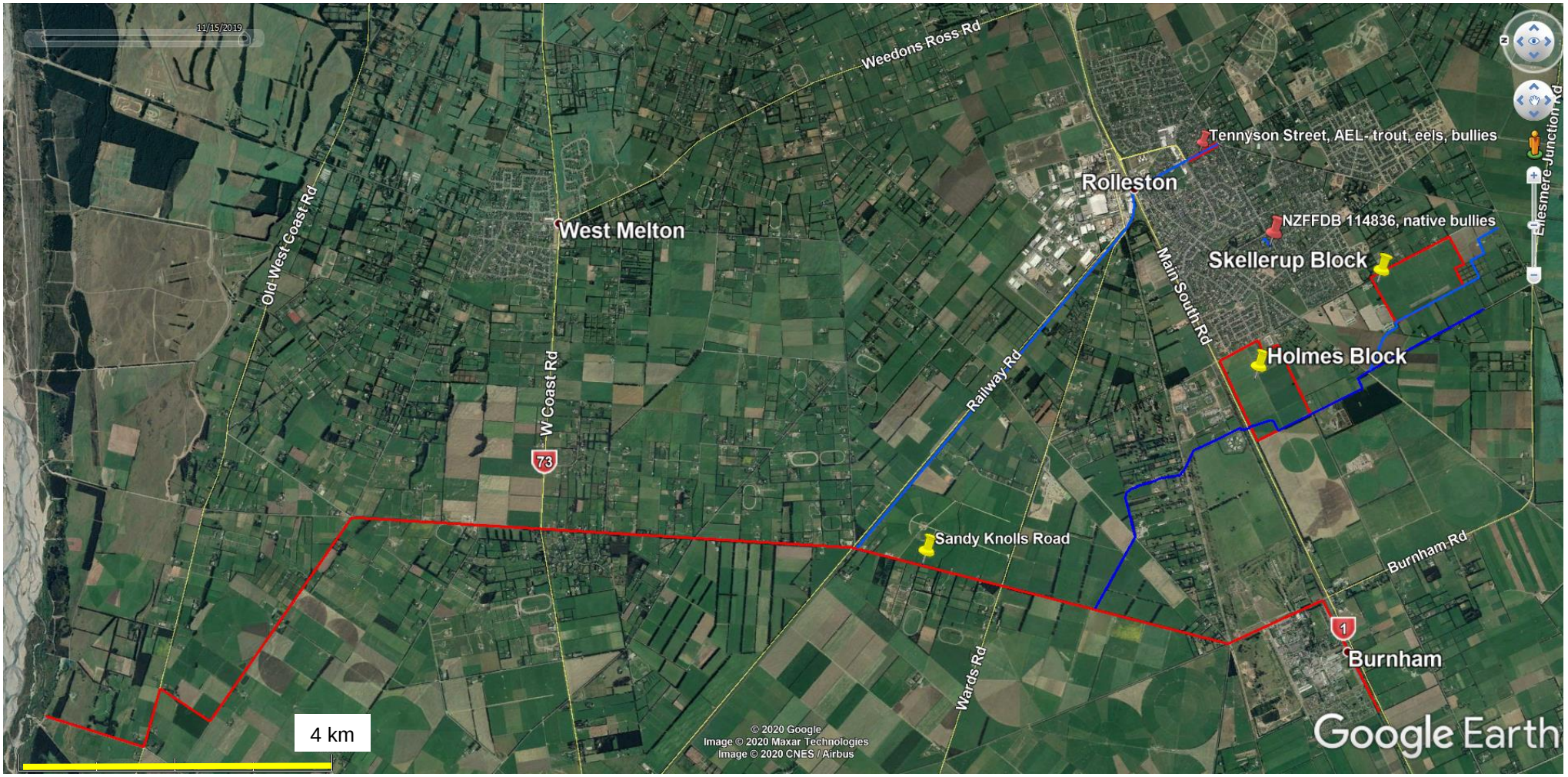
Hudson, H. R.; Harding, J. S. 2004. Drainage Management in New Zealand. Department of Conservation, *Science for Conservation No*. *No. 235*. 39 p.

Jellyman, D. J.; Bonnett, M. L.; Sykes, J. R. E.; Johnstone, P. (2003): Contrasting use of daytime habitat by two species of freshwater eel Anguilla spp. in New Zealand rivers. *In:* American Fisheries Society Symposium. Pp. 63-78.

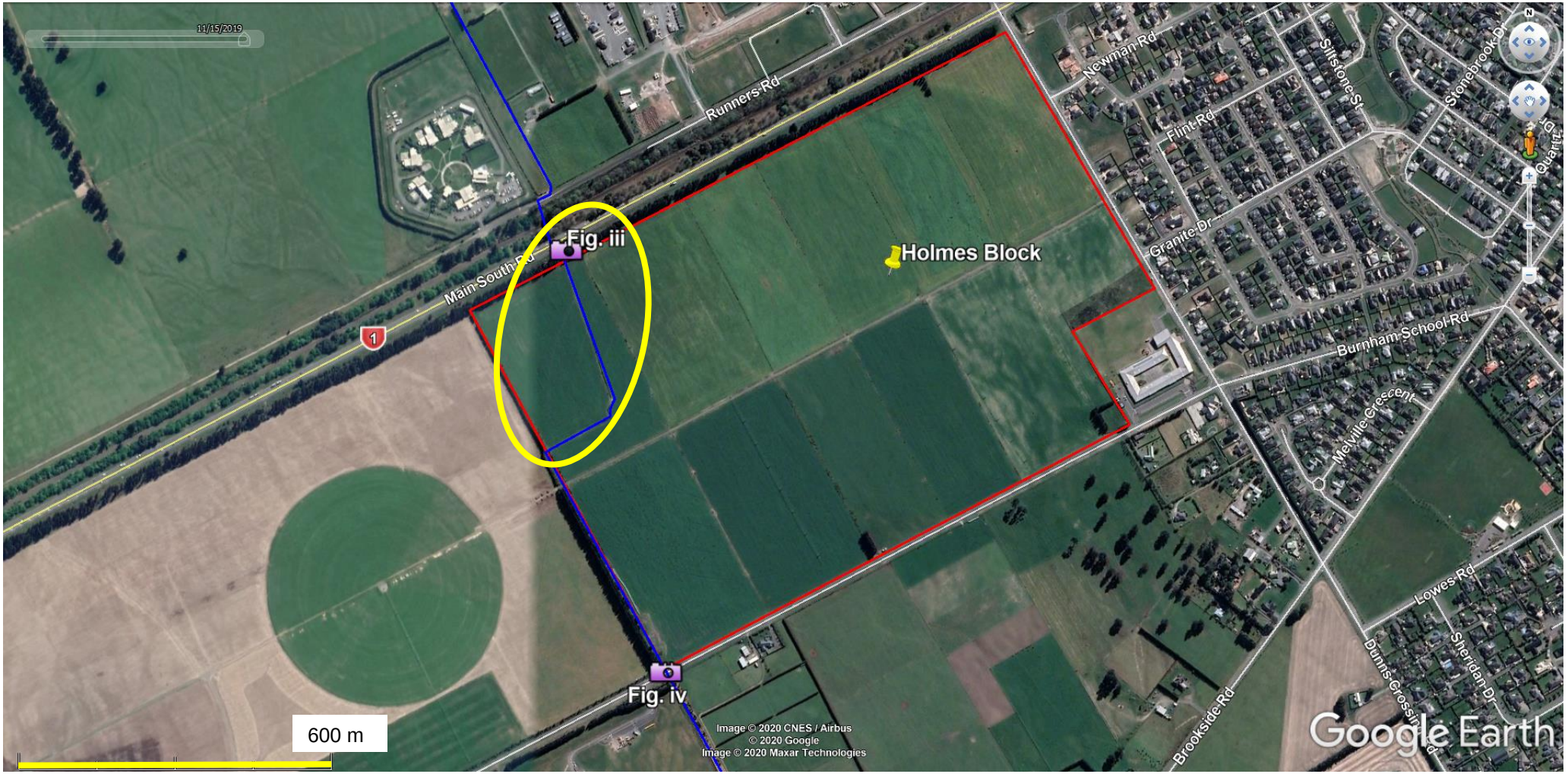
Jowett, I. G.; Boustead, N. C. 2001: Effects of substrate and sedimentation on the abundance of upland bullies (*Gobiomorphus breviceps*). *New Zealand Journal of Marine and Freshwater Research 35*: 605-613.

McDowall, R. M. 1990: New Zealand Freshwater Fishes: A Natural History and Guide. Auckland, Heinemann Reed. 553 p.

**Appendix I.** Recent Google Earth imagery from the Holmes and Skellerup Blocks.



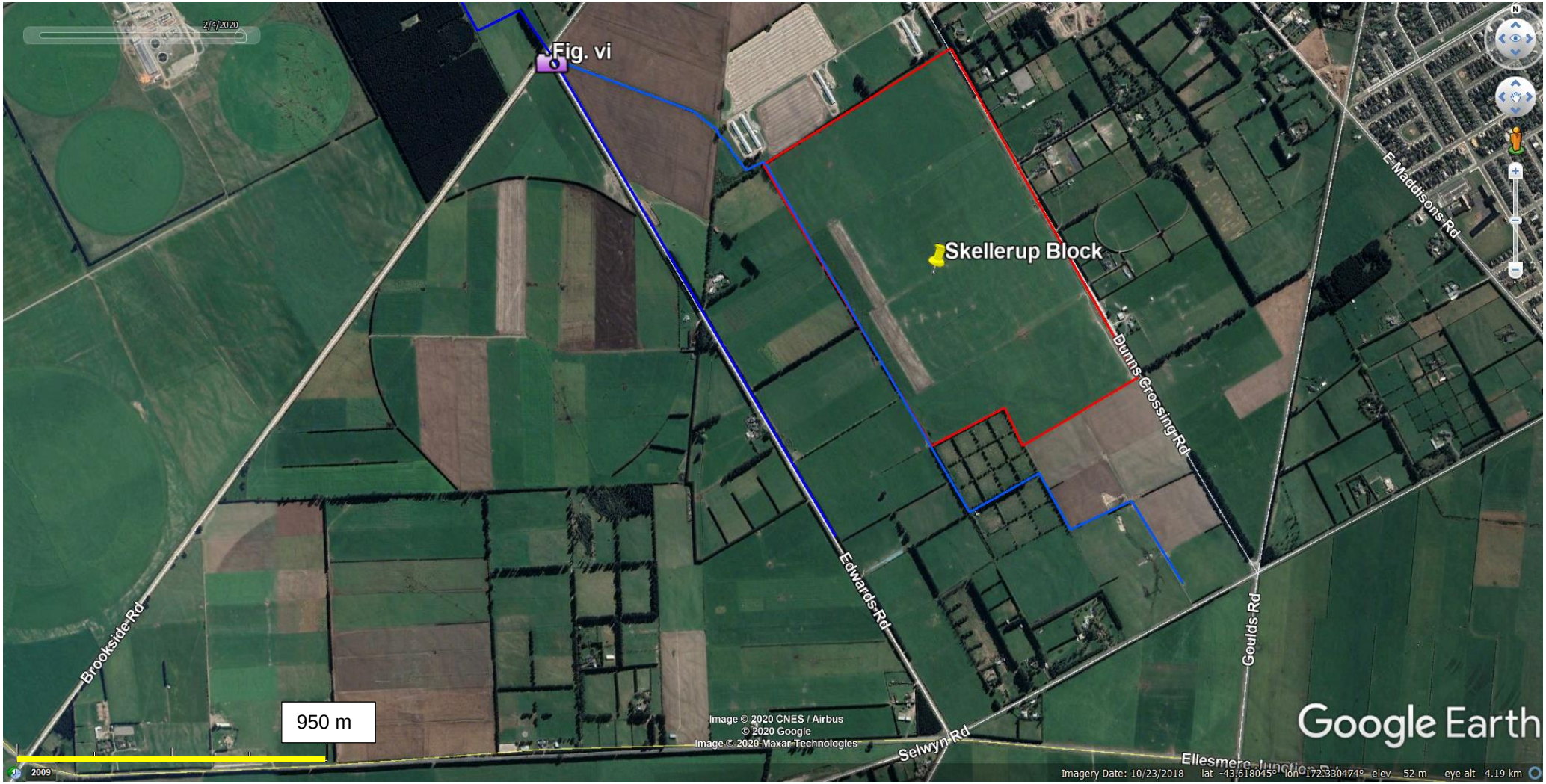

**App. I. Figure i.** Paparua Race Irrigation scheme in relation to waterways in the Holmes and Skellerup Blocks.




**App. I. Figure ii.** Paparua Race Irrigation scheme in relation to waterways in the Holmes and Skellerup Blocks. An approximate fish census is conducted on the channel reach in the yellow ring.

**App. I. Figure iii.** Looking south and downstream from SH1 at the irrigation raceway entering the north boundary of the Holmes Block, March 2020.

**App. I. Figure iv.** Water race at Burnham School Road, (September 2019), looking upstream (north) into the Selwyn District Council land, at the SW corner of the Holmes Block.




**App. I. Figure v.** The raceway network path (blue line) along the west boundary of the Skellerup Block (red line).

**App. I. Figure vi.** Looking east at the weedy raceway channel which further down borders the Skellerup Block (September 2019). While the broom and/or gorse appears sprayed, introduced emergent macrophytes provide a significant amount of instream cover for koura and fish, especially shortfin eels and trout.

**Appendix II.** Recent field photographs from the Holmes Block (Bruce Van Duyn, Carter Group).

**Figure i.** The raceway through the west corner of the Holmes Block.

**Figure ii.** Shallow gravel reaches of the raceway through the west corner of the Holmes Block.

# Appendix G

# Economic Assessment

# ROLLESTON WEST RESIDENTIAL LTD

# APPLICATION FOR ROLLESTON WEST PLAN CHANGE

## ASSESSMENT OF ECONOMIC EFFECTS

**Mike Copeland**
**Brown, Copeland & Co Ltd**

**12 November, 2020**

# 1. INTRODUCTION

## Background

**1.1** Rolleston West Residential Ltd (RWRL) controls two blocks of land on the western outskirts of Rolleston – one block on Burnham School Road and Dunns Crossing Road known as the Holmes Block and the other on Dunns Crossing Road known as the Skellerup Block. RWRL proposes a Plan Change, the Rolleston West Plan Change, which will rezone these two blocks of land from Rural Residential to Residential (Living Z). The proposed Plan Change will allow for up to 1,150 new lots on the 87.53 hectare Holmes Block and up to 950 lots on the 72.69 hectare Skellerup Block; i.e. a maximum of 2,100 lots at an average density of up to 13.1 households per hectare across the total area of 160.22 hectares covered by the Plan Change. Included will be provision for two small 'local centres' (Business 1 zoning) - one within each of the rezoned blocks of land to meet the convenience shopping needs of the developments' residents.

## Report Objective

**1.2** The objective of this report is to assess the economic effects of RWRL's proposed Plan Change. The report will form part of the section 32 evaluation to be lodged in relation to the application for the Plan Change.

## Report Format

**1.3** This report is divided into 6 parts (in addition to this introductory section). These are:

(a) A consideration of the relevance of economic effects under the RMA;

(b) A description of recent population and employment growth within the Selwyn District, and Greater Christchurch (i.e. Selwyn District, Christchurch City and Waimakiriri District);

(c) Identification of the economic benefits from the proposed Rolleston West Plan Change;

(d) A discussion of some potential economic costs from the proposed Rolleston West Plan Change;

(e) Consideration of the development capacity significance of the proposed Rolleston West Plan Change; and

(f) Some overall conclusions.

## 2. ECONOMICS AND THE RMA

### Community Economic Wellbeing

**2.1** Economic considerations are intertwined with the concept of the sustainable management of natural and physical resources, which is embodied in the RMA. In particular, Part II section 5(2) refers to enabling "*people and communities to provide for their … economic ... well being*" as a part of the meaning of "*sustainable management*", the promotion of which is the purpose of the RMA.

**2.2** As well as indicating the relevance of economic effects in considerations under the RMA, this section also refers to *"people and communities"* (emphasis added), which highlights that in assessing the impacts of a proposal it is the impacts on the community and not just the applicant or particular individuals or organisations, that must be taken into account. This is underpinned by the definition of *"environment"* which also extends to include people and communities.

**2.3** How the proposed Plan Change will enable the residents and businesses of the Selwyn District to provide for their social and economic wellbeing is discussed later in this report.

### Economic Efficiency

**2.4** Part II section 7(b) of the RMA notes that in achieving the purpose of the Act, all persons *"shall have particular regard to ... the efficient use and development of natural and physical resources"* which include the economic concept of efficiency[1]. Economic efficiency can be defined as:

[1] See, for example, in *Marlborough Ridge Ltd v Marlborough District Council* [1998] NZRMA 73, the Court noted that all aspects of efficiency are "*economic*" by definition because economics is about the use of resources generally.

*"the effectiveness of resource allocation in the economy as a whole such that outputs of goods and services fully reflect consumer preferences for these goods and services as well as individual goods and services being produced at minimum cost through appropriate mixes of factor inputs"*[2].

**2.5** More generally economic efficiency can be considered in terms of:

- Maximising the value of outputs divided by the cost of inputs;
- Maximising the value of outputs for a given cost of inputs;
- Minimising the cost of inputs for a given value of outputs;
- Improving the utilisation of existing assets; and
- Minimising waste.

**2.6** The proposed Plan Change is consistent with the efficient use of resources, especially in regard to increasing competition in the market for residential land in Rolleston, Selwyn and Greater Christchurch and providing greater choice. These economic efficiency benefits are discussed later in this report.

**Viewpoint**

**2.7** An essential first step in carrying out an evaluation of the positive and negative economic effects of the Plan Change is to define the appropriate viewpoint that is to be adopted. This helps to define which economic effects are relevant to the analysis. Typically a district (or city) and wider regional viewpoint is adopted and sometimes even a nationwide viewpoint might be considered appropriate.

**2.8** The two blocks of land RWRL control and to be covered by the proposed Plan Change are located within the Selwyn District, but residential sections resulting from the proposed rezoning and development will also form part of the Greater Christchurch housing market. Therefore, in this report the economic effects are considered in relation to the residents and businesses within the Selwyn District economy and alsoin relation to the broader Greater Christchurch economy.

[2] Pass, Christopher and Lowes, Bryan, 1993, *Collins Dictionary of Economics* (2nd edition), Harper Collins, page 148.

**2.9** There will also be private or financial benefits associated with the proposed rezoning. Generally these benefits are not relevant under the RMA and the main focus of this report is therefore on the wider economic effects on parties other than RWRL. Economists refer to such effects as "externalities"[3].

**Trade Competition**

**2.10** Consistent with seeking to maximize competition and economic efficiency, the RMA specifically excludes consideration being given to trade competition effects on individual competitors. Importantly, the proposed Plan Change will increase the level of competition in the market for residential sections, at Rolleston, within the Selwyn District and within Greater Christchurch.

**Intangible Costs and Benefits**

**2.11** This report addresses the economic effects[4] of RWRL's proposed Rolleston West Plan Change. Relevant non-economic effects are covered in the Plan Change application main text and other technical reports appended to it.

**2.12** In economics, 'intangible' costs and benefits are defined as those which cannot be quantified in monetary terms. Sometimes attempts can be made to estimate monetary values for 'intangible' non-economic costs and benefits using techniques such as willingness to pay surveys or inferring values on the basis of differences in property values. Once quantified in monetary terms, these effects can supposedly be considered as part of the assessment of economic effects.

**2.13** However, such techniques are frequently subject to uncertainty and criticism. It is generally better to not attempt to estimate monetary values for these effects but to leave them to be assessed by appropriately qualified experts and for their assessments to form part of the application of the relevant legal test. This also avoids the danger of 'double-counting' of effects.

**2.14** Just as it is necessary for decision-makers under the RMA to consider negative intangible effects and to weigh these against positive economic effects, there are sometimes positive intangible effects that need to be incorporated in the decision

[3]Defined as the side effects of the production or use of a good or service, which affects third parties, other than just the buyer and seller.
[4]Sometimes economic effects can have a social dimension – e.g. employment and income effects and housing affordability.

making process. In relation to the proposed Plan Change these will include the social benefits from increased housing affordability.

**The Justification for Land Use Controls**

**2.15** Over the past thirty years or so, there has been a growing acceptance in New Zealand and other countries that economic efficiency is maximized when investment decisions are left to individual entrepreneurs or firms and consumers, without intervention from Government – i.e. “market based” outcomes. The reason for this is that in theory, a perfectly competitive market, where investment decisions are left to individual entrepreneurs or firms and consumers without intervention from Government, achieves an efficient allocation of resources. The essence of this policy is that the efficient use of resources, and therefore "sustainable management" results from the creation of a climate where the market enables people to make investment decisions "to provide for their economic well being".

**2.16** Despite this, in reality markets are not "perfect", and the presence of "externalities" affects the working of the market and the results that could be expected from a totally unregulated system of resource allocation. Externalities arise because the actions of individuals or firms sometimes create positive or negative impacts on others. It is unrealistic to assume that development of particular forms of economic activity and/or the location of that economic activity will not sometimes impose costs on the community in general. Where the developer, those engaged in various forms of economic activity at the site and/or consumers do not face the incidence of these costs, externalities arise and intervention of some form may be justified. In other words, development may create costs or benefits for parties other than those commercially involved in transactions related to the development.

**2.17** Externalities may be in the form of environmental effects such as visual, cultural, noise, water or air pollution effects. Externalities in an economic context may relate to the provision of infrastructure where a strict user pays system is not in place, and road transport congestion and safety effects.

**2.18** Consideration of the efficient allocation of resources must encompass the extent to which externalities will or are likely to exist, but the existence of externalities

does not necessarily imply the need for intervention. This is because intervention in the market, for example to limit where residential development may occur, is not costless in that it prevents optimum resource allocation from the perspective of the market. Also there may be external benefits associated with allowing additional development to occur at a particular location (e.g. Rolleston West) and these need to be taken into account.

**2.19** Therefore, from the point of view of community economic well being and economic efficiency, market interventions such as land use constraints should only be imposed where clear external costs have been identified and the significance of these external costs is such that it outweighs the costs of the particular form of intervention proposed. Further, restricting development having considered only potential negative externalities relies on partial or incomplete analysis and will lead to suboptimal outcomes. It ignores not only positive externalities, but also the economic and other benefits inherent in market determined solutions. In other words to justify land use controls, which restrict free market outcomes, externality costs must be identified and they must be significant enough to outweigh the inherent cost of not allowing a free market solution and any positive externalities that may be associated with that free market solution. This approach is consistent with the requirements under section 32 of the RMA to assess the effectiveness, efficiency and benefits and costs of proposed provisions in district plans.

## 3. BACKGROUND TO SELWYN DISTRICT AND GREATER CHRISTCHURCH ECONOMIES[5]

### Population

**3.1** Statistics New Zealand's June 2020 population estimate for the Selwyn District is 69,700 or 1.4% of New Zealand's population. This is 5.1% higher than in 2019. New Zealand's population in 2020 was 2.1% higher than in 2019. In 2001 population in the District was estimated to be 28,000, implying an increase of 148.9%over the period 2001 to 2020, as compared to only 31.0% for New Zealand as whole. Statistics New Zealand's 'medium' population projections[6] have the Selwyn District's population increasing to 99,500 in 2043 – i.e. an average rate

[5]Data in this section from Statistics New Zealand unless stated otherwise.
[6]Statistics New Zealand prepare three sets of projections – high, medium and low – according to natural population change (i.e. the net effect of birth and death rate assumptions) and net migration assumptions. These projections do not explicitly incorporate assumptions about different rates of economic development.

of increase of 1.6% per annum over the period 2020-43, compared to an average rate of growth for New Zealand of 0.7% per annum. However it is likely the population projection rates for Selwyn District (and New Zealand) will be revised upwards as population estimates in recent years have been higher than previously forecast.

**3.2** Christchurch City's population has grown from 335,300 in 2001 to 394,700 in 2020 – i.e. growth of 17.7%. It is forecast to grow to 459,100 in 2043 at an average rate of growth 0.7% per annum. Waimakariri District's population has grown from 37,900 in 2001 to 64,700 in 2020 – i.e. growth of 70.7%. It is forecast to grow to 83,100 in 2043 at an average rate of growth 1.1% per annum. The Christchurch earthquakes have contributed to faster population within the Selwyn District and to a lesser extent the Waimakariri District than for Christchurch City. However this faster population growth within the Selwyn District is forecast to continue.

**Employment**

**3.3** Employment within the Selwyn District has grown from 9,400 in 2001 to 18,900 in 2019 – i.e. growth of 101.1%. For Christchurch City employment has grown from 165,200 in 2001 to 217,500 in 2019 implying growth of 31.7%. For the Waimakariri District employment has grown from 7,700 in 2001 to 15,200 in 2019, implying growth of 97.4%. Whilst the Selwyn District remains principally a "dormitory area" for Christchurch City, the District has exhibited much higher growth in employment over the 2001-19 period than for Christchurch City (and the Waimakiriri District).

**Gross Domestic Product (GDP)[7]**

**3.4** The Selwyn District's GDP was $2,666 million in 2019. This was up 6.8% over the previous year, more than double national growth of 3.0%.The District's rate of GDP growth over the period 2001 to 2019 has been consistently higher than the national rate each year except in 2008 and 2017. For example, over the period 2009 to 2019, GDP in the District has grown by 87.2%, or at an average rate of 6.5% per annum. This compares with a national increase in GDP of 28.7%, or an average rate of 2.5% per annum.

[7]Data in this section from Infometrics Selwyn District 2019 Economic Profile.

**3.5** In 2019 the most important sectors in the District in terms of GDP were agriculture, forestry and fishing[8] (17.6%), manufacturing (12.6%), construction (8.1%), professional, scientific and technical services (7.5%), rental, hiring and real estate services (6.7%), public administration and safety (6.1%) and education and training (4.6%). Manufacturing has increased its share of GDP from 7.9% in 2009, when it then sat behind agriculture, forestry and fishing (24.2%), public administration and safety (12.9%) and educational and training (7.9%).

## 4. ECONOMIC BENEFITS OF PROPOSED ROLLESTONWEST PLAN CHANGE

### Additional Employment, Incomes and Expenditure

**4.1** The residential development enabled by the proposed Plan Change will bring expenditure, incomes and employment opportunities for local businesses and residents within the Selwyn District and also Christchurch City businesses and residents. However the extent to which the proposed rezoning will generate additional expenditure, incomes and employment for the Selwyn District and Christchurch City will be limited to the extent the rezoning results in greater competition and potentially lower prices and therefore greater demand for housing within Greater Christchurch.

**4.2** Increases in expenditure, incomes and employment within the local Selwyn District economy during the construction phase and subsequently increased population within the District are not in themselves measures of improvements in economic welfare or economic wellbeing. However, there are economic welfare enhancing benefits associated with increased levels of economic activity and population. These relate to one or more of:

(a) Increased economies of scale: Businesses and public sector agencies are able to provide increased amounts of outputs with lower unit costs, hence increasing profitability or lowering prices;

(b) Increased competition: Increases in the demand for goods and services allow a greater number of providers of goods and services to enter markets and there are efficiency benefits from increased levels of competition;

[8] Principally agriculture.

(c) Reduced unemployment and underemployment[9] of resources: To the extent resources (including labour) would be otherwise unemployed or underemployed, increases in economic activity can bring efficiency benefits when there is a reduction in unemployment and underemployment. The extent of such gains is of course a function of the extent of underutilized resources at the time and the match of resource requirements of a project and those resources unemployed or underemployed; and

(d) Increased quality of central government provided services: Sometimes the quality of services provided by central government such as education and health care are a function of population levels and the quality of such services in a community can be increased if increased economic activity maintains or enhances population levels.

**4.3** To the extent that the proposed Plan Change does result in additional economic activity and population within the Selwyn District it will contribute to these types of economic benefits for the local economy.

**4.4** Also, to the extent that the rezoning generates additional local employment opportunities for Selwyn District residents during the construction phase and subsequently as a result of greater population in the District, it will reduce their reliance on employment opportunities in Christchurch City and therefore potentially reduce their commuting transport costs.[10]

**Increased Competition and Choice in Residential Housing Markets**

**4.5** As covered earlier in this report discussing the justification for land use controls, there are economic efficiency benefits from encouraging greater reliance on market determined land use outcomes and eliminating unnecessary constraints on market activity. The National Policy Statement on Urban Development Capacity 2016 (NPS-UDC) states[11]:

[9]Underemployment differs from unemployment in that resources are employed but not at their maximum worth; e.g. in the case of labour, it can be employed at a higher skill and/or productivity level, reflected in higher wage rates.
[10]There may be additional commuting costs for Christchurch residents attracted to jobs at the Rolleston South development site, depending on their place of residence and the location of alternative employment for them.
[11] At page 4.

*"Competition is important for land and development markets because supply will meet demand at a lower price where there is competition. There are several key features of a competitive land market and development market. These include providing plenty of opportunities for development. Planning can impact on the competitiveness of the market by reducing overall opportunities for development and restricting development rights to only a few landowners.*

*This national policy statement requires councils to provide in their plans enough development capacity to ensure that demand can be met. This includes both total aggregate demand for housing and business land, and also the demand for different types, sizes and locations. This development capacity must recognise that not all feasible development opportunities will be taken up. This will provide communities with more choice, at lower prices."*

**4.6** In addition, Policy PA3 of the National Statement requires that when making planning decisions particular regard be given to:

*"a) Providing for choices that will meet the needs of people and communities and future generations for a range of dwelling types and locations, working environments and places to locate businesses;* and

*c) Limiting as much as possible adverse impacts on the competitive operation of land and development markets.*"

**4.7** Under the heading "Responsive Planning" the NPC-UDC contains a number of policies requiring local authorities such as the Selwyn District Council with part, or all, of either a medium-growth urban area or high-growth urban area within their district or region to make available sufficient land capable of housing and business development. For example, policy PC1 requires the Selwyn District Council:

*"To factor in the proportion of feasible development capacity that may not be developed, in addition to the requirement to ensure sufficient, feasible development capacity as outlined in policy PA1[12], local authorities shall also provide an additional margin of feasible development capacity over and above projected demand of* ***at least****:*

[12]Policy PA1 relates to local authorities having to ensure that at any one time there is sufficient housing and business land development capacity with different requirements for the short, medium and long term.

*20% in the short and medium term, and*

*15% in the long term."* (Emphasis added)

**4.8** The NPS-UDC places emphasis not simply on aggregate residential land capacity sufficiency but also on attempts to improve the competitiveness of the market, greater focus on land supply and not just land capacity and addressing the housing affordability issue.

**4.9** The National Policy Statement on Urban Development 2020 (NPS-UD) came into effect on 20 August, 2020 replacing the National Policy Statement for Urban Development Capacity 2016 (NPS-UDC)). The NPS-UD is intended to place even greater emphasis on overcoming imperfections in residential (and other land) development markets to help arrest declining housing affordability trends throughout New Zealand, especially those areas experiencing high rates of urban growth. The NPS-UD, like its predecessor the NPS-UDC, establishes minimum, not maximum margins for feasible residential and business land development capacity to exceed projected demand in the short, medium and long term to overcome frictions in land markets to address housing affordability issues.

**4.10** Objective 2 of the NPS-UD states:

*"Planning decisions improve housing affordability by supporting competitive land and development markets."*

**4.11** Also at section 3.22 the NPS-UD refers to the need for residential (and business) land capacity to exceed forecast demand by a "competitiveness margin" to support choice and competitiveness in housing (and business) land markets, whilst at section 3.25 the NPS-UD places emphasis on the need for housing development capacity to be reasonably expected to be realised.

**4.12** RWRL's proposed Plan Change will help address constraints in the residential land supply markets. It will increase supply and competition and help address housing affordability within the Selwyn District and Greater Christchurch. It is therefore consistent with Objective 2 and other sections of the NPS-UD, which places even greater emphasis on these issues than its predecessor, the NPS-UDC.

**4.13** The proposed Plan Change is also consistent with various components of the NPS-UD's Policy 1 in that it will help:

*"meet the needs, in terms of type, price, and location, of different households"* (Policy 1(a)(i)); and

*"support, and limit as much as possible adverse impacts on, the competitive operation of land and development markets* (Policy 1(d)).

**4.14** Policy 2 of the NPS-UD, like the NPS-UDC again uses the term "at least" in discussing the need for local authorities to provide development capacity for housing and for business land over the short term, medium term and long term. In Policy 7 and at section 3.6 of the NPS-UD, the term "bottom lines" is used when requiring that development capacity exceed expected demand by at least the competiveness margin percentages specified. Therefore the NPS-UD makes an even stronger statement than the NPS-UDC that such margins should be interpreted as minimum not maximum thresholds.

**4.15** Policy 8 of the NPS-UD states:

*"Local authority decisions affecting urban environments are responsive to plan changes that would add significantly to development capacity and contribute to well-functioning urban environments, even if the development capacity is:*

*(a) unanticipated by RMA planning documents; or*

(b) *out-of-sequence with planned land release."*

**4.16** Policy 8 NPS-UD underscore that the NPS-UD seeks to encourage urban development rather than to unnecessarily restrict it and the proposed Plan Change is consistent with this and other parts of the NPC-UD.

## 5. POTENTIAL ECONOMIC COSTS OF PROPOSED ROLLESTON WEST PLAN CHANGE

### Lost Agricultural Production

**5.1** The areas to be covered by the proposed Plan Change are zoned "Rural Residential" and are currently used for mostly cropping and some pastoral

grazing. However, any lost agricultural production is not an external cost of using the site for residential development. The productive value of the land in alternative uses (such as agricultural and other use) has been internalised into the cost structure of the development – in other words RWRL in agreeing to purchase the land has agreed a price reflective of future net returns from alternative uses for the land. Such costs are not costs to be borne by the wider community. In any case the land in agricultural terms is relatively unproductive. Also zoning land in excess of projected demand will mean that if the Rolleston West land is developed in advance of other land zoned for residential development, this other land will generally[13] not be taken out of alternative productive use, so there is a transfer of economic activity rather than a net loss in productive use.

**Retail Effects**

**5.2** The retail centres proposed to be included within each of the Holmes and Skellerup Blocks to be developed are intended only to meet the convenience needs of the local residents and will be governed as to scope and scale by the controls for Neighbourhood Shopping Centres contained within the Selwyn District Plan. There will be no provision for supermarkets and the centres will not undermine the viability, vibrancy and amenity values of existing larger centres within Rolleston or elsewhere within the Selwyn District, noting that retail activity will be limited in the each centre to a total floor area of 450m$^2$, and individual tenancies will not exceed 350m$^2$. To the extent that the Plan Change increases the extent of residential development in Rolleston and the District, the proposed Plan Change will increase the viability, vibrancy and amenity values of larger centres in Rolleston and the District.

**Utilities**

**5.3** Externality costs can arise when utilities provided by central or local government (e.g. roads, water supply, storm water and flood control systems and wastewater disposal) are not appropriately priced, requiring their provision to be cross-subsidised by other District ratepayers. In the case of residential development on RWRL's Rolleston West sites no such externality costs will arise. Development contributions, rates and user charges will cover the capital and ongoing O&M

[13] In some cases partial development of an area zoned for residential use may preclude alternative productive use or reduce the productivity of the land not yet developed.

costs associated with Council provided services. In addition petrol taxes, road user charges, and roading costs payable as part of annual rates, will meet the costs for local roads and state highways. The extent to which bulk infrastructure capacity will need to be duplicated or future increments of capacity brought forward will depend upon site specific factors. These issues are addressed in the technical reports of the Plan Change application, which concludes that the proposed development on each of the blocks of land can be fully serviced from existing or development related upgrades to the infrastructure capacity within the infrastructure networks.

**5.4** Therefore other Selwyn District ratepayers, residents and businesses will not be required to cross-subsidise the proposed rezoning and subsequent development of residential development on the sites.

**Transport Costs**

**5.5** Rezoning land more distance from employment, retail and commercial centres, recreational and entertainment facilities, educational institutions and public facilities such as hospitals and libraries may lead to increased transport costs if, as a result, more distant residential areas are developed in preference to those not so distant to these facilities. However, for the most part any such additional transport costs are internalised to owners (or renters) of the newly developed properties.

**5.6** Only to the extent there are additional transport externality costs – e.g. road accidents, congestion and greenhouse gas emissions – are the effects of traffic generated by the development a relevant consideration. In the case of residential development on the Rolleston West Holmes and Skellerup Blocks, the Traffic Assessment prepared by Novo Group has concluded that the local road network can safely and efficiently accommodate the traffic that would be generated from their proposed development. Also the site is adjacent, and well connected to the existing Rolleston urban area and therefore travel distances to key facilities (schools, retail facilities, employment centres, etc.) are likely to be similar to alternative residential development sites within the Selwyn District.

## 6. DEVELOPMENT CAPACITY SIGNIFICANCE OF PROPOSED ROLLESTON WEST PLAN CHANGE

**6.1** As noted above in Section 4 of this report Policy 8 of the NPS-UD states:

*"Local authority decisions affecting urban environments are responsive to plan changes that would add significantly to development capacity and contribute to well-functioning urban environments, even if the development capacity is:*

*(a) unanticipated by RMA planning documents; or*

(b) *out-of-sequence with planned land release."*

**6.2** Section 3.8 of the NPS-UD states that:

*Every regional council must include criteria in its regional policy statement for determining what plan changes will be treated, for the purposes of implementing Policy 8, as adding significantly to development capacity.*

Because the NPS-UD only came into effect in August 2020, Environment Canterbury has yet to revise its current Regional Policy Statement to align with this requirement of the NPS-UD and indicate the basis for determining "significant" development capacity.

**6.3** However, there can be little doubt that the additional housing development capacity that would be enabled by the proposed Rolleston West Plan Change would be significant, whether in the context of Rolleston or at a wider Selwyn District level.

**6.4** Selwyn District has a current population of 69,700 implying around 24,890 households, assuming an average of 2.8 persons per household[14]. Therefore the proposed development of up to 2,100 dwellings represents around 8% of the existing dwellings in the District. RWRL expects that once the Plan Change is approved (assumed to be sometime in 2021), development of the up to 2,100 dwellings will approximately occur over an 8 year period – i.e. from say mid–2021 to mid-2029, with an average of up to 260 dwellings coming onto the market in each of the 8 years 2022-2029 (inclusive).

**6.5** Within the context of Rolleston the development capacity enabled by the proposed Rolleston West Plan Change is even more significant. The current estimated

[14]This is the average size of household assumed by Statistics New Zealand in their medium growth forecasts over the next decade.

population of Rolleston is 21,910[15] or 7,825 households assuming an average of 2.8 persons per household. The up to 2,100 additional dwellings of the proposed Plan Change represents up to 27% of the existing dwellings.

**6.6** Furthermore, the population of Rolleston is proposed to be around 26,927 or 9,616 households in the year 2029/2030[16], when the development may be coming towards its capacity. Therefore, at that time, the up to 2,100 dwellings of the proposed Plan Change would represent up to 22% of the total dwellings in the District at that time.

## 7. CONCLUSIONS

**7.1** RWRL's proposed Plan Change enabling the rezoning of Rural Residential land at Rolleston West to Residential land will provide for increased competition and choice in residential land markets and help address declining housing affordability. It may also increase levels of economic activity and population in Rolleston and the Selwyn District.

**7.2** The proposed Plan Change is consistent with the Government's recently released National Policy Statement on Urban Development 2020 and its predecessor, the National Policy Statement on Urban Development Capacity 2016.

**7.3** The Plan Change will not give rise to economic externality costs.

**7.4** The Rolleston West Plan Change is consistent with:

(a) Enabling "*people and communities to provide for their … economic (and social) ... well being*"; and

(b) Having regard to *"the efficient use and development of natural and physical resources"*.

[15] Source: Statistics New Zealand NZStat. Subnational population estimates (RC, SA2) by age and sex at 30 June 1996-2020 (2020 boundaries). Equal to the sum of Rolleston Izone, Rolleston North-west, Rolleston Central, Rolleston North-east, Rolleston South-west and Rolleston South-east statistical areas.
[16] Selwyn District Council Transport Activity Management Plan; 2018:
https://www.selwyn.govt.nz/services/roads-And-transport/transportation-activity-mgt-plan (section 2, page 47).

**7.5** The Plan Change would add significantly to residential development capacity both in the context of the existing scale of Rolleston and the Selwyn District, and for the future forecast growth of both areas.

# Appendix H

# Odour Assessment

11 November 2020 Project No. 20438027_7403-002-L-Rev0

**Jeremy Phillips**
Novo Group
Level 1, 279 Montreal Street
Christchurch

**REVIEW OF ODOUR EFFECTS RELATING TO HOLMES AND SKELLERUP BLOCKS - ROLLESTON WEST PLAN CHANGE**

Dear Jeremy,

This letter report[1] provides a review of the potential odour effects due to the odour generating activities in the vicinity of the "Holmes" and "Skellerup" blocks (the blocks) located to the west of Rolleston if these blocks are changed to a residential land use. It is understood that Rolleston West Residential Ltd (RWRL) intend to submit on the Selwyn District Council (SDC) Plan change with the aim of achieving the rezoning the blocks from rural-residential to conventional residential (12 households/hectare density). These blocks currently have areas where housing density is restricted due to potential reverse sensitivity effects upon existing nearby waste management activities which discharge odour. The areas are referred to as Odour Control Setback Area in the operative Selwyn District Plan (the Plan) and are shown in Appendix 39 and 40 of the Plan for the Holmes and Skellerup blocks respectively. The location of the Holmes and Skellerup blocks are shown in Figure 1 and Figure 2.

The Odour Control Setback Areas are understood to be based on reviews of consented and existing activities in the vicinity of the blocks during the SDC plan change 8 and plan change 9 hearings (PC8 and PC9). These were private plan changes by the Selwyn Plantation Board Limited (SPBL) during 2010-2011 to change the zoning of these blocks to be rural-residential. Golder Associates (NZ) Ltd (Golder 2008) provided advice to the SPBL in support of these plan changes.

The scope of this review is an assessment on the requirements to avoid significant reverse sensitivity to odour effects due to the proposed rezoning of the Holmes and Skellerup blocks. This review utilises previous work by Golder (2008) for the SPBL in the regards to the Reverse sensitivity effects associated with PC8 and PC9. The review also accounts for changes in land use since 2008 including consideration of any new consented activities, cessation of activities and known consented changes in operation of odour generating activities. Any changes in published buffer distances referred to by Golder (2008) will also be considered. Where necessary, Golder has used its professional judgement in combination with available buffer guidance to assess a suitable buffer for each of the activities to ensure only minor or less reverse sensitivity effects from the proposed land use changes. This review relies on information publicly available at the time.

[1] This letter is subject to the limitations provided in Attachment 1.



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A brief description of the odour generating activities and any changes to these is provided in Section 1.0. This is followed by a review of buffer distance criteria for each activity and any other mitigating factors that may be applied - Section 2.0. Finally, overall recommendations on limitations on the locations of residential dwellings is provided Section 3.0.

# 1.0 ODOUR GENERATING ACTIVITIES

## 1.1 Overview

Activities identified in the previous Golder (2008) assessment include the following three potentially odorous activities:

- The Rolleston Wastewater Treatment Plant and disposal site (herein referred to as the "Pines WWTP");
- Rolleston Resource Recovery Park (herein referred to as Pines Resource Recovery Park "PRRP"); and
- Tegel Foods Limited's intensive poultry farming sheds (herein referred to as "Tegel's poultry operation").

Our review of existing consents in the vicinity of the Holmes and Skellerup blocks finds that the Pines WWTP and the PRRP hold active air discharge consents with the Canterbury Regional Council (CRC). Tegel's poultry operation does not – and it is understood that one is not required. We have also identified dairy effluent irrigation consents on the north side of State Highway 1, however due to the buffer distance to these activities and restrictions within the associated air disharge consents for these activities, these activities are not expected to result in significant odour effects on the Holmes or Skellerup blocks. These activities have not been considered further.

A description of the operation of the above activities is provided in Golder (2008) and a summary of the operation and changes to the consented operation since the Golder (2008) report are provided in the sections below.

## 1.2 Pines WWTP

Golder (2008) concluded that potential odour nuisance from the Pines WWTP would be associated with:

- Biosolids handling, storage and disposal;
- Secondary treated effluent irrigation; and, to a lesser degree;
- The primary effluent treatment process.

Based on our current understanding of the activity, these are still the main sources of potential odour nuisance for the blocks, if developed to residential areas.

Based on a review of the consents associated with the Pines WWTP, it appears that no changes have been made to the primary effluent treatment processes.

There have been changes[2] to the consent for biosolids application to land (current consent is CRC210644). It is noted that the current consent clarifies that the method of further processing biosolids is solar drying in

[2] These are for reduced bore monitoring following upgrades to reticulated water supply for the potentially affected parties, and increases to the limits of zinc and copper contained in the biosolids.

glasshouses. This method of processing is expected to have a lower odour potential compared to biosolids processing via composting.

There are no changes to the classification (i.e., Class Aa) required by this consent for the biosolids that can be applied to land, which would alter the odour potential from this activity.

There have been several changes to the conditions of the Pines WWTP consent (current consent number CRC153952) which impact the extent of the potential odour effects due to irrigation of the treated effluent. The consent now defines different restrictions for treated effluent irrigation for various areas, including that adjacent to the western boundary of the Holmes Block. There are specific additional conditions in CRC153952 (Conditions 35 to 42) that were contingent on the then proposed Plan Change 8 to the Selwyn District Council resulting in the Holmes block being rezoned rural residential. As the proposed plan change was successful, it is assumed that Conditions 35 to 42 apply.

Under these consent conditions, the irrigation of treated effluent is allowed to occur up to 25 m from the common boundary (Condition 40c), subject to meeting criteria related to the irrigated water quality, method of irrigation and boundary planting. The distance to the boundary is increased if:

- The water quality limits are not achieved. This would mean that during wind conditions that would put the Holmes block downwind, irrigation cannot occur within 200 m from the common boundary (Condition 39a).
- The method of the irrigation does not meet Condition 43, irrigation cannot occur within 150 m of the common boundary. Condition 43 sets irrigation nozzle parameters to maximise droplet size,
- The shelter belt planting does not meet the requirements of Condition 40. In this case irrigation cannot occur within 150 m of the common boundary.
- The irrigator has been turned off for 24 hours there can be no irrigation with 200m of the boundary. This is to prevent treated effluent that is potentially anaerobic being irrigated close to this boundary.

From a review of recent aerial photographs, it appears that irrigation is undertaken up to 150 m from the boundary, and this appears to be due to the incomplete shelterbelt planting.

All of the above consent provisions reduce the risk of odour, pathogens and aerosols causing significant air quality impacts within the Holmes block. Given the water quality parameters required of the irrigated effluent (e.g., mean suspended Solids of 20 g/m$^3$, mean biological oxygen demand of 15 g/m$^3$), it is considered to be of a tertiary treated standard, and therefore the potential for adverse odour effects is expected to be low. However, there is a risk of pathogens (pathogens can include bacteria, parasites and viruses that are contained in human waste) being discharged and impacting the Holmes block if pathogens in the treated effluent significantly exceed the consent limit of 500 CFU/100 ml (median).

In terms of land that may be used in the future for treated effluent irrigation, there does not appear to be any additional blocks of land that are in the immediate vicinity of the Skellerup or Holmes blocks that appear to be obvious candidates for treated effluent irrigation.

## 1.3 Pines Resource Recovery Park - PRRP

The operations at the PRRP includes a composting facility and a refuse transfer operation. Changes to the operation of these are discussed below.

### 1.3.1 Composting

At the time of the Golder (2008) report, composting of green waste and putrescible waste (excluding biosolids) was consented (CRC041489) to be undertaken at the PRRP using an in-vessel process. An indicative maximum of 2,000 tonnes per annum of organic material was consented to be processed at the site. A HotRot system had been proposed to be used for the initial stages of composting with static piles used for the final maturation.

In 2019 (CRC190492) consent was granted for the removal of the in-vessel based system and for composting to be undertaken using an open windrow-based system. Also included in the application was explicit reference to the types of organic waste composted. These include kerbside organics (considered to be mostly garden waste and food scraps) and green waste.

A Golder review[3] of the application for Environment Canterbury prior to it being granted, concluded that the site was likely to produce more odour than it had in the past. However, due to the distance to the nearest sensitive receptors, it was unlikely to increase odour effects. The review noted that the scale of the operation is not explicitly constrained via consent condition (either in the previous consent or in the application for CRC190492), but the assessment of effects was on the basis of the current throughput of 4,200 Tonnes per year. The Golder review also recommended regular oxygen monitoring to confirm that compost was maintained in an aerobic state.

The use of an open air windrow-based composting system is considered to have increased risk of odour compared to the originally consented in-vessel system.

### 1.3.2 Refuse transfer operations

There have been no documented or consented changes associated with the refuse handling.

## 1.4 Tegel's Poultry Operation

Tegel operates seven breeder (egg laying) sheds between Dunns Crossing Road and Edwards Road. The Tegel operation is directly adjacent and to the north of the Skellerup block. Based on discussion with RWRL, Golder understands there have been no changes to the Dunns Crossing Road farm and there are no increases in operation planned.

# 2.0 RECOMMENDED BUFFER DISTANCES

## 2.1 Pines WWTP

### 2.1.1 Wastewater Treatment plant

Both the South Australia (SA) EPA and Victoria (Vic) EPA (EPA Victoria, 2012, South Australia Environment Protection Authority 2019) recommend buffer distances for wastewater treatment plants. These guidance documents have been updated since Golder, 2008. The SA EPA and the Vic EPA guidance reports buffer

[3] Letter M McCauley to Matthew Harrison (Environment Canterbury) dated 20 August 2018. Golder Ref 1791554-7403-007-LR-Rev0

distances are based on the installation treatment capacity (population equivalent - PE) and the type of treatment process. Golder (2008) discussed that the Pines WWTP had a future design capacity for a PE greater than 80,000, and this has been assumed.

The SA EPA reports the same buffer criteria of 300 m for a mechanical/biological treatment plant with PE <15,000. No buffer guidance is available for a treatment capacity PE greater than this.

Vic EPA provides an equation to calculate the buffer distance and based on this, a 430 m buffer is calculated for the 80,000 PE.

Previously Golder (2008) recommended a buffer distance of 500 m from the WWTP based on experience with similar operations in New Zealand, and this is retained in this assessment.

### 2.1.2 Biosolids handling, storage and disposal

For biosolids, the method of further processing the biosolids has been refined to be solar drying in glasshouse. ACT EPA recommend a distance of 400 m for this activity. No other relevant buffer criteria could be identified. This is a reduction on the 1,000 m recommended by Golder (2008) and which was based on potential composting of biosolids – composting is considered to be a potentially more odorous activity than solar drying.

With regard to land spreading of biosolids, Golder (2008) recommended a 500 m buffer to residential areas and as there have been no changes to the classification of the biosolids that could have impacted on the potential for odour effects. The recommendation of a 500 m buffer between land spreading of Class Aa biosolids and residential areas is retained.

### 2.1.3 Spray irrigation

While it is considered that the mitigation in place (See Section 1.2) will minimise the risk of odour. There is still a residual health risk due to pathogens associated with the consented irrigation of treated wastewater, and this is heightened with any discharge that does not comply with the consent limit of 500 CFU/100 ml.

It is considered that aerosol's generated from an irrigator nozzle, can travel up to approximately 200 m prior to desiccation. The planting required by the Pines WWTP is likely to provide a reasonably effective mitigation to aerosol carryover, as the ability for trees to act as a physical barrier to aerosols is considered effective[4]. RWRL have indicated that bunding and planting will be installed on the western boundary of the Holmes site. It is considered dense planting – similar to that required by the Pines WWTP would further reduce the potential for irrigation generates aerosols and associated pathogen risk, impacting beyond the shelter belts.

While the risk of pathogens being dispersed is generally associated with the risk of aerosol carryover, virus' are understood to potentially be more resilient and not reliant on droplets and we cannot comment on the ability to virus' to survive after desiccation. Although, as with aerosols, the shelter belts are expected to be effective at removing viruses, including those that have become desiccated.

Given the planting (both on the Pines WWTP side and the Holmes block side) and other consent conditions relating to the effluent quality, it is considered that no internal setback within the Holmes block is required to adequately mitigate odour effects.

[4] Evidence R Chilton for the Selwyn Plantation Board in the matter of applications CRC 101109, CRC1011111 and CRC 040100.1 related to the expansion of the Pines WWTP.

With regard to pathogen risk, it is considered likely that a 200 m setback would usually be sufficient to protect against pathogen risk associated spray irrigation of tertiary treated municipal effluent, assuming no shelter belts.

This buffer can be significantly reduced (given the proposed shelter belts on both the Pines WWTP property and a similar shelter belt on the adjacent Holmes block boundary. We recommend a setback of 100 m (between irrigated areas and nearest residential notional boundary) is maintained between the at this stage. To achieve this, with the Pines WWTP current consented operation, a setback of 75 m within the Holmes Block is required. However, a further detailed assessment at the time of any subdivision consent application may confirm that a lesser standard of mitigation/separation distance is appropriate'

Alternatively to the above, a setback could be maintained within the Pines WWTP irrigation area to mitigate against pathogen risk, rather than relying on a buffer/mitigation within the Holmes block.

## 2.2 Pines Resource Recovery Park

### 2.2.1 Waste transfer operations

The waste transfer operations have not changed since Golder (2008) and there are no changes to the reported buffer distances in the South Australia, Victoria and Western Australian EPA guidance. Therefore, Golder's previous recommendation of a 300 m buffer is retained.

### 2.2.2 Composting

As discussed in 1.3.1, the current consent allows for an uncovered windrow system and while there are no limits in the conditions, the application for the current active consent was based on a throughput of 4,200 T/year.

South Australia EPA, Victoria EPA, Western Australia EPA all provide recommended buffer distances for composting operations, these are discussed further below.

South Australia EPA: The SA EPA buffer guidance (South Australia Environment Protection Authority, 2019) provides an evaluation distance of 1,000 m for composting operations greater than 200 tonnes/year.

Victoria EPA: Vic EPA have provided specific guidance on composting (EPA Victoria, 2017). This provides examples of appropriate buffer criteria depending on the through-put of the operation, type of material being processed, and the type of composting process being used. It is notable that open air composting system for processing mixed source separated kerbside (Garden waste/food waste – FOGO[5]) is not recommended and no buffer criteria are provided. For an open air, with only green waste operation with a throughput of to 1,200 tonnes per year, a buffer distance of greater than 600 m is recommended and for up to 14,000 tonnes per annum >1,100 m is recommended.

Western Australia EPA: For an open air composting operation with manure, mixed food, putrescible and vegetative waste, WA EPA recommends a buffer distance of 1,000 m.

In summary on the basis that the throughput is maintained close to the current throughput, i.e., limited to 4,200 tonnes/annum and there is a high degree of control in the manufacture of the compost, the leachate management (particularly maintaining both of these in an aerobic state), and given the location of the

[5] Food Organics and Garden Organics

proposed residential area, a buffer distance of 600 m is considered to be reasonable. This is consistent with the distance to the existing dwelling to the north east of the compost operation.

## 2.3 Tegel's Poultry Operation

Based on that there having been no changes to the Tegel operation, Golder's 2008 recommended buffer distances of 150 m is retained as a recommendation.

# 3.0 SUMMARY

Table 1 provides a summary of the recommended buffer distances to mitigate odour effects. With respect to pathogen risk from irrigation of treated effluent, an upper estimate of an additional setback distance required given the proposed trees and shelter belt, this setback may be able to be reduced with following a further detailed assessment. Figure 1 and Figure 2 show the recommended buffer distances to mitigate against odour reverse sensitivity for the Holmes and Skellerup blocks respectively.

**Table 1: Summary of distances expected to avoid reverse sensitivity due to odour.**

| Facility | Recommended buffer distance for odour mitigation | Comments |
|---|---|---|
| Pines WWTP – treatment | 500 m from facility | |
| Pines WWTP – biosolids production | 400 m from drying facility | |
| Pines WWTP- Irrigation | 100 m from land used for treated Wastewater irrigation. | This distance is based on pathogen risk, and may be able to be reduced following a detailed assessment. |
| Pines WWTP biosolids land spreading | 500 m from land disposal area | |
| PRRP – waste transfer operations | 300 m from facility | |
| PRRP – composting | 600 m from compost area | Based on throughput of 4,200 tonnes per annum and good control on leachate and compost. |
| Tegel Poultry Operation | 150 m from sheds | |

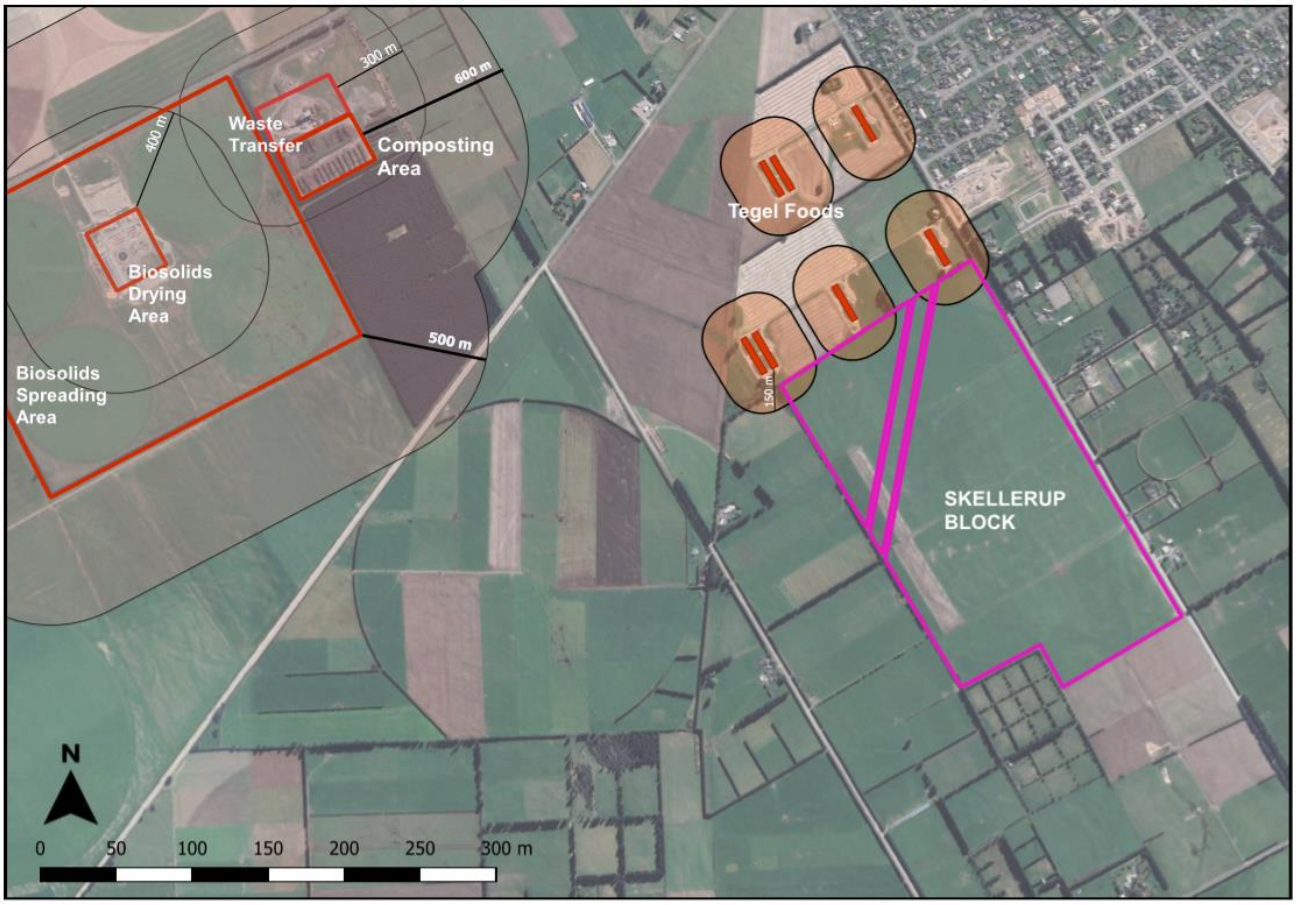



**Figure 1: Recommended buffer distance for Skellerup block.**

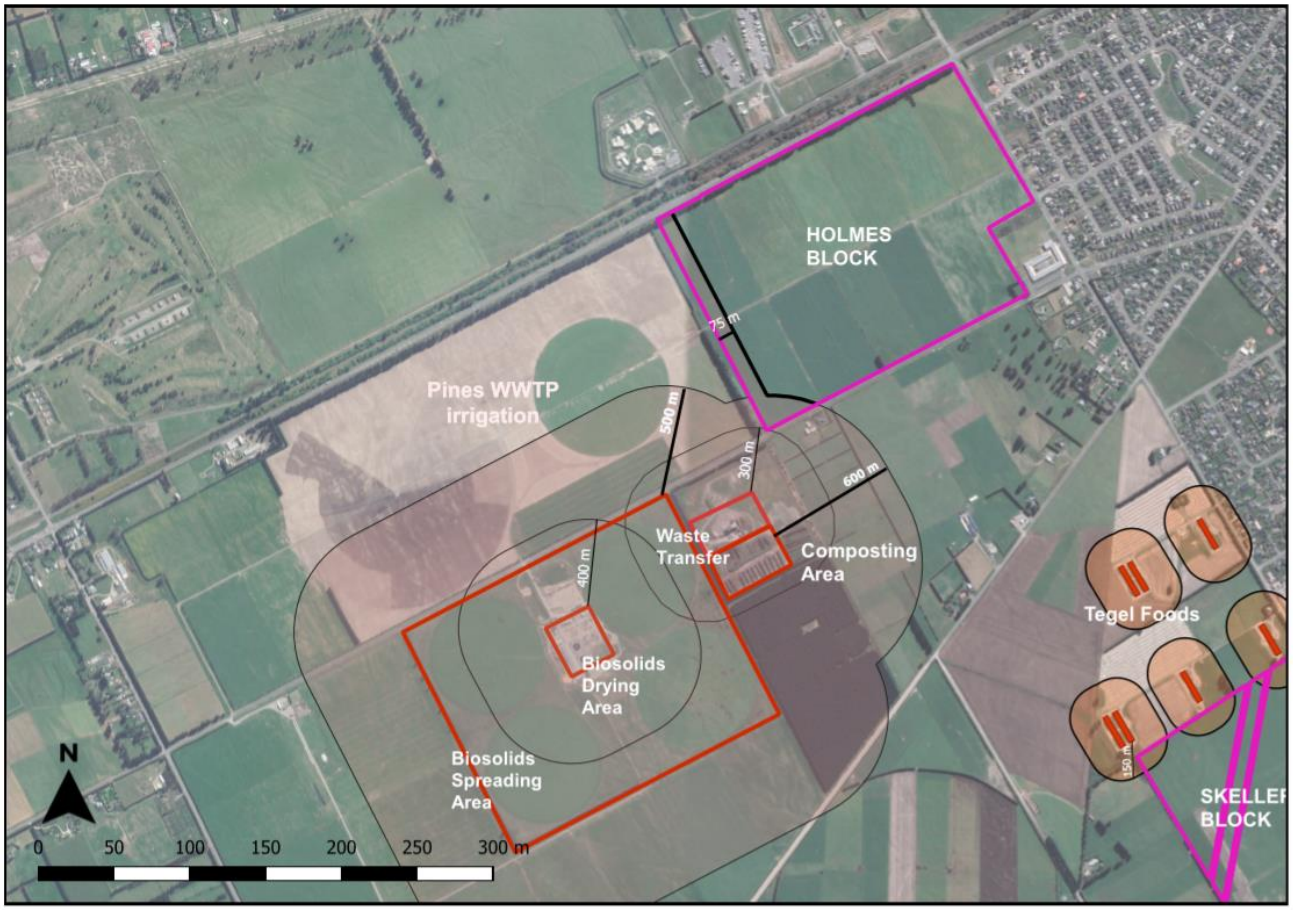



**Figure 2: Recommended buffer distance for Holmes block.**

## 4.0 CONCLUSION

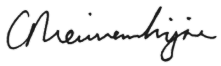
Based on our assessment above and subject to the recommended mitigation measures/buffers shown in Section 3.0, we consider that rezoning from rural-residential to residential would not result in reverse sensitivity to odour effects.

## 5.0 CLOSING

We trust the above information will assist RWRL in understanding the potential odour impacts on the Holmes and Skellerup blocks if developed into residential areas. If you have any queries regarding this letter, please contact the undersigned by email at cnieuwenhuijsen@golder.co.nz or by phone at (03) 903 2450.

Yours sincerely,

**Golder Associates (NZ) Limited**



Cathy Nieuwenhuijsen
*Senior Air Quality Consultant*

CN/RC/MU/mt

Attachment: Report Limitations.

https://golderassociates.sharepoint.com/sites/137296/project files/6 deliverables/002 l/20438027_7403-002-l-rev0.docx

## 6.0 REFERENCES

Golder, 2008. Rolleston Odour Assessment prepared by Golder Associates (NZ) for Selwyn Plantation Board Limited. Golder report reference number: SELPL-CHC-004

Environmental Protection Authority Victoria, 2012. Draft guidelines for separation distances for composting facilities, EPA Victoria Publication 1445, 2012.

Environmental Protection Authority Victoria, 2017. Designing, Constructing and Operating Composting Facilities: Guideline. Publication 1588.1, June 2017.

Environmental Protection Authority South Australia, 2019, Evaluation Distances for Effective Air Quality and Noise Management. Issued August 2016, Updated March 2019.

Australian Capital Territory, 2018. Separation Distance Guidelines for Air Emissions. November 2018.

**ATTACHMENT 1**

# Report Limitations

## Report Limitations

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# Appendix I

# Acoustic Assessment

# DESIGN ADVICE MEMO

## ACOUSTIC

| | |
|---|---|
| Memo No | **A01 Issue B** |
| Job Name | **Rolleston West** |
| Job No | **201522/A** |
| Date | **17 November 2020** |
| To | **Novogroup** |
| Email | **jeremy@novogroup.co.nz** |
| Attention | **Jeremy Phillips** |

Signature **James Glen** BEng(Hons) MASNZ AMIOA


P **03 366 1777**

W **www.pfc.co.nz**

383 Colombo St, Sydenham, Christchurch

PO Box 7110, Sydenham 8240 Christchurch


**Rolleston West Plan Change (ODP Area 39 and 40)**

### 1. Introduction

Powell Fenwick has been engaged by Rolleston West Residential Ltd to provide high level feedback regarding the reverse sensitivity noise implications of a proposed rezoning of the Holmes block and the Skellerup block in West Rolleston. Rolleston West Residential Ltd propose plan changes that rezone the land from Living 3 Zone to Living Zone Z. The Holmes block is located at 385 Burnham Rd adjacent to State Highway 1 (SH1). The Skellerup block is located on Dunns Crossing Rd over 1.5km south of SH1. The Skellerup block has no particular identifiable factors which would require noise assessment so therefore has not been considered further in this memorandum.

This memorandum does not constitute a full noise assessment of the Holmes block, which due to the likely noise exposure would be strongly recommended prior to residential subdivision consent. This memorandum is only intended to review the interests of the critical road infrastructure (NZTA SH1) and the amenity of future residential activities which occur onsite, to ensure the rezoning is acceptable from a reverse sensitivity perspective.

Specifically this memorandum draws comparisons between the proposal at 385 Burnham Rd and the nearby subdivisions ODP Area 1 (Stonebrook) and ODP Area 3/8 to gauge the suitability of the proposed rezoning.

### 2. Comparative Review

It is expected that the predominant source of noise which would affect the development will be from SH1. Noise from roads, particularly from busier State Highways can be readily predicted using the procedures detailed within the Calculation of Road Traffic Noise 1988. The relative noise exposure at a particular point is a function of the following variables:

- Traffic volume (annual average daily traffic (AADT))
- Road Surface Type
- Speed
- Gradient
- Angle of view and number of opposing reflecting surfaces.

Based on our review of the available SH1 road information we note the following observations:

- The traffic volume has not significantly increased since 2013 in the vicinity of Stonebrook; the application date of Stonebrook subdivision. Significant increases in traffic volume are required to measurably increase noise levels. As the Stonebrook subdivision is directly adjacent to the Holmes subdivision there will be little variance in traffic volumes.
- For ODP area 3/8 we note that traffic volumes are 20% higher which might equate to about 1 dB difference across the site.

- The road surface for the sections of road adjacent to the subdivisions are chip seal Grade 3/5.
- The marked road speed for the sections of road adjacent to the subdivisions are all 100 km/h (ODP Areas 3/8 temporarily have lower speed limits due to road works but we have assumed 100 km/h.)
- Relevant sections of SH1 have a similar gradient adjacent to the subdivision areas.
- There are no reflecting surfaces directly opposite any of the subdivisions.

Based on the above observations, we consider that the noise exposure at the Holmes Subdivision is likely to be similar to the Stonebrook subdivision and the ODP Areas 3 and 8. We have therefore compared the applicable District Plan rules to each of these Subdivisions in the following Section.

## 3. Rules

Holmes Block

We have been advised that Selwyn District Plan Rule 4.9.38 is applicable to the Living 3 zoned Holmes block (as currently zoned). This is presented below:

> *4.9.38 Any dwelling, family flat, and any rooms within accessory buildings used for sleeping or living purposes, and any internal areas associated with noise sensitive activities in the Living 3 Zone at Rolleston (as shown on the Outline Development in Appendix 39) shall be setback at least 80m from State Highway 1.*

Stonebrook Subdivision

We have been advised that Selwyn District Plan rules 4.9.3 and 4.9.4 are applicable to the Stonebrook Subdivision (as a generic case). These are presented below:

> *4.9.3 Except for the Living 3 Zone at Rolleston identified on the Outline Development Plan in Appendix 39 and Appendix 40, and ODP Area 3 and ODP Area 8 in Rolleston, and the Living 2A Zone in Darfield, as identified in the Outline Development Plan in Appendix 47, any dwelling, family flat, and any rooms within accessory buildings used for sleeping or living purposes shall be located no closer than 40m from the edge of the sealed carriageway of State Highways with a posted speed limit of 70 Km/hr or greater.*
>
> *4.9.4 Except for the Living 3 Zone at Rolleston identified on the Outline Development Plan in Appendix 39 and Appendix 40, and ODP Area 3 and ODP Area 8 in Rolleston, and the Living 2A Zone in Darfield, as identified in the Outline Development Plan in Appendix 47, any dwelling, family flat, and any rooms within accessory buildings used for sleeping or living purposes within 100m from the edge of the sealed carriageway of State Highways with a posted speed limit of 70 Km/hr or greater shall have internal noise levels from road traffic that do not exceed the limits set out below with all windows and doors closed:*
>
> - *Within Bedrooms: 35 dBA (Leq 24 hour)*
> - *Within Living Area Rooms: 40 dBA (Leq 24 hour)*

ODP Area 3 & 8

The below rules 4.9.35 and 4.9.36 are applicable to ODP Area 3/8 from the Operative Selwyn District Plan:

> *4.9.35 In ODP Area 3 and ODP Area 8 in Rolleston, no dwellings shall be located closer than 40m (measured from the nearest painted edge of the carriageway) from State Highway 1*
>
> *4.9.36 In ODP Area 3 and ODP Area 8 in Rolleston, for any dwelling constructed between 40m and 100m (measured from the nearest painted edge of the carriageway) from State Highway 1:*
>
> - *Appropriate noise control must be designed, constructed and maintained to ensure noise levels within the dwelling meet the internal design levels in AS/NZS2107:2000 (or its successor) – 'Recommended design and sound levels and reverberation times for building interiors'*
> - *Prior to the construction of any dwelling an acoustic design certificate from a suitable qualified and experienced consultant is to be provided to Council to ensure that the above internal sound levels can be achieved.*

Table 1 below summarises the requirements of the noise rules presented above, together with supplementary guidance from the NZTA document '*Guide to the management of effects on noise sensitive land use near to the state highway network Sep 2015 V1.0.*'

*Table 1: Comparison of Subdivision Rules*

| Subdivision Rule/Guidance | Setback Distance (m) | Effects Buffer (m) | Noise Criteria |
|---|---|---|---|
| **Living 3 Zone (Rule 4.9.38)** | 80m | n/a | n/a |
| **Stonebrook (Rule 4.9.3/4)** | 40m | 100m | Bedrooms 35 dB $L_{Aeq(24hr)}$ Living areas 40 dB $L_{Aeq(24hr)}$ |
| **ODP Area 3/8 (Rule 4.9.35/36)** | 40m | 100m | Bedrooms 40 dB $L_{Aeq(T)}$, Living areas 45 dB $L_{Aeq(T)}$ – based on AS/NZS 2107:2016 criteria |
| **NZTA Guidance** | 40m | 100m | All habitable spaces 40 dB $L_{Aeq(24hr)}$ |

*Notes: T in LAeq(T) is the duration for which the space is expected to be occupied.*

We have the following commentary on the above rules:

- We have been advised by Novo Group that it is preferable to maintain consistency with rules in the District Plan.
- The original resource consent conditions for the Stonebrook site allowed properties within the 40m area provided that a specialist report was provided. Should residential activities be proposed within the 40m setback zone then we understand that this could be revisited by way of discretionary consent under Rule 4.9.56.
- AS/NZS 2107:2016 is now the most recent version of the standard, although this is accounted for within the rule. We also note that AS/NZS 2107:2016 is applicable to steady-state or quasi-steady-state noise sources and is not applicable to road traffic noise. The noise levels recommended, however, are broadly consistent with the internal noise criterion (Criteria C) presented within NZS 6806 for internal sound levels of 40 dB $L_{Aeq(24hour)}$ within dwellings near new and altered roads (which is also noted in the NZTA Guidance) but differ in the following ways:
    - The time period for assessment in AS/NZS 2107 for varying sources is the duration of the expected usage of the space. Bedrooms, for example, the expected duration might be 8 hours for night time. In this instance a space designed to the NZS 6806:2016 internal noise criterion of 40 dB $L_{Aeq(24hr)}$ would likely result in quieter levels during the night than the AS/NZS 2107:2016 40 dB $_{LAeq(8hr)}$.
    - The assessment of road traffic noise in New Zealand typically considers a 24 hour average $L_{Aeq(24hr)}$ which can readily be calculated from AADT without the need for detailed traffic information. Therefore we consider that the adoption of AS/NZS 2107 is not ideal for road traffic noise.
- The Stonebrook subdivision Rule 4.9.4 also considers a 24 hour average but has a more stringent requirement for bedrooms when compared to broader national and NZTA guidance. The 35 dB $L_{Aeq(24hr)}$ criterion is expected to broadly align with the World Health Organisation Guidelines for Community Noise 1999 guideline criterion of 30 dB $L_{Aeq(8hr)}$.
- The District Plan rules are more lenient (allow higher internal noise levels) than those written in the resource consent conditions (RC 135261). However, we have been advised that the District Plan rule is most relevant.
- The Living 3 Zone rules (whch are currently applicable) do not specify any noise criteria, and instead reverse sensitivity effects are dealt with through set back distances within the zone.
- The word '*maintained*' has been used in the Rule 4.9.36 which could imply that future increases in road noise levels (due to increasing traffic or otherwise) could trigger the occupants of dwellings to retrofit improvement measures. It is assumed that the word '*maintained*' is instead intended to ensure that any future refurbishments or modifications do not result in increased noise levels which exceed the standard. Similar wording is recommended with the NZTA Guide.
- Rules 4.9.4, 4.9.36 specify an internal level rather than a set façade reduction. The rule is therefore applicable to a wide range of developments with varying noise exposures as the target outcome is maintained.

- None of the rules provide any protection of outdoor amenity other than set back distance. The Stonebrook subdivision has a 3m acoustic barrier along the road consisting of a bund and paling fence. It is unclear without conducting a full assessment the extent that the barrier protects the outdoor amenity of the subdivision, however, it is expected to be what is *reasonably* practicable to reduce noise exposure to outdoor areas.
- We note there is no explicit requirement for mechanical ventilation where windows are required to be closed to achieve the internal design sound levels. We understand that this is consistent with the rest of the District.

Considering the above, we recommend that the existing rule wording and noise level criteria in rules 4.9.3 and 4.9.4 should be applicable to the proposed Holmes block (ODP Area 39). This rule wording is consistent with the adjacent Stonebrook subdivision, and with wider design *best practice* for road traffic noise. Any relaxing of this criteria would need to be assessed in more detail as part of a subdivision application.

In order to assist in achieving the internal design sound level criteria and to moderate outdoor noise levels we consider that a 3m high acoustic barrier should be included alongside SH1.The acoustic barrier should provisionally be 3m high and be constructed of a material with a surface mass exceeding 10 kg/$m^2$ such as 24mm overlapped timber palings. The barrier height may be made up in whole or in part by a landscaped bund. The detailed requirements should be determined as part of a subdivision consent.

## 4. Conclusion

Based on our comparative assessment and subject to the proposed rules for the Holmes block described above we consider the Holmes and Skellerup blocks are suitable for rezoning when considering road noise / reverse sensitivity effects.