Planning. Traffic. Development.

Request for Change to the Selwyn District Plan

prepared for

ROLLESTON INDUSTRIAL DEVELOPMENTS LIMITED

Springs Road, Lincoln

October 2020

Request for Change to the Selwyn District Plan

prepared for

ROLLESTON INDUSTRIAL DEVELOPMENTS LIMITED

Springs Road, Lincoln

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

Document Date:	29/10/2020
Document Version/Status:	FINAL
Project Reference:	021028
Project Manager:	Jeremy Phillips, Director & Senior Planner
Prepared by:	Jeremy Phillips, Director & Senior Planner
Reviewed by	Kim Seaton, Senior Planner

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 Industrial Developments Limited ('RIDL') 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 south side of the Lincoln township (to the immediate south of the Te Whāriki and Verdeco residential subdivisions), to the east and west of Springs Road, and to the north of Collins Road. The western and eastern boundaries of the subject land are an ephemeral waterway termed Western Boundary Drain and the LII River respectively. The subject land is primarily comprised of the 178 hectare property known as 1491 Springs Road, Lincoln.

   - Total Area: 186 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**.

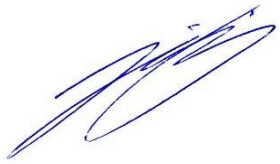
2. The Proposed Plan Change undertakes the following changes to the Selwyn District Plan (changes <u>underlined</u> or ~~struck through~~):

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

   2. To amend Township Volume, Appendix 37 Outline Development Plan- Lincoln by adding the ODP attached in **Attachment 4**.

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

3. An assessment is provided in **Attachment 5** in accordance with the requirements of the Resource Management Act 1991 and including Section 32 of the Act.



DATED: 29 October 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 Industrial Developments 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	**607588**
Land Registration District	**Canterbury**
Date Issued	05 March 2013

Prior References
CB10K/327 CB4B/759

Estate	Fee Simple
Area	1.4884 hectares more or less
Legal Description	Rural Section 38994 and Rural Section 40021

Registered Owners
John Campbell Greenslade as to a 1/2 share
Leslie Jane Greenslade as to a 1/2 share

Interests

Subject to Section 59 Land Act 1948

Subject to a right to drain sewage (in gross) over part Rural Section 38994 marked K, M & N on DP 50546 in favour of the Ellesmere County Council created by Transfer 824391.6 - 30.8.1989 at 10:30 am

The easement created by Transfer 824391.6 is subject to Section 309(1)(a) Local Government Act 1974

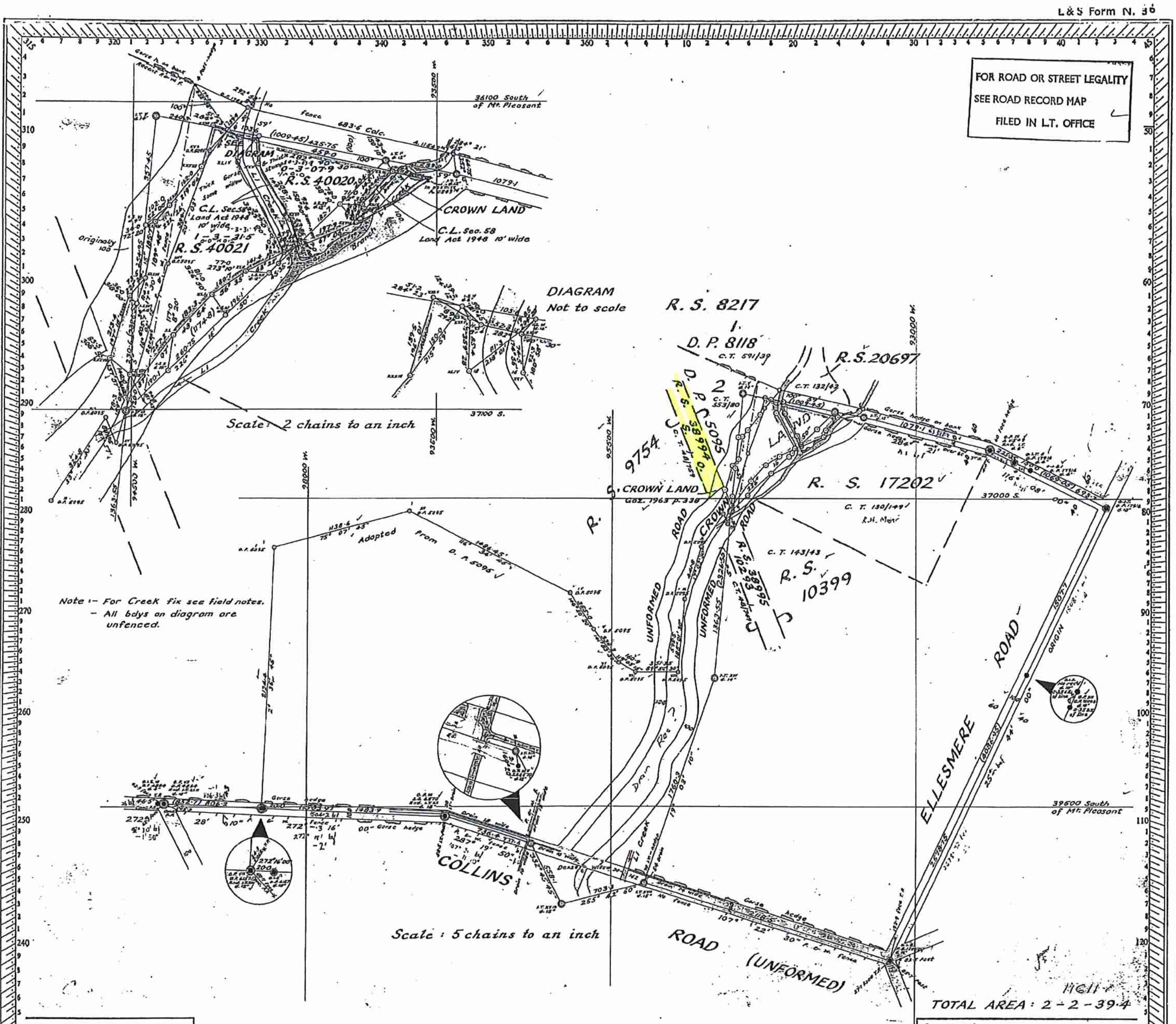
A371695.3 Mortgage of Rural Section 38994 to The National Bank of New Zealand Limited - 6.10.1998 at 2.00 pm

6758357.1 Variation of Mortgage A371695.3 - 20.2.2006 at 9:00 am

8189860.1 Variation of Mortgage A371695.3 - 23.6.2009 at 10:40 am

Subject to Section 241(2) and Sections 242(1) and (2) Resource Management Act 1991(affects DP 445316)

L&S Form N. 36



Received L. Hodcroft
File M. 3894
Instructions
Reference Plans
Field book 1277 p. 65-69
Traverse book 78 p. 71-73
Examined by H. Rhind C.B. 250
Recorded 14.6.71
Plan in order for approval 5/5/71

PLAN OF R.S.s 40020 & 40021

Survey Block & District Block V Halswell S.D.
Land District Canterbury Local Body Ellesmere County Council
Scales 2 & 5 chains to an inch Surveyed by T.E. Miles Date Feb.–March 1971

I, Roblin Eric Fear of Christchurch Registered Surveyor and holder of an annual practising certificate, hereby certify that this plan has been made from surveys executed by me; that both plan and survey are correct and have been made in accordance with the regulations under the Surveyors Act, 1938.

Dated at Christchurch this 5th day of April 1971.

R.E. Fear
Registered Surveyor.

Approved
Deputy Chief Surveyor 5/5/71

11611

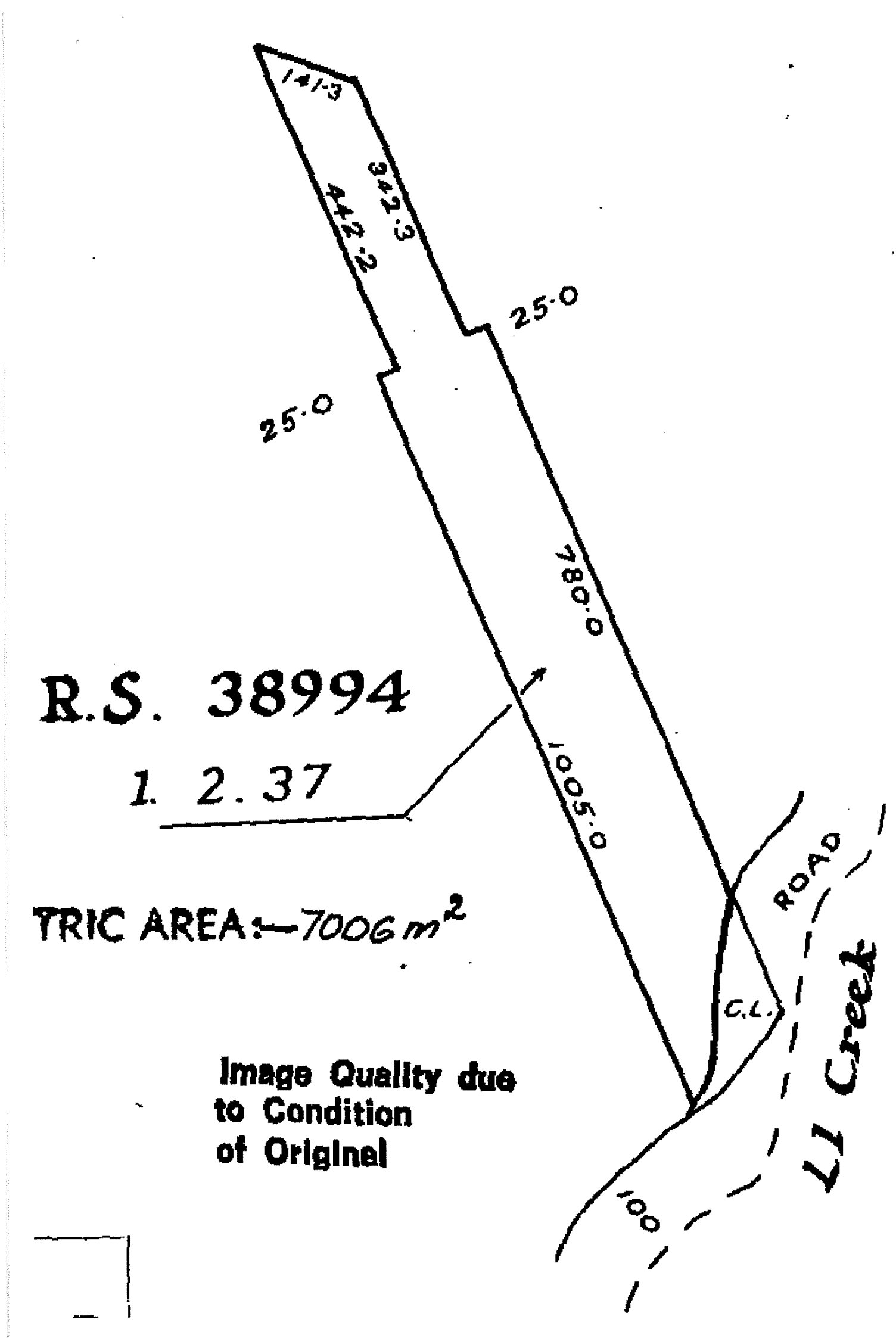


Image Quality due to Condition of Orginel

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Limited as to Parcels
Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**CB32K/521**
Land Registration District	**Canterbury**
Date Issued	16 January 1990

Prior References
CB364/295

Estate	Fee Simple
Area	28.4711 hectares more or less
Legal Description	Part Rural Section 2456, Part Rural Section 2933, Part Rural Section 2951 and Part Rural Section 5844

Registered Owners
John Campbell Greenslade as to a 1/2 share
Leslie Jane Greenslade as to a 1/2 share

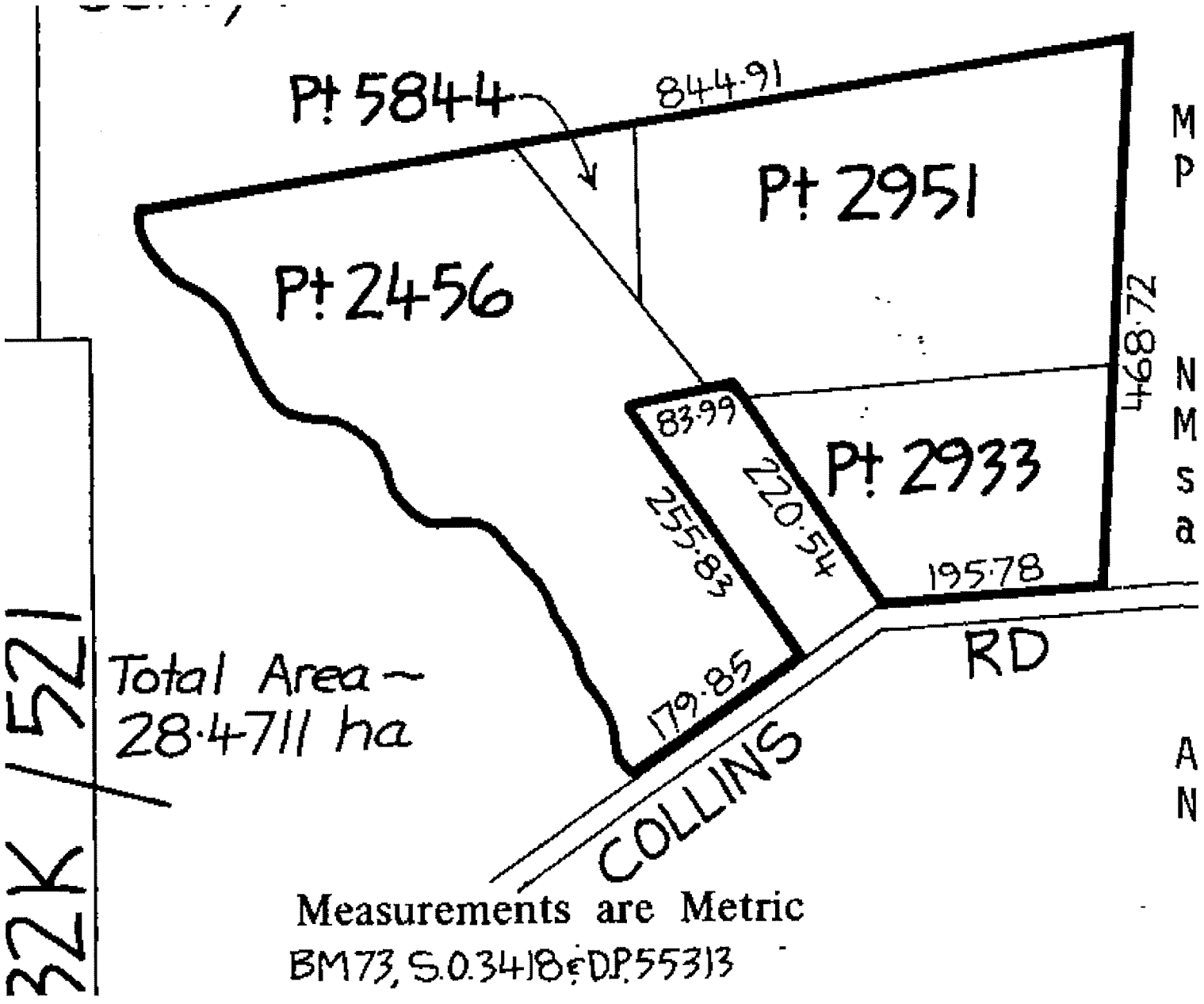
Interests

846754.5 CERTIFICATE UNDER S308(2) LOCAL GOVERNMENT ACT 1974 (AFFECTS CT CB364/296) - 16.1.1990 AT 11.27 AM

A371695.3 Mortgage to The National Bank of New Zealand Limited - 6.10.1998 at 2.00 pm

6758357.1 Variation of Mortgage A371695.3 - 20.2.2006 at 9:00 am

8189860.1 Variation of Mortgage A371695.3 - 23.6.2009 at 10:40 am


Pt 5844
844·91
Pt 2951
Pt 2456
468·72
83·99
Pt 2933
220·54
255·83
195·78
179·85
RD
COLLINS
Total Area ~
28·4711 ha
32K / 521
Measurements are Metric
BM73, S.O.3418 & D.P.55313

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Part-Cancelled

Identifier	**CB364/296**
Land Registration District	**Canterbury**
Date Issued	15 June 1925

Prior References
DI 8C/S1318

Estate	Fee Simple
Area	17.2042 hectares more or less
Legal Description	Lot 1 Deposited Plan 4157

Registered Owners
John Campbell Greenslade as to a 1/2 share
Leslie Jane Greenslade as to a 1/2 share

Interests

422408 Proclamation proclaiming as road that piece of within land coloured red hereon and containing 6.5 perches - 29.7.1955 at 1.40 pm

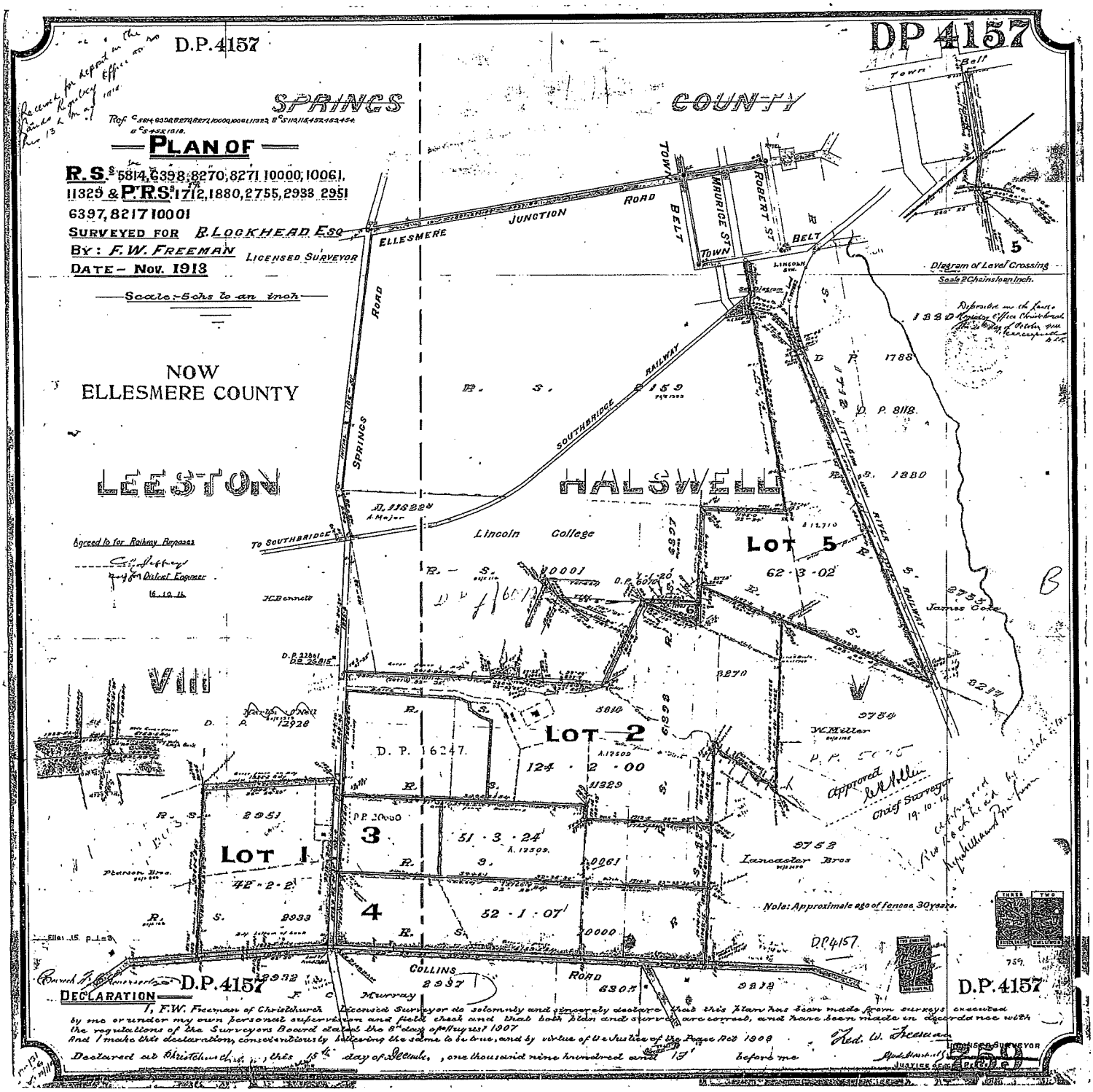
846754.5 CERTIFICATE UNDER S308 (3) LOCAL GOVERNMENT ACT 1974 - 16.1.1990 AT 11.27 AM

A371695.3 Mortgage to The National Bank of New Zealand Limited - 6.10.1998 at 2.00 pm

6758357.1 Variation of Mortgage A371695.3 - 20.2.2006 at 9:00 am

8189860.1 Variation of Mortgage A371695.3 - 23.6.2009 at 10:40 am

8939128.1 Easement Instrument granting a Profit a Prendre to extract gravel over part marked A on DP 459579 in favour of Lincoln University Property Joint Venture Limited and to Ngai Tahu Property Joint Ventures Limited - 31.1.2013 at 4:37 pm


D.P.4157
DP 4157
SPRINGS
COUNTY
PLAN OF
R.S.s 5814, 6398, 8270, 8271, 10000, 10061, 11329 & P.R.S.s 1712, 1880, 2755, 2933, 2951, 6397, 8217, 10001
SURVEYED FOR R. LOCKHEAD ESQ
BY: F. W. FREEMAN LICENSED SURVEYOR
DATE – Nov. 1913
Scale:-5chs to an inch
NOW ELLESMERE COUNTY
LEESTON
HALSWELL
ELLESMERE JUNCTION ROAD
SPRINGS ROAD
SOUTHBRIDGE RAILWAY
TOWN BELT
MAURICE ST
ROBERT ST
Diagram of Level Crossing
Scale 2 Chains to an Inch.
To SOUTHBRIDGE
Lincoln College
LOT 1
42 · 2 · 2
LOT 2
124 · 2 · 00
LOT 3
51 · 3 · 24
LOT 4
52 · 1 · 07
LOT 5
62 · 3 · 02
D. P. 16247.
COLLINS ROAD
Agreed to for Railway Purposes
Chief Surveyor for District Engineer
16.10.14
Approved
Chief Surveyor
19.10.14
Note: Approximate age of Fences 30 years.
DECLARATION
I, F.W. Freeman of Christchurch Licensed Surveyor do solemnly and sincerely declare that this Plan has been made from surveys executed by me or under my own personal supervision and field check and that both Plan and Survey are correct, and have been made in accordance with the regulations of the Surveyors Board dated the 8th day of August 1907 And I make this declaration conscientiously believing the same to be true, and by virtue of the Justices of the Peace Act 1908
Declared at Christchurch this 15th day of Novemb, one thousand nine hundred and 13 before me
F. W. Freeman
LICENSED SURVEYOR
JUSTICE OF THE PEACE
D.P.4157

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**CB40A/573**
Land Registration District	**Canterbury**
Date Issued	21 June 1995

Prior References
CB24B/1236

Estate	Fee Simple
Area	21.7240 hectares more or less
Legal Description	Lot 8 Deposited Plan 68631

Registered Owners
John Campbell Greenslade and Leslie Jane Greenslade

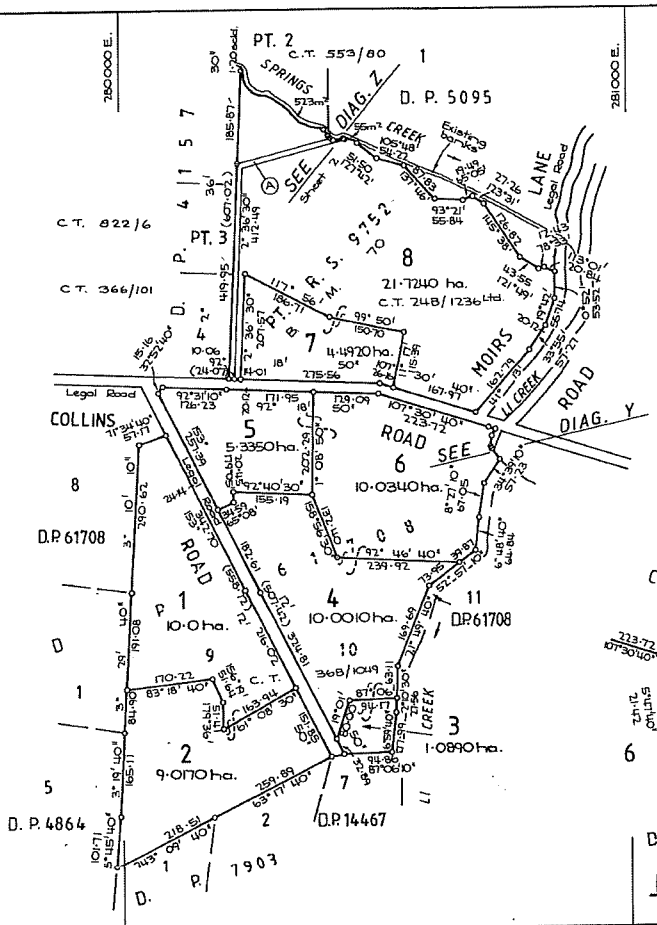
Interests

97365 (149 D 309) Deed of Easement

Type	Servient Tenement	Easement Area	Dominant Tenement
Right of way	Lot 8 Deposited Plan 68631 - herein	A DP 68631	Part Rural Section 9752
Right of way	Lot 8 Deposited Plan 68631 - herein	A DP 68631	Part Rural Section 9754

5577695.3 Mortgage to The National Bank of New Zealand Limited - 7.5.2003 at 9:00 am

10297394.1 Variation of Mortgage 5577695.3 - 23.12.2015 at 10:00 am



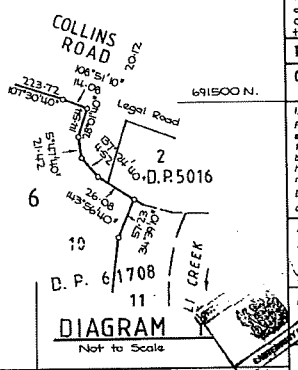


DIAGRAM
Not to Scale

Completion/~~Compliance~~/Condition
Certificate No. A179264/3
Separate Approvals/Consents
Site —
New Titles Issued
Lot 1 CT 40A/567
Lots 2 & 3 CT 40A/568
Lot 4 40A/569
Lot 5 40A/570
Lot 6 40A/571
Lot 7 40A/572
Lot 8 40A/573

Approvals

D. J. Green M. F. Green
Registered Proprietors.

Approved pursuant to Section 223 of the Resource Management Act 1991 on the 14th day of NOVEMBER 1994 subject to the amalgamation condition set out hereon.

The common seal of the Selwyn District Council is affixed hereto in the presence of

Mayor

District Manager

We hereby acknowledge that this plan shows the true boundary between Lot 8 hereon and our land (C.T. 553/80) and we agree to the issue of an ordinary certificate of title in terms of this plan

6/4/95 6/4/95

Areas shown 573m² & 55m² affected by running water are to be excluded from Title.

Existing Easement

Nature	Servient Ten. Lot No. Shown		Document
Right of Way	8	A	Deed of Conveyance No. 93865 Bk 90.309

See Doc. (A113708/1)

Amalgamation Condition

That Lots 2 & 3 hereon be amalgamated and that one Certificate of Title be issued for those two parcels of land.

Total Area 71·6920 ha.

Comprised in C.T. 24B/1236 ltd & C.T. 36B/1049

I, Graham Harvey Fowler

Registered Surveyor and holder of an annual practising certificate (or who may act as a registered surveyor pursuant to section 25 of the Survey Act 1986) hereby certify that this plan has been made from surveys executed by me or under my directions, that both plan and survey are correct and have been made in accordance with the Survey Regulations 1972 or any regulations made in substitution thereof

Dated at CHRISTCHURCH this 13th day of NOV. 1995. Signature

Field Book — p — Traverse Book — p —

Reference Plans D.P.s 4157, 4644, 5016, 5095, 7903, 14467, 50546, 54271, 61708 S.O.s 5873, 11611 BM 30

Examined — Correct —

Approved as to Survey 15/95 Deputy Chief Surveyor

Deposited this 21st day of June 1995 District Land Registrar

File — Received 14·2·95 — Instructions

DP 68631

LAND DISTRICT CANTERBURY
SURVEY BLK. & DIST. V HALSWELL
NZMS 261 SHT M.36 RECORD MAP No 10000/1+2

LOTS 1-8 BEING SUBDIVISION OF PT. R.S. 9752 & LOTS 9 & 10 D.P. 61708

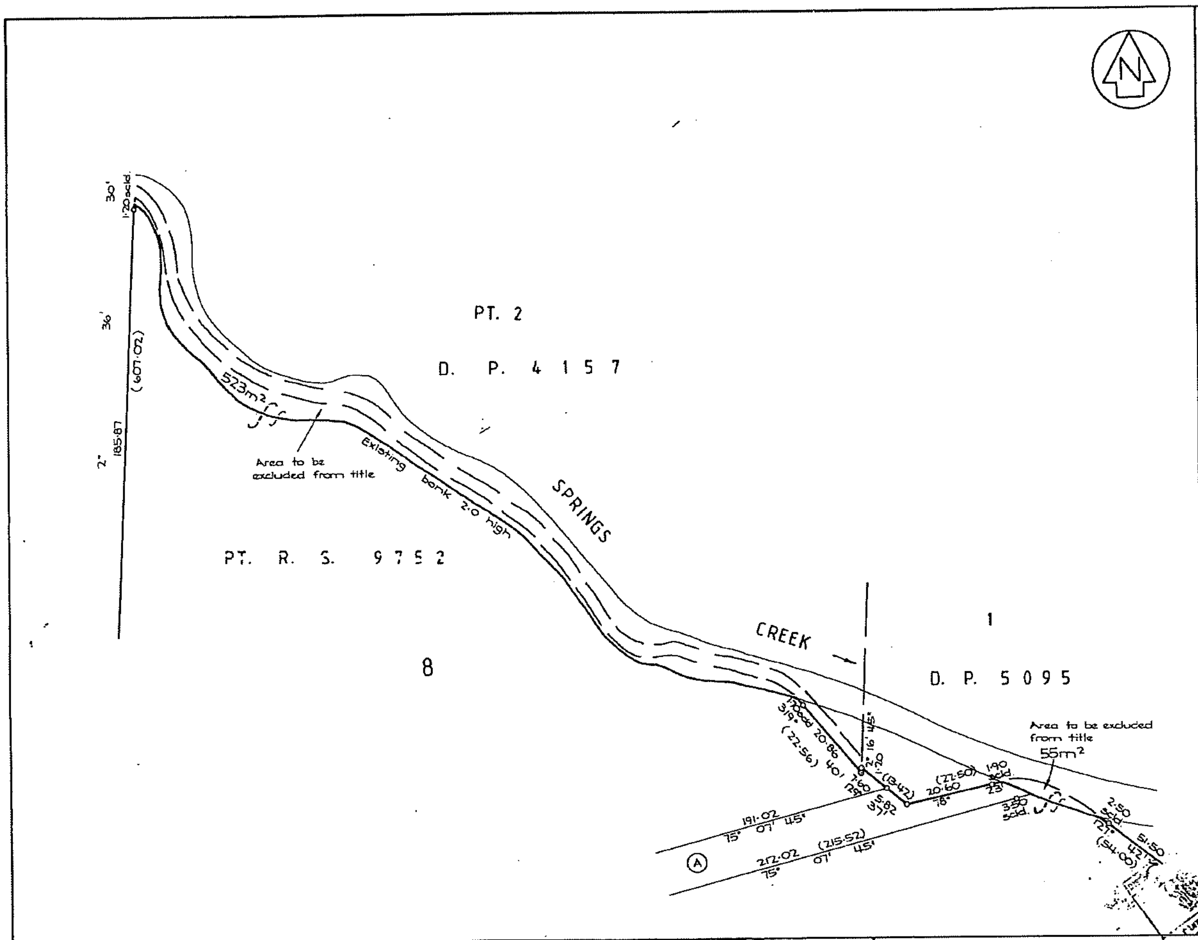
TERRITORIAL AUTHORITY SELWYN DISTRICT
Surveyed by MILES, FOWLER AND FEAR
Scale 1:5000 Date Sept. 1994 - March 1995

Sheet 1 of 2 Sheets

Supplied by the drawing room

W.A. ROBERTSON, DIRECTOR GENERAL/SURVEYOR GENERAL, DEPARTMENT OF SURVEY AND LAND INFORMATION, NEW ZEALAND

Approved LM 84/23 PD 43/24/4000 DOSLI FORM D13



Approvals

Total Area

Comprised in

I, Graham Harvey Fowler

Registered Surveyor and holder of an annual practising certificate (or who may act as a registered surveyor pursuant to section 25 of the Survey Act 1986) hereby certify that this plan has been made from surveys executed by me or under my directions, that both plan and survey are correct and have been made in accordance with the Survey Regulations 1972 or any regulations made in substitution thereof.

Dated at CHRISTCHURCH this 30th day of MARCH 1995 Signature

Field Book ____ p ____ Traverse Book ____ p ____

Reference Plans

Examined ____ Correct —

Approved as to Survey

[signature] 12/5/95 Deputy Chief Surveyor

Deposited this 21st day of June 1995.

[signature] District Land Registrar

File

Received 10·4·95

Instructions

DP 68631

LAND DISTRICT CANTERBURY

SURVEY BLK. & DIST. V HALSWELL

NZMS 261 SHT M 36 RECORD MAP No.

DIAGRAM Z

TERRITORIAL AUTHORITY SELWYN DISTRICT

Surveyed by MILES, FOWLER AND FEAR

Scale 1 : 600 Date Sept. 1994 - March 1995

Supplied by the drawing room

W.A. ROBERTSON, DIRECTOR GENERAL/SURVEYOR GENERAL, DEPARTMENT OF SURVEY AND LAND INFORMATION, NEW ZEALAND

Sheet 2 of 2 Sheets.

Approved LM 84-23 PO482/4000 DOSLI FORM D15

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**CB553/80**
Land Registration District	**Canterbury**
Date Issued	23 June 1952

Prior References
CB497/43

Estate	Fee Simple
Area	63.9252 hectares more or less
Legal Description	Lot 1-2 Deposited Plan 5095 and Part Lot 2 Deposited Plan 4157

Registered Owners
John Campbell Greenslade as to a 1/2 share
Leslie Jane Greenslade as to a 1/2 share

Interests

Subject to a right to drain over part Lot 2 DP 4157 and Lot 1 DP 5059 created by Deed of Easement 95263 (147D191)

824391.6 Transfer creating the following easements in gross - 30.8.1989 at 10.30 am

Type	Servient Tenement	Easement Area	Grantee	Statutory Restriction
Drain sewage	Lot 1-2 Deposited Plan 5095 and Part Lot 2 Deposited Plan 4157 - herein	Part herein	The Ellesmere County Council	

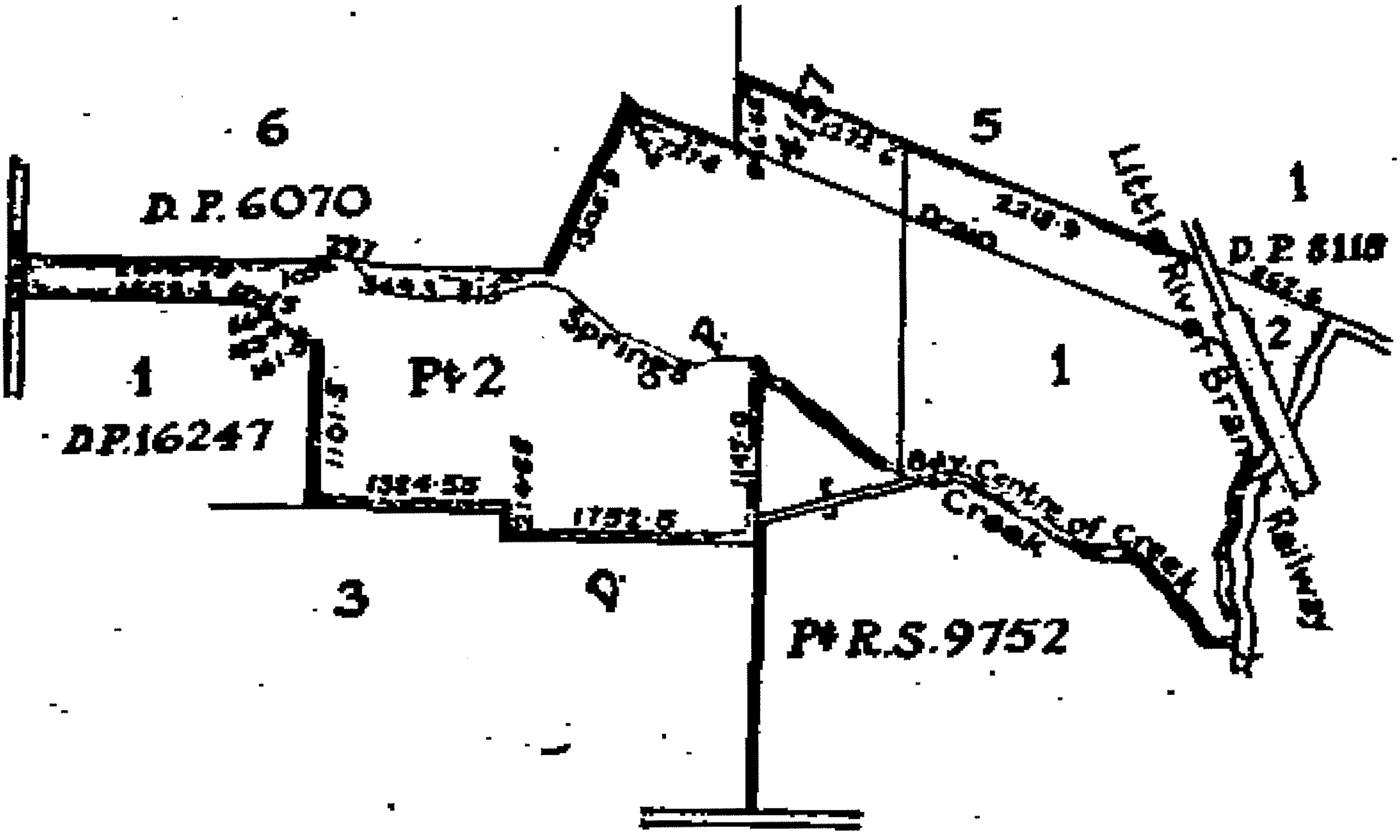
A371695.3 Mortgage to The National Bank of New Zealand Limited - 6.10.1998 at 2.00 pm

6758357.1 Variation of Mortgage A371695.3 - 20.2.2006 at 9:00 am

8189860.1 Variation of Mortgage A371695.3 - 23.6.2009 at 10:40 am

Subject to a right (in gross) to drain water over Lot 1 DP 5095 marked S on DP 535301 in favour of Selwyn District Council created by Easement Instrument 11460247.9 - 4.10.2019 at 11:50 am

The easements created by Easement Instrument 11460247.9 are subject to Section 243 (a) Resource Management Act 1991


6
D. P. 6070
1
DP.16247
Pt 2
Springs
A
5
1
Drain
Little River Branch
1
D. P. 8118
2
Railway
Centre of Creek
Creek
3
D
Pt R.S.9752
1101.5
1384.55
1752.5
1147.9

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**723451**
Land Registration District	**Canterbury**
Date Issued	08 April 2016

Prior References
CB366/101 CB822/6

Estate	Fee Simple
Area	46.8208 hectares more or less
Legal Description	Lot 1 Deposited Plan 16247 and Lot 2 Deposited Plan 494430 and Part Lot 3 Deposited Plan 4157

Registered Owners
John Campbell Greenslade as to a 1/2 share
Leslie Jane Greenslade as to a 1/2 share

Interests

Appurtenant to Lot 2 DP 494430 is water rights created by Deed of Easement 116433 (185 D 522) - 29.10.1924 at 2:20 pm

A371695.3 Mortgage to The National Bank of New Zealand Limited - 6.10.1998 at 2.00 pm (affects Lot 1 DP 16247 and Part Lot 3 DP 4157)

6758357.1 Variation of Mortgage A371695.3 - 20.2.2006 at 9:00 am

8189860.1 Variation of Mortgage A371695.3 - 23.6.2009 at 10:40 am

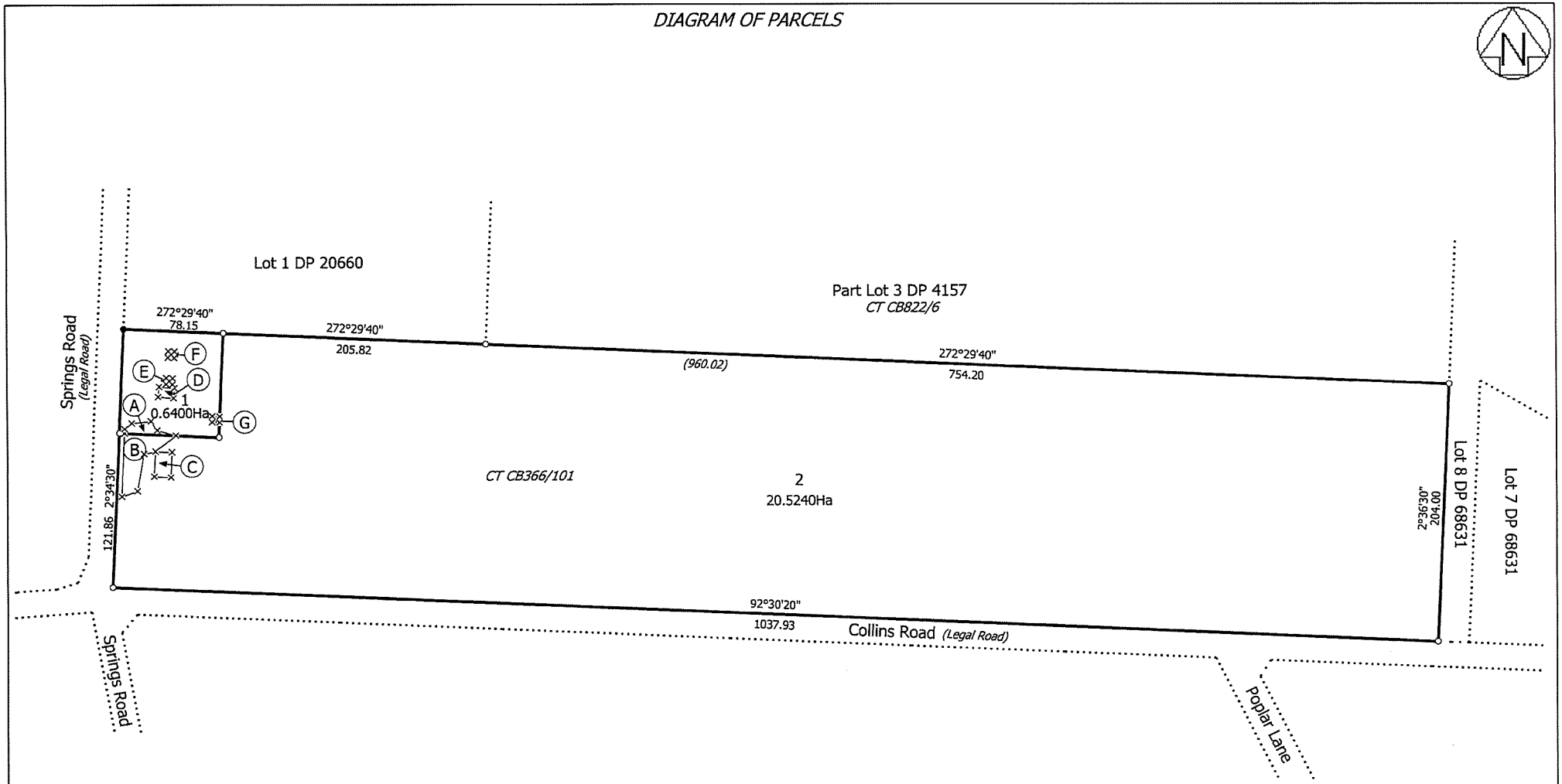
9812360.5 Mortgage to ANZ Bank New Zealand Limited - 24.9.2014 at 11:39 am (affects Lot 2 DP 494430)

Subject to Section 241(2) and Sections 242(1) and (2) Resource Management Act 1991(affects DP 494430)

10392148.3 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 8.4.2016 at 3:01 pm (affects Lot 2 DP 494430)

10392148.4 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 8.4.2016 at 3:01 pm (affects Lot 2 DP 494430)

DIAGRAM OF PARCELS

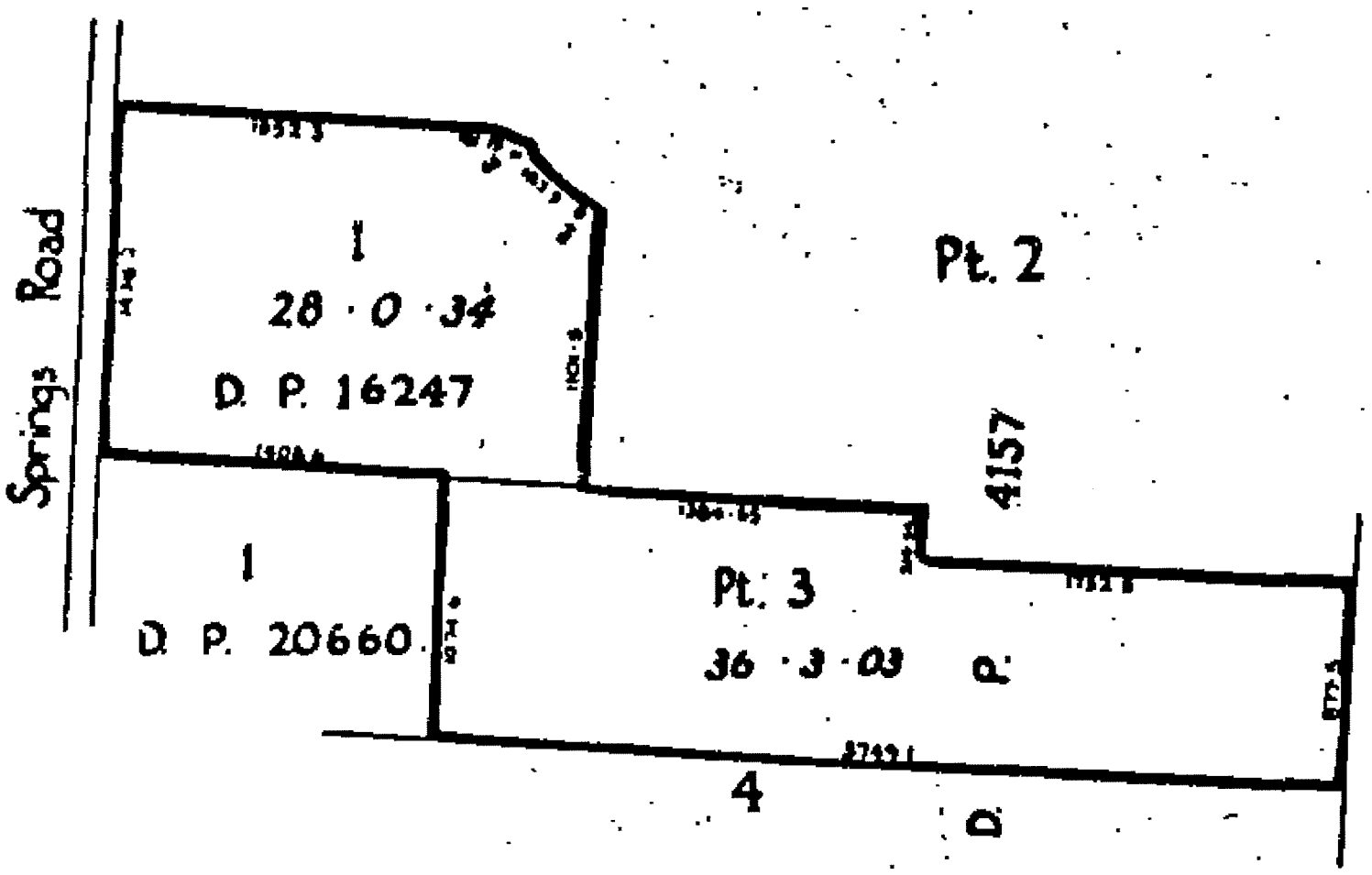


NOTE:
1. Lot 2 is subject to an amalgamation condition
2. Areas A, B, C, D, E, F and G are to be subject to a proposed consent notice
3. Lot 2 is to be subject to a proposed consent notice.

Surveyor Ref: 12380

T 1/2

Land District: Canterbury Digitally Generated Plan Generated on: 23/03/2016 08:24am Page 3 of 4	Lots 1 and 2 being a Subdivision of Lot 4 DP 4157	Surveyor: Craig William Hurford Firm: Survus Contracting Ltd	Title Plan LT 494430 Approved on: 23/03/2016


Springs Road
1
28 · 0 · 34
D. P. 16247
Pt. 2
4157
1
D. P. 20660
Pt. 3
36 · 3 · 03
4

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

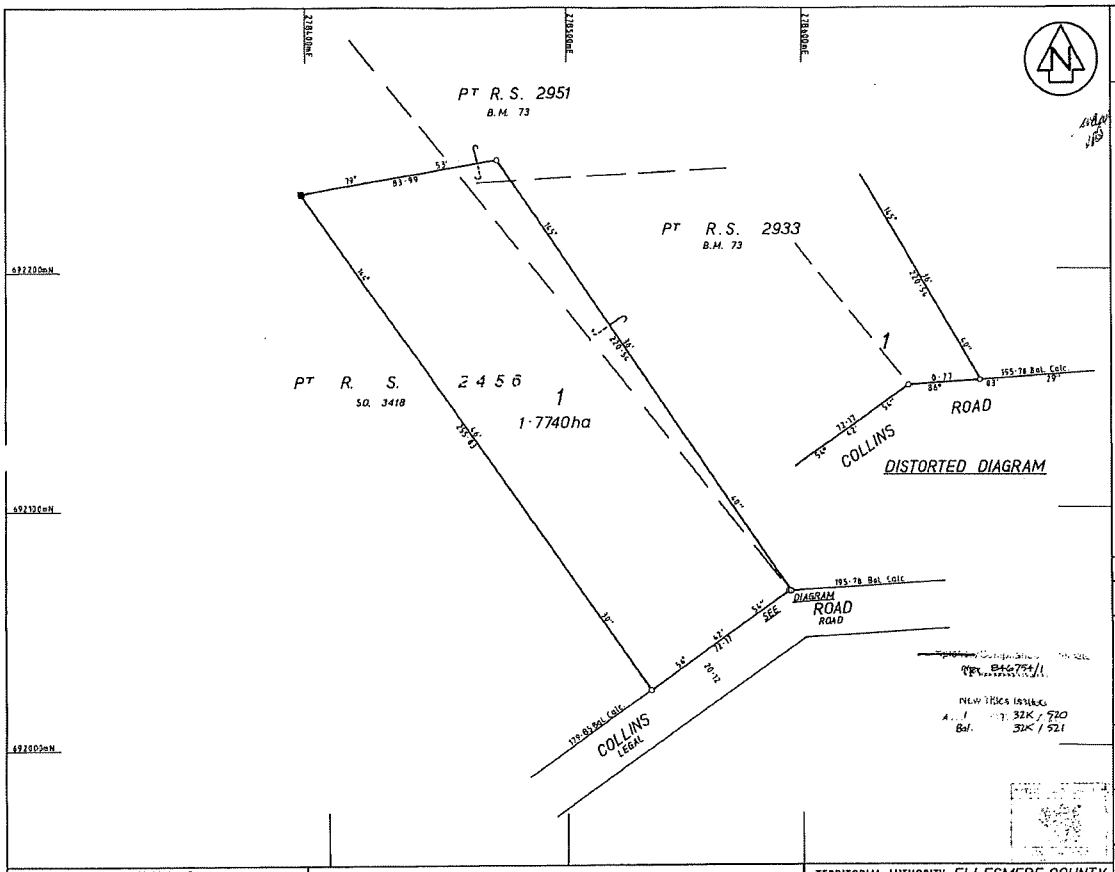
Identifier	**CB32K/520**
Land Registration District	**Canterbury**
Date Issued	16 January 1990

Prior References
CB364/295

Estate	Fee Simple
Area	1.7740 hectares more or less
Legal Description	Lot 1 Deposited Plan 55313

Registered Owners
Morris John Wright and David Neil Wright

Interests



Approvals

Pursuant to a resolution under Section 305 Local Government Act 1974 dated 21st day of [illegible] 1989 the Ellesmere County Council has approved this plan of subdivision ~~subject to the conditions of endorsement set out hereon~~ and certifies that the plan is in accordance with the requirements and provisions of the operative district scheme the common seal of the Ellesmere County Council was affixed hereto in the presence of

[illegible] Chairman

[illegible] Principal Officer

Total Area 1·7740ha

Comprised in PT CT. 364/295 LTD

I, GRAHAM HARVEY FOWLER of Christchurch

Registered Surveyor and holder of an unrestricted practising certificate (or who may act as a registered surveyor pursuant to section 25 of the Survey Act 1986) hereby certify that this plan has been made from surveys executed by me or under my directions, that both plan and survey are correct and have been made in accordance with the Survey Regulations 1972 or any regulations made in substitution thereof.

Dated at CHRISTCHURCH this 13th day of SEPTEMBER 1989 Signature [illegible]

Field Book ... p. ... Traverse Book ... p. ...

Reference Plans O.Ps 457 & 52989, S.O. 5870, D.P. 73

Examined [illegible] Correct ✓

Approved as to Survey

13/12/89 [illegible] Chief Surveyor

Deposited this [illegible] day of [illegible] 1989

[illegible] District Land Registrar

File

Received 11-10-89

Instruments

DP55313

LAND DISTRICT CANTERBURY

SURVEY BLK. & DIST. VIII LEESTON

NZMS 261 SHT M 36 RECORD MAP No 100001/2

LOT 1 BEING SUBDIVISION OF PART R. S's. 2456, 2951 & 2933

TERRITORIAL AUTHORITY ELLESMERE COUNTY

Surveyed by MILES GREGORY & FEAR (3820)

Scale 1:1000 Date SEPTEMBER '89

Printed by Lithotech Wellington New Zealand

W.A. ROBERTSON, SURVEYOR GENERAL, DEPARTMENT OF SURVEY AND LAND INFORMATION, N.Z.

LOSTHUYCS

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**CB822/5**
Land Registration District	**Canterbury**
Date Issued	17 December 1959

Prior References
CB554/93

Estate	Fee Simple
Area	6.1234 hectares more or less
Legal Description	Lot 1 Deposited Plan 20660

Registered Owners
Murray Thomas Robson

Interests

Outstanding Agreement Registered No. 116433 (185 D 522) to grant water rights affecting the above described land

A178082.1 Mortgage to Murray Thomas Robson and Gerald Peter Dwyer - 15.6.1995 at 9.25 am

A309601.2 Mortgage to (now) Westpac New Zealand Limited - 28.7.1997 at 3.00 pm

A309601.3 Memorandum of Priority making Mortgages A309601.2 and A178082.1 first and second mortgages respectively - 28.7.1997 at 3.00 pm

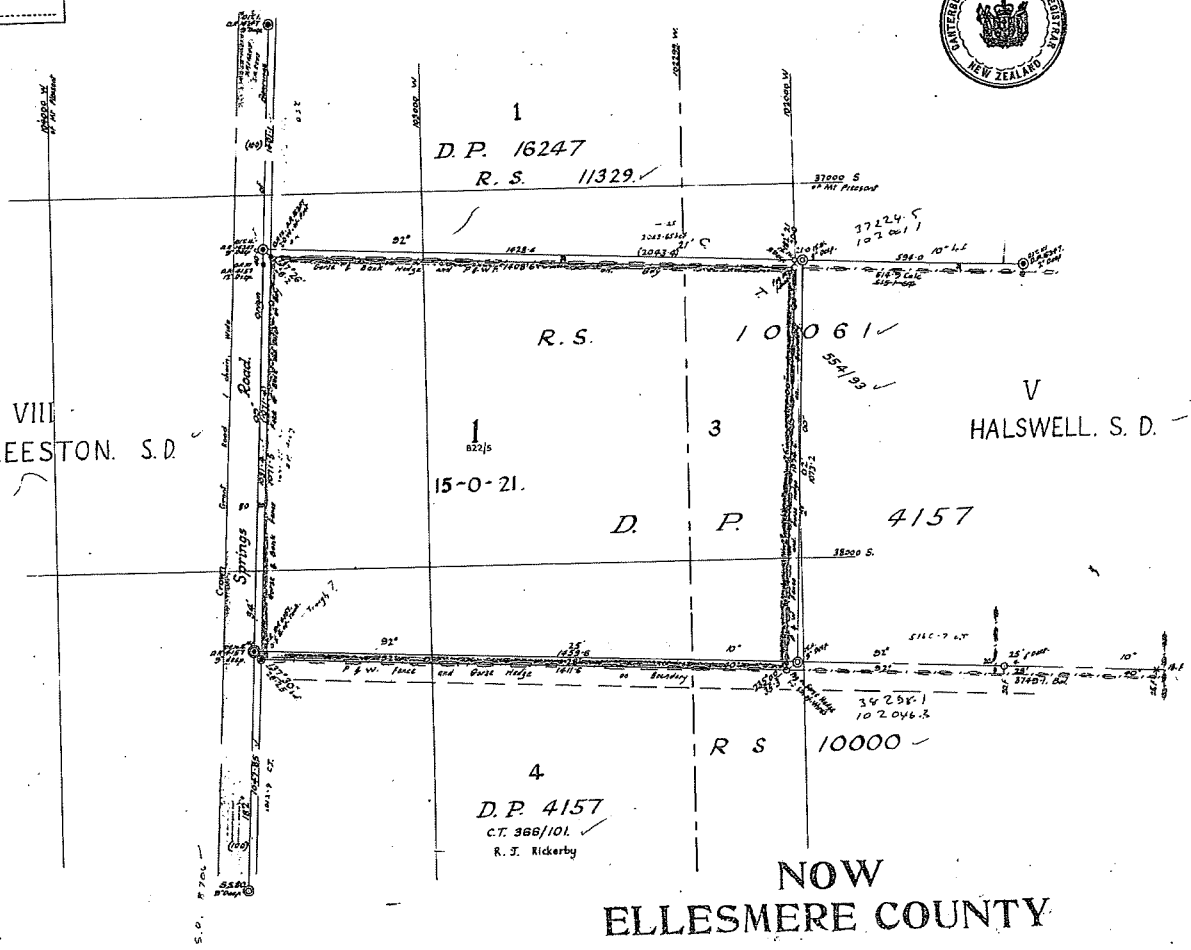
7573911.1 Variation of Mortgage A309601.2 - 11.10.2007 at 9:00 am

LAND TRANSFER ACT 1952

Leeston 10/5

Land Transfer Office
Received 13/7/1959
Title Reference Pt. C.T. 554/93
Referred to L. T. Surveyor

Deposited this 31st day of July 1959
Land Registrar



Subdn. of Pt Lot 3. D.P. 4157.
Being Pt. R.S. 10061.

Approved as to Survey
Chief Surveyor
30.7.59.
Received 13/7/1959
Reference plans D.P. 16247 4157
Field book 180 p 69-70
Traverse book 143 p 83
Examined by [illegible]
Recorded 10-8-59
Corrected 30-7-59 L. T. Surveyor

Comprised in Pt. C.T. 554/93
Land District Canterbury
Survey Block & District Blk VIII Leeston S.D. & Blk V Halswell S.D.
Local Body Springs County Council
Scale 2 chains to an inch
Surveyed by Davie, Lawell-Smith & Todd
Date July 1959

I, Duncan Macquarrie Bruce of Christchurch, Registered Surveyor and holder of an annual practising certificate, do solemnly and sincerely declare that this plan has been made from surveys executed by me; that both plan and survey are correct, and have been made in accordance with the regulations under the Surveyors Act, 1938.
And I make this solemn declaration, conscientiously believing the same to be true and by virtue of the Oaths and Declarations Act, 1957.

Declared at Christchurch this 6th day of July 1959
before me
Registered Surveyor

Justice of the Peace, (or Solicitor, or Notary Public)

F.H. R. [illegible]

Approved
Applicant or Registered Owner
This space reserved for plan number

DP 20660

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**723450**
Land Registration District	**Canterbury**
Date Issued	08 April 2016

Prior References
CB366/101

Estate	Fee Simple
Area	6400 square metres more or less
Legal Description	Lot 1 Deposited Plan 494430

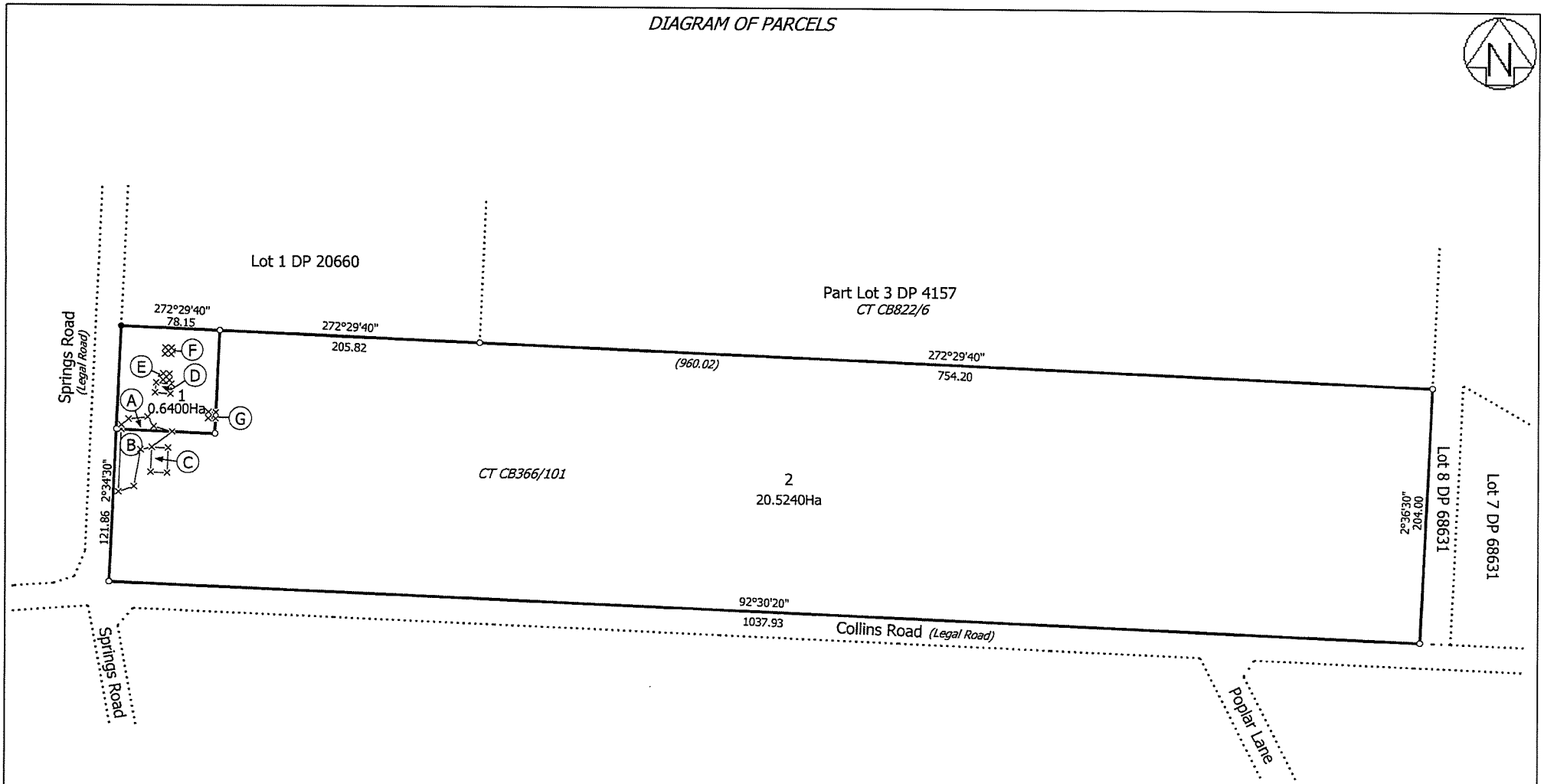
Registered Owners
Wilowe Limited

Interests

Appurtenant hereto is water rights created by Deed of Easement 116433 (185 D 522) - 29.10.1924 at 2:20 pm

10392148.4 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 8.4.2016 at 3:01 pm

DIAGRAM OF PARCELS



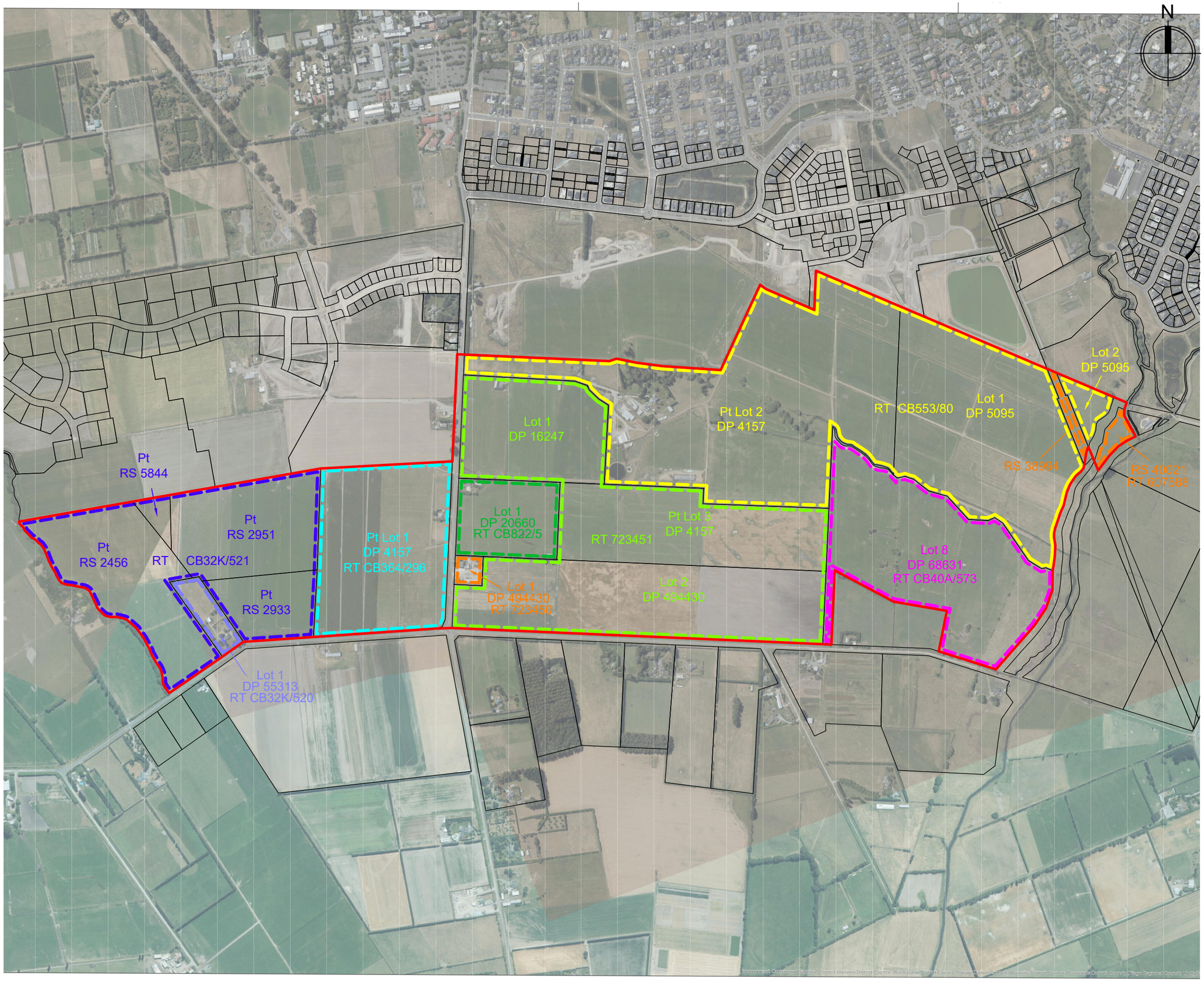
NOTE: 1. Lot 2 is subject to an amalgamation condition
2. Areas A, B, C, D, E, F and G are to be subject to a proposed consent notice
3. Lot 2 is to be subject to a proposed consent notice.

Surveyor Ref: 12380

T 1/2

Land District: Canterbury Digitally Generated Plan Generated on: 23/03/2016 08:24am Page 3 of 4	Lots 1 and 2 being a Subdivision of Lot 4 DP 4157	Surveyor: Craig William Hurford Firm: Survus Contracting Ltd	Title Plan LT 494430 Approved on: 23/03/2016

Attachment 2: Location Plan



A For discussion — SW — 22.10.20
Revision — App — Date

Verify all dimensions on site before commencing work. Do not scale from this drawing. No liability shall be accepted for unauthorized use of this drawing.

Client
ROLLESTON INDUSTRIAL HOLDINGS LIMITED

Project Title
LINCOLN SOUTH PLAN CHANGE

Sheet Title
EXISTING TITLES

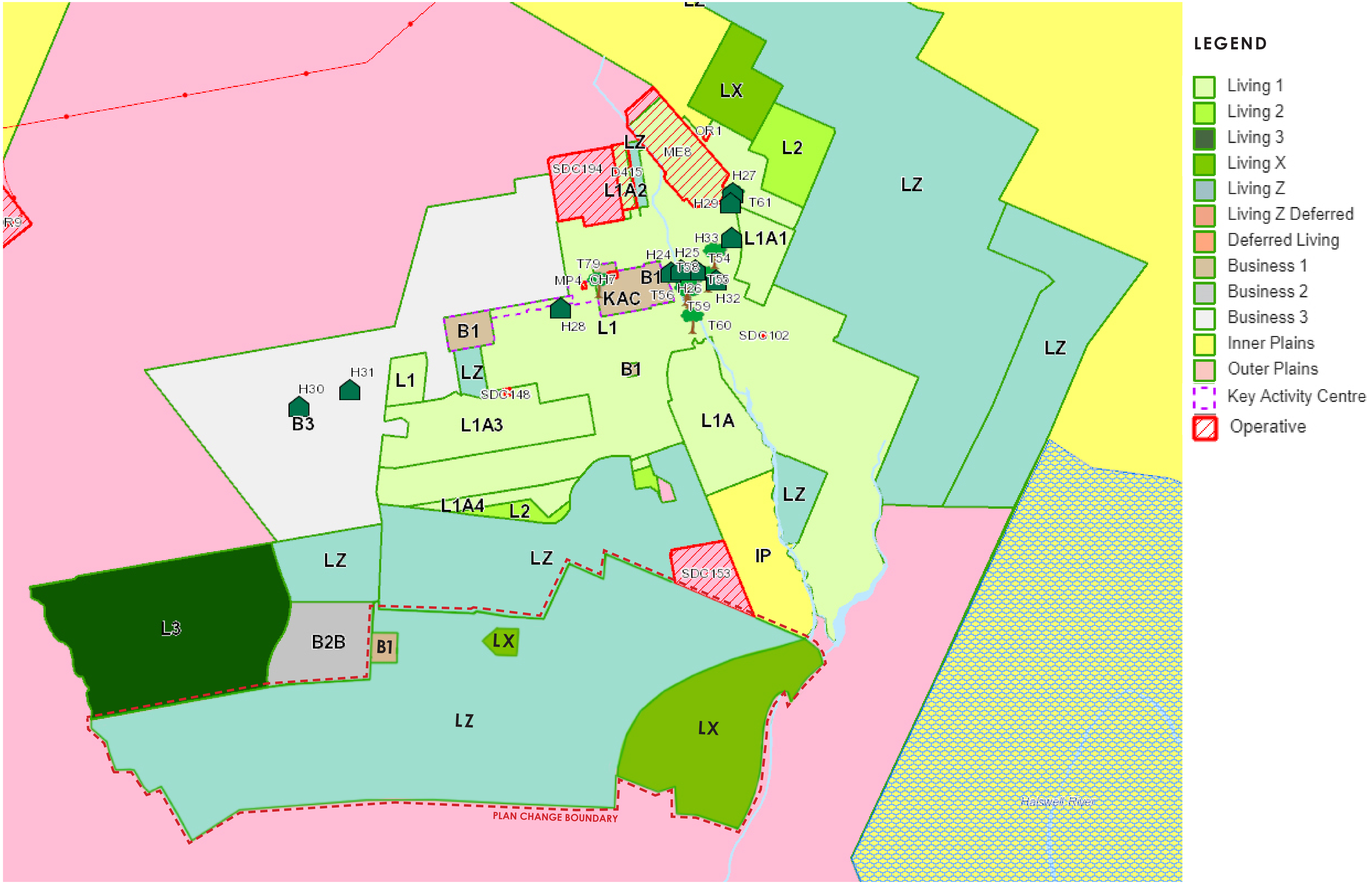
MAINLAND SURVEYING
480B Moorhouse Ave
Christchurch
mainlandsurveying.co.nz
+64 3 3664747

Scale (A3 Original) 1: 10000

100 50 0 100 200 300

Project No	Drawing No	Sheet	Revision
2119	4005	01	A

Attachment 3: Proposed Planning Map Changes


LX
L2
LZ
OR1
ME8
SDC194
D415
L1A2
H27
H29
T61
H33
L1A1
H24
H25
T54
T79
T58
MP4
CH7
B1
T55
H26
KAC
T56
H32
T59
H28
L1
T60
SDC102
B1
H31
H30
B3
L1
LZ
SDC148
B1
L1A3
L1A
LZ
L1A4
L2
LZ
LZ
IP
SDC153
LZ
L3
B2B
B1
LX
LZ
LX
PLAN CHANGE BOUNDARY
Halswell River
R9
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
Key Activity Centre
Operative

Attachment 4: Proposed Outline Development Plan

OUTLINE DEVELOPMENT PLAN – SOUTH LINCOLN

Introduction

The Outline Development Plan (ODP) area comprises 186 hectares and is bounded by the Te Whariki and Verdeco subdivisions to the north, Collins Road to the south, an ephemeral waterway termed Western Boundary Drain to the west, and the LII River to the east.

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 four 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 low density area of Living X zoning is located on the eastern extent of the ODP, with a minimum lot area of 2,000m^2. This low density area will provide a buffer between the higher density residential areas located centrally within the ODP area, and the adjoining rural areas to the east, and will otherwise meet stormwater objectives for the site. A low density area of Living X zoning is also proposed for the heritage item Chudleigh Homestead, so as to provide for a larger site size that accounts for the heritage values and setting associated with this building.

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 east of Springs Road. This provides a link across the LII River to Moirs Lane and Ellesmere Road beyond, to the east. It also connects to Springs Road and the potential bypass road indicated in ODP 8 through the Verdeco subdivision northwest towards Shands Road.

b. Secondary routes are otherwise provided throughout the ODP block, including a loop route on the western side of Springs Road and connections to Collins Road to the south.

c. Shared pedestrian and cycle connections throughout the ODP area, including existing connections to the north, to enhance safe walking and cycling opportunities to other parts of Lincoln township.

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

Four recreation reserves are provided throughout the ODP area in addition in addition to green links and reserves that provide open space and facilitate attractive pedestrian connections.

A 20m wide recreation reserve with possible cycleway is provided along Spring Creek and provides connectivity to the Te Whariki subdivision and its existing green links.

Opportunities to integrate stormwater collection, treatment and disposal into the open space reserves also exist, where appropriate.

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 the majority of the site will be conveyed by a network of swales and pipes to two proposed Stormwater Management Areas (SMA's) for treatment and attenuation before being discharged into the Ararira/LII River to the east and an existing private drain to the west of the site. Detailed design of the SMA's will be determined by the developer in collaboration with Council at the subdivision stage and in accordance with Environment Canterbury requirements.

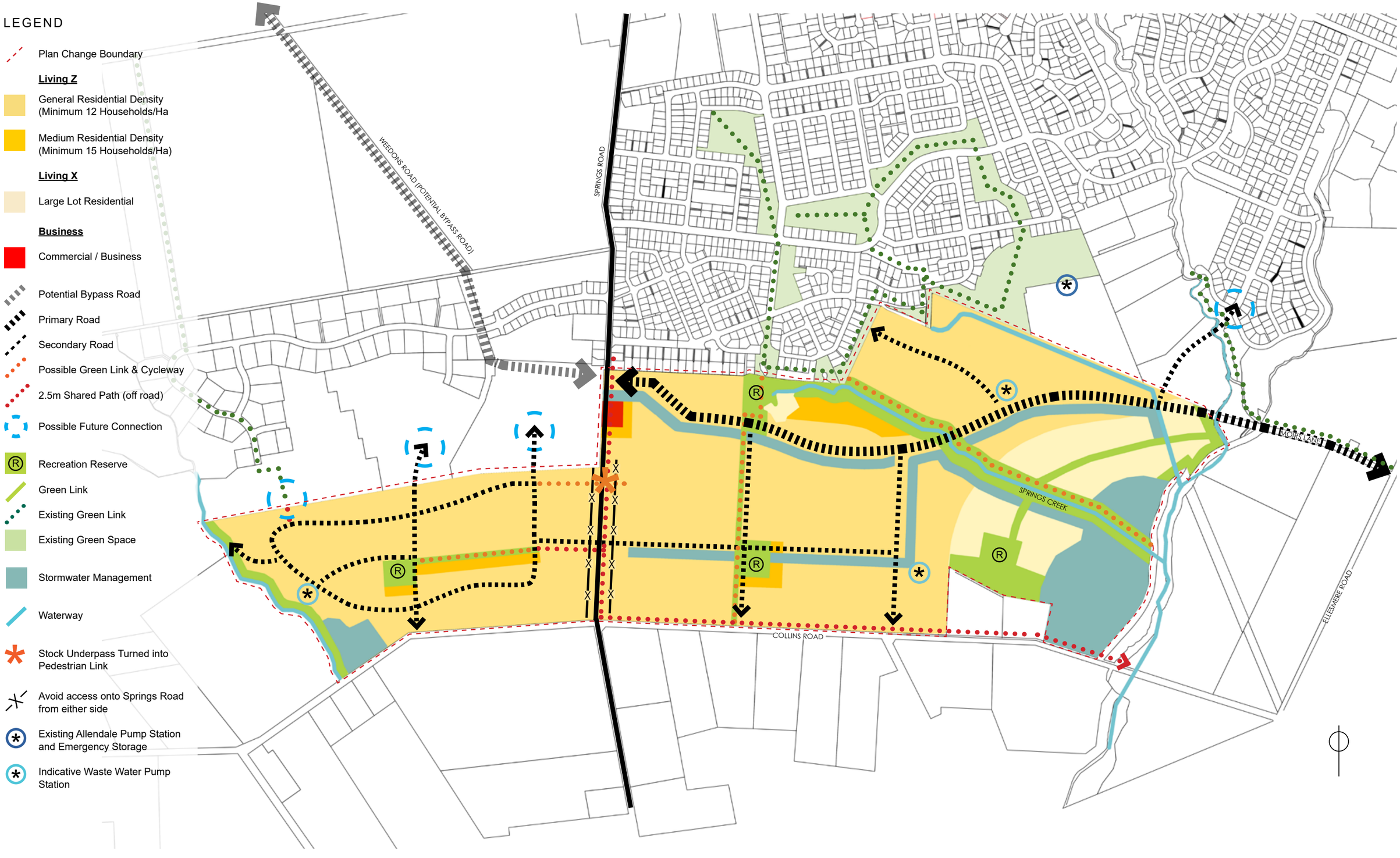
Lincoln Main Drain– The spring-fed Lincoln Main Drain (LMD) crosses the northeast portion of the site from northwest to southeast and serves as the main drain outlet for the Te Whariki subdivision. The drain is to be diverted to the northern boundary of the development site but detailed design will ensure its ongoing function is not compromised. There is opportunity to naturalise and enhance the LMD as part of the wider green and blue network of the site.

Springs Creek –Springs Creek is a spring fed tributary of the Ararira/LII River with headwater springs situated within the grounds of the historic 'Chudleigh' homestead. The creek alignment has been modified over time to straighten the channel and improve its drainage function. There is opportunity to enhance and incorporate this natural feature into the wider green and blue network of the site.

Sewer – The majority of new sites will be serviced by gravity sewer network discharging to new pump station(s) located to the western and eastern margins of the site (lowest elevation). Sites that cannot be serviced by gravity sewer will utilise Local Pressure Sewer to discharge into the gravity network. The eastern pump station will discharge via a new pumping rising main directly across to the SDC Allendale Pump Station some 900m to the northeast of the site. If developed first, the western pump station servicing the area to the west of Springs Road can initially discharge into the existing an Ø140mm sewer rising main Springs Road, and then be modified to discharge to the gravity network draining to the eastern pump station once this is developed. The Allendale Pump Station has sufficient emergency storage to act as a buffer for additional flows entering the system from the plan change area.

Water – The water reticulation will be an extension of the existing water reticulation network bordering the site. Upgrades of existing pipes in Springs Road and bore site at Vernon Drive may be required to ensure adequate water supply. 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)



LANDUSE AND DENSITY

LEGEND

Plan Change Boundary

Living Z

General Residential Density
(Minimum 12 Households/Ha

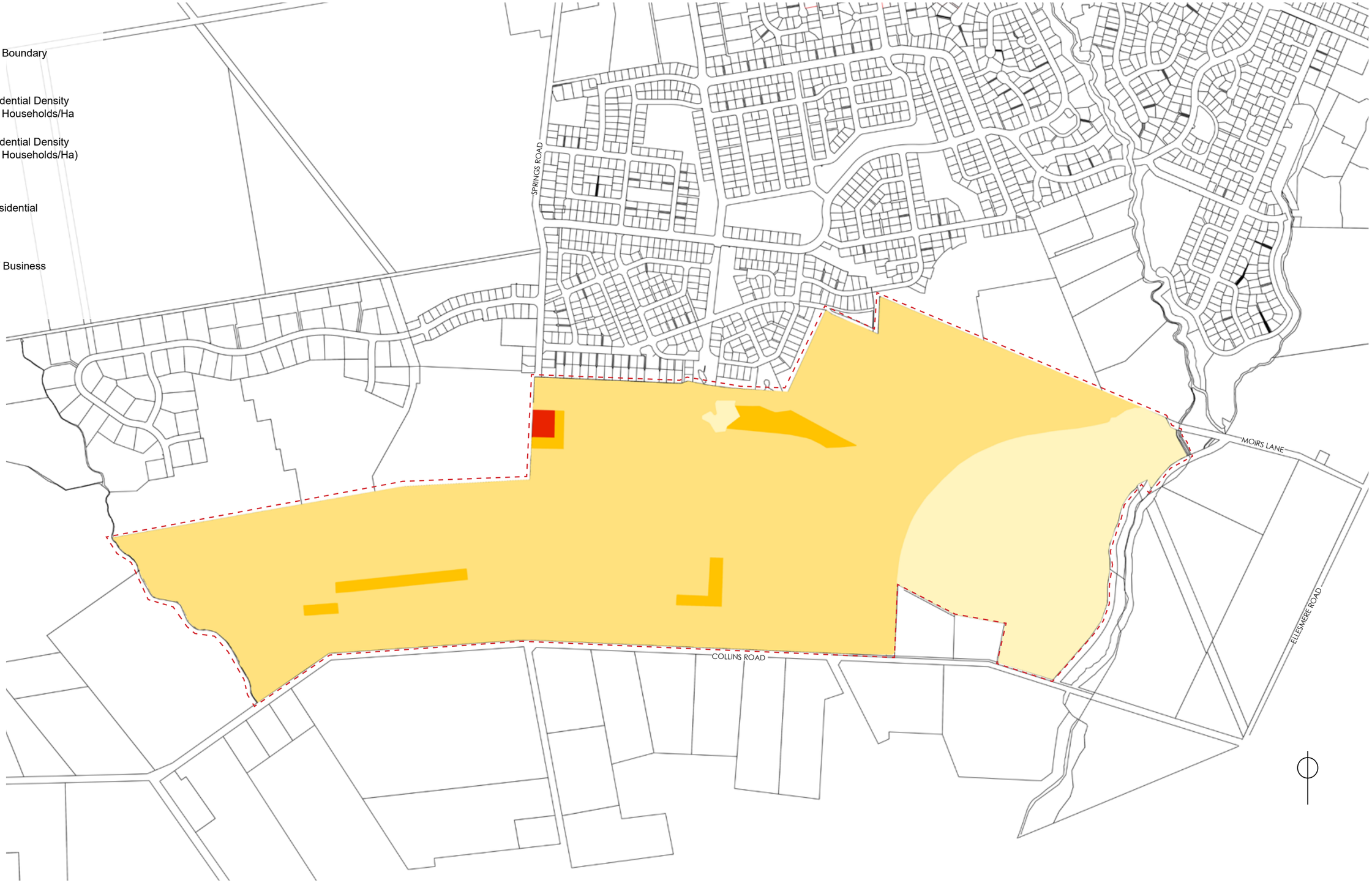
Medium Residential Density
(Minimum 15 Households/Ha)

Living X

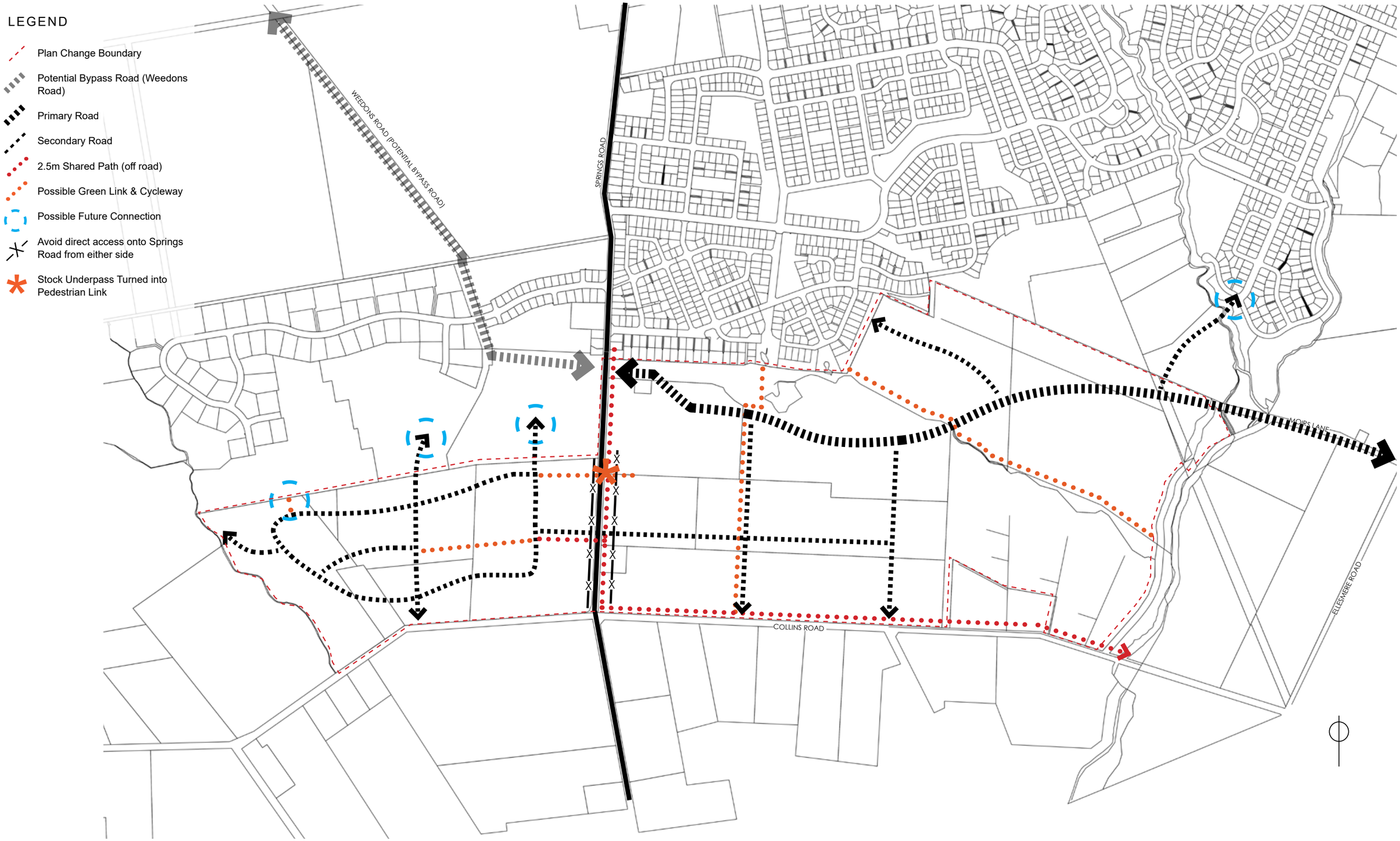
Large Lot Residential

Business

Commercial / Business



MOVEMENT AND CONNECTIVITY



GREEN / OPEN SPACE NETWORK

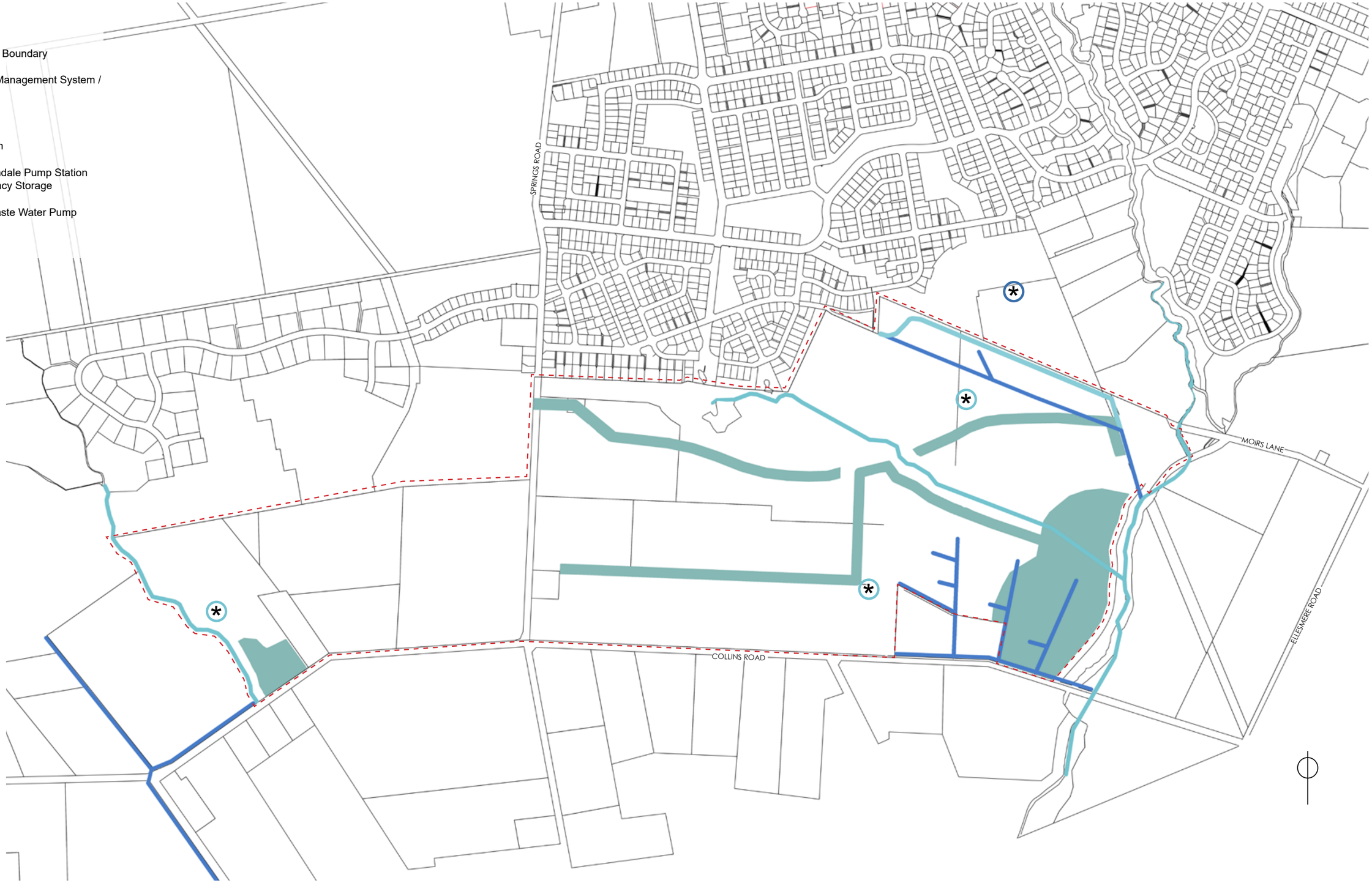
LEGEND

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

BLUE NETWORK

LEGEND

- Plan Change Boundary
- Stormwater Management System / Areas
- Waterway
- Existing Drain
- Existing Allendale Pump Station and Emergency Storage
- Indicative Waste Water Pump Station



Attachment 5: Section 32 Evaluation

Table of Contents

List of Figures and Tables

Appendices

Introduction

1. Rolleston Industrial Developments Limited ('RIDL') requests a change to the Selwyn District Plan to rezone approximately 186 hectares of Rural Outer Plains Zone, to Living X, Living Z and Business 1 (Local Centre), at Lincoln.

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

3. The site immediately adjoins an existing residential area that is currently zoned Living Z, Living 3 and Business 2B and Living 2A and which forms part of the Lincoln township.

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 land to the north.

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 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.

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

The Site and Surrounding Environment

8. The subject land is located generally on the south side of the Lincoln township, to the east and west of Springs Road, and to the north of Collins Road. The western and eastern boundaries of the subject land are an ephemeral waterway termed Western Boundary Drain and the LII River respectively.

9. The subject land has an area of approximately 186 hectares and is primarily comprised of the 178 hectare property known as 1491 Springs Road, Lincoln.

10. 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 ODP contained in **Attachments 2 -4** of the Plan Change Application.

11. The site has frontage and access to/from Springs Road and Collins Road to the south. Springs Road is an arterial road providing access to Ellesmere Junction Road, Gerald Street and the Lincoln main street, and connections through to Christchurch city further north. The site also has access to Moirs Lane, an unformed legal (paper) road to the east, which connects to Ellesmere Road.

12. To the north of the site is the existing Lincoln township, including the recently constructed and progressively developing Te Whāriki and Verdeco residential subdivisions, on the east and west sides of Springs Road respectively.

13. To the south, east and west is Rural Zone land used predominantly for rural residential activity, grazing or similar rural activity.

Figure 1: Aerial photograph indicating subject land (Source: Canterbury Maps)

14. The site itself contains an operational dairy farm, with an existing cluster of buildings located east of Springs Road, near the northern boundary of the plan change site (see **Figure 1**). This property includes the Springs' O'Callaghan farmhouse ('Chudleigh') which

was constructed in circa. 1877 but is not presently listed as a heritage item in the District Plan or by Heritage New Zealand. Another dwelling is also located on this property between this cluster and Springs Road.

15. Of note, the plan change area includes the properties at 1521 and 1543 Springs Road and 208 Collins Road. These sites are in separate ownership to 1491 Springs Road and presently feature dwellings, accessory buildings and rural activity.

16. 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**); and

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

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

The Plan Change

Description of the Proposal

18. It is proposed to rezone approximately 186 hectares of Rural Outer Plains Zone land for primarily residential purposes, with an Outline Development Plan (ODP) guiding the form and layout of future development.

19. The plan change and ODP adopts three zone types from the District Plan, being: Living Z, Living X and Business 1 (Local Centre). Aside from a change to the planning map and insertion of the ODP into the Plan, no changes, additions or deletions are proposed to the content of the District Plan.

20. The Living X zone provides for larger lot sizes, with an average minimum allotment area of 2,000m^2. This zoning is primarily proposed at the eastern end of the plan change site accounting for stormwater management requirements in this location which suit lower density development and areas of open space that can support stormwater management objectives. A Living X zone is also proposed for the heritage item (Chudleigh Homestead) on 1491 Springs Road, so as to provide for a larger site size that accounts for the heritage values and setting associated with this building.

21. The Living Z zone is proposed for the majority of the plan change site and this is a natural extension of the existing Te Whāriki and Verdeco developments. 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).

22. A Business 1 zoned local centre is proposed to provide for a small commercial area or neighbourhood shops at the intersection of Springs Road and the proposed primary road. 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.

23. The ODP area is designed to achieve an overall minimum net density of 12 households per hectare, incorporating the lower density Living X zoned sites and the Living Z densities described above, including the higher density (15hh/Ha) residential areas proposed adjacent to key open spaces and green corridors. Based on these densities and a developable area on the plan change site of approximately 150-165 hectares[2], the proposed Plan Change is envisaged to provide for the establishment of up to 2,000 new households.

[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.

Outline Development Plan - Layers

14. **Attachment 4** to the Plan Change includes an ODP comprising an overall ODP, plus separate layer diagrams as described below.

15. The Outline Development Plan (ODP) area comprises 186 hectares and is bounded by the Te Whāriki and Verdeco Park subdivisions to the north, Collins Road to the south, an ephemeral waterway termed Western Boundary Drain to the west, and the LII River to the east.

16. 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

17. A single Overall ODP is accompanied by four 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 ODP (see **Attachment 4**).

Urban Design Attributes

18. 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.**

19. 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’.*

20. 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. Retain and protect heritage and cultural elements, including the Chudleigh Homestead;

d. Create a street hierarchy providing different modal allocation;

e. Create a connection with a potential bypass road highlighted in Lincoln ODP Area 5 (Verdeco);

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

g. Create a high level of legibility created through street hierarchy;

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

i. Avoid direct access onto Springs Road for individual properties;

j. Create streets with a high level of amenity;

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

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

m. Celebrate Springs Creek as an important natural feature of the ODP area, to create a sense of place;

n. Provide sufficient space near waterways and wetland areas to enable habitat protection as well as providing access for future residents;

o. Ensure stormwater is kept separate from natural waterways prior to treatment;

p. Encourage the use of low impact design techniques including grass swales and detention basins; and

q. Ensure a development setback, via a reserve, from Springs Creek.

Transport Attributes

21. 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.

22. 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 20 above.

Servicing

23. 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

24. 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 X, Living Z and Business 1 (Local Centre) as shown in **Attachment 3**.

    2. To amend Township Volume, Appendix 37 Outline Development Plan- Lincoln by adding the ODP attached in **Attachment 4**.

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

Consultation

25. 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 Lincoln.

26. 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 the adjacent zoning and development of Verdeco and Te Whāriki and other recent residential zoning proposals elsewhere in Selwyn District. The applicant is also mindful of the sensitive and culturally significant features on the plan change site such as natural waterways, springs, and indigenous vegetation of value. 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

27. 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.*

28. 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

29. 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 E2 Environmental and WSP.

30. In summary, the Inovo report concludes:

> *'Stormwater runoff from the majority of the site will be conveyed by a network of swales and pipes to two proposed Stormwater Management Areas for treatment and attenuation before being discharged into the Ararira/LII River to the east and an existing private drain to the west of the site. Detailed design of the SMA's will be determined by the developer in collaboration with SDC at the subdivision stage and in accordance with Environment Canterbury requirements.*

The majority of new sites can be serviced by gravity sewer network discharging to new pump station(s) located to the west of Springs Road and at the east end of the site (lowest elevation). Sites that cannot be serviced by gravity sewer will utilise Local Pressure Sewer to discharge into the gravity network. The eastern pump station will discharge via a new pumping rising main directly across to the SDC operated Allendale Pump Station some 900m to the northeast of the site. The Allendale Pump Station has sufficient emergency storage to act as a buffer for additional flows entering the system from the plan change area.

The water reticulation will be an extension of the existing water reticulation network bordering the site. Upgrades of existing pipes in Springs Road may be required to ensure adequate water supply. Additional connections to other parts of the SDC network to the northeast will be determined at the subdivision stage to increase network connectivity and resilience.

Existing electricity and fibre broadband networks in the surrounding developments to the north can be extended to service the proposed plan change area.

From an infrastructure perspective, the plan change can be supported by extension of infrastructure servicing neighbouring developments and provision of stormwater management areas within the development'.

31. 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

32. The Plan Change site is identified on Selwyn District Council flooding maps as being potentially subject to flood hazard risks, particularly in the vicinity of the LII River. This potential natural hazard risk has been accounted for in the assessment by Inovo Projects / E2 Environmental in **Appendix A** which states:

'Flood management is required to ensure that floodwaters in the 0.5% AEP and 0.2% AEP flood events are safely managed away from people and property. These events have been modelled by SDC in a large catchment-wide two-dimensional hydraulic model which represents the floodplain by a 10 m coarse rectangular grid…

In general, ground levels on lots will be set above road levels so that in large flood events the roads act as secondary flow paths. These secondary flow paths will need to safely convey floodwaters to their existing flow path location at the boundary of the proposed development (i.e. the management of secondary flow paths should maintain the site's hydraulic neutrality). There are eight key areas which require varying levels of engineering design (conceptually at this stage) to ensure the overland flow paths and flooded areas are safely managed'.

33. Table 3 in the E2 assessment describes these flood management options and the way in which they are able to be implemented for the plan change site, noting that such detail

would be required for the purposes of an assessment of section 106 of the Act at the time of any subdivision consent. Based on this assessment by E2, flood hazard effects associated with the proposal can be adequately avoided or mitigated.

34. 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:

> *'The site investigations and preliminary liquefaction assessment indicates that the site is predominantly TC1-like. Other geotechnical hazards (erosion, slippage and inundation) are considered 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 be carried out at the subdivision consent stage'.*

35. 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:

> *'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) and/or remediation works (i.e. remediation and validation of farm dumps / offal pits) being carried out prior to any earthworks and or building consents being granted'.*

36. Based on the assessment of flood hazard risk by Inovo Projects / E2 Environmental (**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

37. 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**.

38. 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.

39. The assessment concludes:

> *'The Plan Change proposed would enable the development of up to 2,000 residential Lots plus a small commercial zone to be established at the application site. These activities are predicted to generate in the order of 1,400 vehicle movements per hour in the peak hours and 14,000 vehicle movements per day.*

Primary access to the Plan Change site would be via two roundabouts on Springs Road. The northern roundabout has the potential to form part of a Lincoln bypass route, with the Plan Change road layout providing a connection from Springs Road to Ellesmere Road (via Moirs Lane). The remainder of the bypass route has been accounted for in the Verdeco Park subdivision. The site would also have accesses to Collins Road.

Road cross-section upgrades are proposed as described in detail earlier in this report so as to accommodate the predicted traffic volumes from the Plan Change site.

The Ellesmere Junction Road / Springs Road / Gerald Street roundabout has been identified as being at capacity with the completion of the current subdivisions in Lincoln. The inclusion of traffic associated with this Plan Change would lead that intersection to being over-capacity and an upgrade will be required. Council has already planned and funded a traffic signal-controlled intersection at this location and a potential revised layout has been identified that would accommodate the Plan Change traffic. There is potential that a lesser upgrade would be required if the Lincoln bypass were to be completed, with the proposed Plan Change including internal roading that is intended to facilitate this bypass. As such, the final form of the intersection arrangement needs to be agreed with Council.

The traffic capacity of the Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection has been assessed. This intersection can operate satisfactorily with the proposed Plan Change traffic added to the network. That said, the Council has a proposal to upgrade this intersection to a roundabout and this would reduce the traffic safety effects of the proposed Plan Change at this location.

Conclusion

Overall, it is considered that the transport effects of the proposed Plan Change will be acceptable on the surrounding transport network subject to undertaking the off-site improvements outlined in this report.

40. 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.

Landscape / Visual Effects and Amenity Values

41. 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'*.

42. The current character and amenity of the site and surrounds can be characterised as rural within the Plan Change site itself. 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). The

site does however contain 'rivers, wetlands or other natural waterbodies' of relevance in terms of Section 6(a) of the Resource Management Act. The site also features historic heritage (albeit not listed within the District Plan or HNZ register), which is relevant in terms of section 6(f).

43. 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.

44. 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. The receiving environment is to maintain aspects of openness through the restoration and retention of green and blue 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 Collins road. Though there is a change from rural to suburban, from this location the effects are minor as the proposal is an extension of the existing development present in the background. Views from Te Whāriki are screened by the existing level of development and have negligible effects. 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 Lincoln township. Effects for motorists are considered Less than Minor to Indiscernible.*
>
> *Overall, the scale and bulk and location of the proposal would allow it to appear as a natural extension of existing development within Lincoln, with the anticipated effects being minor.*

45. 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 proposed, the proposal will result in an acceptable magnitude of change on the existing rural landscape character and values. Key landscape features, including Springs Creek, LII River and natural springs will be retained and protected from*

development. Medium density areas will be 'internalised' within the development with lower density development providing a buffer with adjoining rural areas. The site will change from one rural and open in character to one which is more compartmentalised and suburban in nature, with the change partially mitigated through fencing controls and landscape planting.

In terms of visual amenity, the rural properties will experience a change in the openness of views across the space, noting that many of the adjoining properties are surrounded by well-established shelter belt and boundary plantings restricting views out. Adjoining suburban residential properties, current and future, overlooking the Plan Change area will have a mix of open, partial, and screened views of future development. In many cases these views will be across stormwater areas or are separated from the site by Liffey Creek, allowing for any future development to be assimilated into the existing residential character of Lincoln. The setback from existing walkways and extensions to existing walkways, while a physical attribute, will provide significant amenity to existing residents by allowing access to areas which are not currently accessible'.

46. 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.

47. Effects on broader amenity values are similarly considered to be less than minor, with the character and amenity values becoming residential in nature, consistent with the wider Lincoln township.

Urban Design & Urban Form

48. 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 Lincoln township.

49. The urban design assessment by DCM Urban Design in **Appendix E** addresses this and paragraph 20 above has outlined the key urban design and urban form outcomes that the proposed ODP will achieve.

50. 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.

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.

51. 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 zoning that provides diversity in the type, price, and location, of different households;

ii. Māori to express their cultural traditions and norms, accounting for the recognition and protection of water bodies on the site that are of cultural significance;

b. Have suitable provision for business, through a small local centre that will service local needs and supplement the services otherwise found in the Lincoln commercial centre.

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 Lincoln 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.

f. Be resilient to the likely current and future effects of climate change accounting for the flooding assessment in **Appendix A**.

52. 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

53. An assessment of the existing ecological values of the Lincoln South area 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**.

54. The conclusions from that assessment are as follows:

> *'Overall, from a plan change/rezoning perspective if the development incorporates key design items such as:*
>
> - *Stormwater discharging via first flush basins, detention basins and wetlands to attenuate stormflow and reduce contaminants to appropriate SDC & ECan guidelines;*
> - *Reserves/green space placed directly adjacent to key ecological waterways to protect them (i.e. western boundary drain, Springs Creek, LII River, natural springs and isolated waterbodies);*
> - *Fencing waterways with ecological value from further stock access;*
> - *Adherence to the 10m waterbody setback rules, or detailed assessment through a resource consent process;*
>
> *then the possibility of the plan change/rezoning ecological impacts being beneficial to the environment are likely to be increased. Currently, the draft outline development plan (ODP) proposed for the Lincoln South plan change shows many of these key design items proven to protect aquatic ecology.*
>
> *As a prerequisite to a submission of any subdivision consent application and subsequent land development, AEL recommends ecological assessment of the following habitats, in order to identify any ecologically significant biota, and construct mitigation measures to maintain and protect ecological values:*
>
> - *isolated waterbodies east of Springs Road;*
> - *minor drains in the south east corner of the development;*
> - *the LII River immediately downstream of the region proposed for re-zoning;*
> - *Springs Creek.*
>
> *In summary, if the listed key design items are implemented, along with the further ecological assessments, AEL believes this plan change will not necessarily manifest adverse ecological effects'.*

55. The plan change proposal incorporates the key design features recommended through the ODP (e.g. placement of reserves / green space), and will otherwise incorporate these features through subdivision (including stormwater) design and adherence to District Plan rules (e.g. waterbody setbacks).

56. On this basis, the potential adverse ecological effects of the proposal can be adequately avoided or mitigated.

Reverse Sensitivity

57. Intensive farming activities do not operate from the subject land or immediately surrounding land. No other activities in the vicinity of the Plan Change site are likely to give rise to notable reverse sensitivity effects.

58. Ultimately, the proposal will relocate the rural/urban interface from its present location along the northern edge of the plan change site, to its southern edge with Collins Road (beyond which are a number of rural-residential allotments).

59. Potential adverse reverse sensitivity effects from the Plan Change proposal are therefore considered to be negligible.

Sites of Significance to Iwi

60. Based on feedback from runanga 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 wahi tapu and wahi taonga 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.

61. Whilst the site contains no identified/listed waahi tapu, taonga or other sites of significance to Iwi, the presence of natural surface waterbodies and springs are recognised as being items of significant cultural value to tangata whenua. Consultation with MKT will be progressed in respect of the plan change generally and in respect of these water bodies especially, however it is noted that the proposed ODP incorporates large green space buffers adjacent to watercourses on the site and any waterbodies on the site will be protected by a 10m setback requirement for development[3].

Loss of Agricultural Production

62. The proposed plan change will result in land that is currently zoned Rural Outer Plains and which is used for pastoral grazing converting to an urban residential zoning and land use. Under the land use capability classifications, the land includes class 1, 2 and 4 soils (see **Figure 2**).

[3] Rule 2.1.1.4 stipulates a 10m setback for earthworks within 10m of any waterbody.

63. To the extent that the proposal will result in lost versatile soil, the quantum is not considered to be significant when assessed in the context of the wider rural Lincoln area or in terms of the District generally. 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.

64. Whilst the Plan Change proposal will result in the loss of some versatile soils and associated agricultural production, any corresponding effects will not be significant or unacceptable.

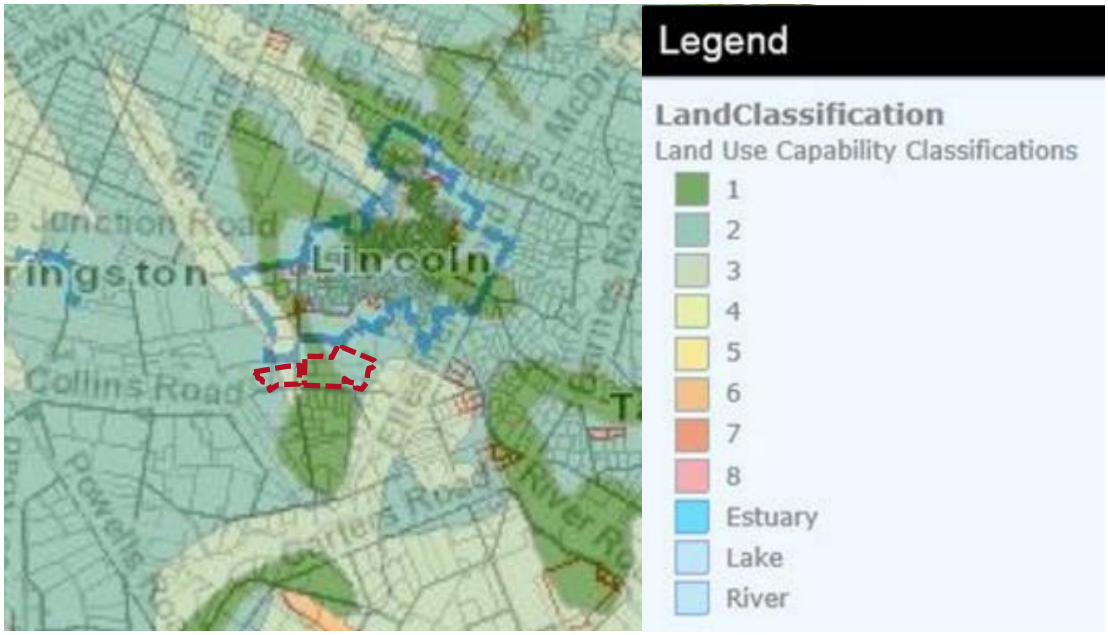


Figure 2: Versatile Soils Map (Source: Selwyn District Council)

Retail Effects

65. As noted above, the retail centre and Business 1 zoning proposed 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.

66. Accounting for these attributes, the proposed Business 1 zone will not undermine the viability, vibrancy and amenity values of existing larger centres within Lincoln or elsewhere within the Selwyn District.

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

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

Economic Effects

69. 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.

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

Summary of Effects

71. 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

72. 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.*

73. 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.

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

75. 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

76. 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.

77. 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.

78. 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 Lincoln (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.

79. 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 form that exists currently, the proposal is considered to be an efficient use of the physical land resource.

80. 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 Lincoln 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 *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.* *Objective B4.1.2* *New residential areas are pleasant places to live and add to the character and amenity values of townships.* *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 proposal will ensure that Lincoln 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. The subject area will be a pleasant place to live and will contribute to the character and amenity of Lincoln. Open space is provided throughout the plan change site, including greenspaces along site edges and waterbodies, 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, beyond the removal of some land from primary production. 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 to an urban 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, noting it incorporates the properties at 1521 and 1543 Springs Road and 208 Collins Road.

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

Policy B4.3.56

Ensure that new Greenfield urban growth only occurs within the Outline Development Plan areas identified on the Planning Maps and Appendices, and in accordance with the phasing set out in Policy B4.3.9.

Policy B4.3.57

Ensure any land rezoned for new residential development has motor vehicle access from an alternative collector or arterial road other than Gerald Street.

Policy B4.3.58

Ensure stormwater disposal from any land rezoned for new residential or business development will not adversely affect water quality in the LI or LII waterbodies; or exacerbate potential flooding from the LI or LII waterbodies "downstream".

Policy B4.3.59

Achieve integration between the rezoning of land for new residential development at Lincoln and associated provisions for utilities, community facilities and areas for business development.

Policy B4.3.60

Ensure rezoning any land for new residential or business development does not create or exacerbate potential "reverse sensitivity" issues in respect of activities in the Business 3 Zone or surrounding Rural Zone.

Policy B4.3.61

Consider any potential adverse effects of rezoning land for new residential or business development to the north of Lincoln Township on the 'rural-urban' landscape contrast of the area with Christchurch City, as identified in the RPS.

Policy B4.3.63

Ensure that development within each of the Outline Development Plan areas identified on the Planning Maps and Appendices within Lincoln addresses the specific matters relevant to each ODP Area number listed below:

The proposal entails Greenfield urban growth that is not within the Outline Development Plan areas identified on the Planning Maps and Appendices, however it is considered appropriate accounting for the recent policy direction in the NPS-UD, as is assessed later in this report.

The subject land has motor vehicle access from an alternative arterial road other than Gerald Street.

Stormwater disposal from the rezoned land will not adversely affect water quality in the LI or LII waterbodies; or exacerbate potential flooding from the LI or LII waterbodies "downstream" – refer to the Inovo Projects / E2 assessment in **Appendix A**.

Accounting for its location and physical connectivity, the proposal will effectively integrate with adjacent residential land, and with utilities, community facilities and business within the Lincoln township.

As has been assessed earlier, the proposed rezoning will not create or exacerbate potential "reverse sensitivity" issues in respect of activities in the Business 3 Zone or surrounding Rural Zone.

The proposal is not within an existing Outline Development Plan area, however it addresses the equivalent matters insofar that these are relevant to the subject land – refer **Appendix E**.

Township Volume: Chapter B2 Physical Resources

Objective B2.1.1
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.

Objective B2.1.2
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.

Objective B2.1.3
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.

Objective B2.1.4
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.
Objective B2.1.5

Policy B2.1.2
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.

Policy B2.1.3
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.

Policy B2.1.4(a)
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:
– the number and type of vehicle movements generated by the activity;
– the road classification and function; and
– 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

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.

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.

In regard the arterial function of Springs Road, the proposal recognises and protects the function of this road and provides for its efficient flow. Also, Springs Road will have no direct access to lots in the new development as shown on the ODP.

In regards utilities and as stated in the Infrastructure Report contained in **Appendix A,** while the township is subject to some sewer and water supply constraints currently, they are able to be resolved.

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.*	The proposal will maintain a relatively compact town form albeit the town will extend further to the south 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. The proposal will provide for a character and amenity that is consistent with the remainder of the Lincoln Township and the existing developing Te Whāriki and Verdeco subdivisions on adjacent land. The proposed Living zone will meet the outcomes sought by Policy B3.4.3. There are no existing activities with which the development is anticipated to be incompatible.

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;*
    - *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 is understood to encompass some areas of versatile soils[5]. The proposal is not understood to create a shortage of land or soil resources and the area of versatile soils to be removed from productive use is not large relative to the wider availability of versatile soils in the District.

Accounting for the buffers provided for within the ODP, the development of the site 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.

81. 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 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 Lincoln. 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.

[5] Selwyn District Council Baseline Assessment – Versatile Soils (DW015), Dec 2018. Figure 9.

Assessment of Efficiency and Effectiveness of the Plan Change

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

- Leave the area zoned Rural
- 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 Lincoln residential environment.
- Apply for multiple plan changes in other locations around Lincoln to otherwise achieve an equivalent extension to the existing Lincoln residential environment.

83. **Tables 2-4** which follow provide an assessment of these options.

Table 2: Benefits and Costs of Option 1 – Leave the area zoned Rural

Benefits/Advantages	Costs/Disadvantages
• Maintains the existing character and amenity of the area. • No time or costs arising from a plan change process. • No additional demands on infrastructure. • No effects on versatile soil resources.	• Does not meet market demand for residential sites in Lincoln (especially to the south part of Lincoln).

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

Benefits/Advantages	Costs/Disadvantages
• Increasing the availability of allotments within Lincoln township. • Economic benefit to Council from larger rating base through additional properties being added upon subdivision. • Economic benefit to the landowner from development of the property. • Provision of high quality residential amenity for future residents. • Additional supply of housing will assist in avoiding price rises resulting from otherwise suppressed housing supply, noting that all other residential zoned land to the south of Lincoln either has been or is currently being developed.	• Change in character and amenity of the site from rural to urban. • Increase in traffic generated in and around Lincoln township. • Additional infrastructure capacity required, to be provided at developer's cost. • Loss of low productivity rural land.

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. • Council has the ability to place stricter controls on the development through consent conditions than may be possible through a plan change. • 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. • Restricted timeframe in which land has to be developed and houses built, leading to potential economic costs for landowner/developer. • Less flexibility in being able to develop the land. • Possibly higher costs to develop land through the placing of tighter controls on the development by way of strict conditions on a consent. • High difficulty of obtaining resource for non-complying status subdivisions. • Change in character and amenity of the site from rural to urban. • Increase in traffic generated in and around Lincoln township. • Additional infrastructure capacity required, to be provided at developer's cost. • Loss of low productivity rural 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) • Distribution of growth to other locations	• As for Option 2 (see Table 3) • Reduced economies of scale • Fragmented / ad hoc development • Inability to implement wider benefits such as Lincoln south bypass, road network upgrades, Springs creek corridor enhancements, etc.

84. 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.

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

Effectiveness

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

87. 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 Lincoln (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

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

89. 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.

90. 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.

91. Taking into account the costs and benefits, Option 2, rezoning the Plan Change area, 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

92. Given the relatively recent rezoning and subdivision consenting of the adjoining Verdeco and Te Whāriki developments, the relevant issues associated with the rezoning and development of land in this 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

93. 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.

94. 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

95. 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.

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

97. 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.

98. 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.

99. 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

100. 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.

101. 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 north, with only such amendments as are necessary to recognise the site, the proposed ODP. The proposed ODP provides the methods for Council to manage potential effects of this activity and demonstrates an integrated management approach.

Section 75 – Contents of District Plans

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

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

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

105. 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

106. 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.

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

108. 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.

109. 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.

110. 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).

111. 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 Lincoln population is less than 10,000 people currently, with the 2019 census indicating a population of approximately 7,500. Discussions with Selwyn District Council planners[6] have however indicated that Lincoln 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.

112. 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.

113. 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.

114. 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.

[6] By email, Ben Rhodes, 6 August 2020.

115. In regards to development capacity, the contribution will be significant. In simple terms, the provision of up to 2,000 additional households/allotments is clearly significant in the context of a township with a population of 8130[7].

116. Selwyn District Council staff have also provided information on 'theoretical' development capacity within the recently zoned areas of Lincoln township relative to actual development[8]. This information is presented in **Table 5** below and indicates that of the 3721 theoretical dwellings provided for within the existing residential zoned ODP areas 1-8 at Lincoln, 2957 allotments have been issued subdivision consent approval (i.e. a residual of only 764 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 Lincoln has been largely developed already.

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

LINCOLN 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	495	0	0	61
2	623	532	217	180
3	1708	1931	958	798
4	599	265	222	186
5	127	113	62	22
6	23	0	0	0
7	36	4	2	0
8	110	112	30	19
TOTAL	**3721**	**2957**	**1491**	**1266**
Percentage of theoretical total of 3721		**79%**	**60%**	**34%**

117. Again, when considered in relative terms, it is clear that the proposal to provide for up to 2,000 allotments will 'add significantly to development capacity' for the Lincoln township, noting that the remaining 8 ODP areas collectively provide for 3721 allotments.

[7] Source: https://www.selwyn.govt.nz/community/living-in-selwyn/selwyn-stats-And-facts and http://nzdotstat.stats.govt.nz/

[8] Theoretical capacity is based on the gross land area of ODP Areas 1-8 in the District Plan and a 10 households / hectare density. Actual development accounts for allotments that have obtained subdivision consent approval, section 224c certification, and building consent approvals.

118. For the reasons expressed earlier in this assessment and within the urban design assessment in **Appendix E**, the proposal will otherwise 'contribute to well-functioning urban environments'.

Canterbury Regional Policy Statement

119. 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.

120. The most relevant objectives and policies of the RPS are those contained in Chapter 6, which were inserted by the Land Use Recovery Plan. Chapter 6 contains the objectives and policies that guide the Recovery and Rebuilding of Greater Christchurch.

121. In 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 ODP, with the adjoining residential zone. However, the Plan Change is not located within an identified priority area for urban development within Greater Christchurch. As noted above, NPS-UD Policy 8 provides for inconsistency with this requirement.

122. 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. The proposal will have some effect on rural character and amenity, though the landscape and visual assessment attached in **Appendix E** confirms that effect will be minimised.

123. With regard to transport objectives and policies, 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 south, the site will not result in long travel distances to the township, noting that facilities such as Lincoln University, the town centre and its associated commercial activities and amenities 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.

124. 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

125. 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

126. 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

127. 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 and basins, 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, or otherwise treated and disposed of via first flush and detention basins (as referred to in **Appendix A**). In respect of surface water bodies on the site, these are provided with open space buffers and 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

128. 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

129. 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

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

Te Waihora

131. 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

132. 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

133. 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.

134. 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 within the application site or close by. In respect of section 6(f) and the protection of historic heritage from inappropriate subdivision, use, and development, the (unlisted) heritage item within the site will be retained with sufficient space to account for its setting and heritage values.

135. 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 the northern boundary of the plan change site to the Collins Road boundary to the south and rural-residential and rural land use beyond. 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.

136. An overall assessment of the proposal to rezone the land for Living X, 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 Lincoln.

Appendix A

Infrastructure Assessment

Infrastructure Report

ROLLESTON INDUSTRIAL DEVELOPMENTS LTD

LINCOLN SOUTH PLAN CHANGE

PROJECT 14692

ISSUE 3 – 28 OCTOBER 2020

INOVO PROJECTS

Contents

QUALITY ASSURANCE

PREPARED BY	TIM MCLEOD	SENIOR CIVIL ENGINEER		28 OCTOBER 2020
REVIEWED & APPROVED BY	PETER MCAULEY	DIRECTOR		28 OCTOBER 2020

1. Introduction

1.1. Purpose

Inovo Projects Ltd has been engaged by Rolleston Industrial Developments Ltd to complete an Infrastructure Assessment for a proposed residential development at 1491 Springs Road, south of the township of Lincoln, in support of a Plan Change application for development of approximately 2,000 residential lots at the site. 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 Lincoln South Plan Change site is an existing dairy farm of approximately 186 ha straddling either side of Springs Road located to the south of Lincoln township, adjacent to the Te Whāriki (Residential - Living Z) and Verdeco Park (Residential - Living 3 & Living Z and Business 2B) developments. The site extends south to Collins Road, east to Ararira/LII River , and west to an unnamed private drain along its western boundary.

The land is currently zoned Rural – Outer Plains. The current land use surrounding the site to the west, south and east is primarily rural. Lincoln University located 1 km to the north and the Lincoln township located approximately 2 km to the northeast of the site. Stage 4 of Te Whāriki subdivision, between Southfield Drive and the plan change site, is currently under construction and will contain approximately 360 lots typically ranging in size from 500-900m^2.

The site is typically gently sloping (1:180) to flat, sloping from Springs Road to the southeast towards Ararira/LII River and to the south / southwest to Collins Road and the unnamed private drain. Springs Creek traverses the eastern half of the site before combining with the Ararira/LII River. The site has been used for dairy farming purposes for the last 50 years and is currently covered in variety of irrigated pasture. The majority of the site comprises agricultural fields and pasture, with a cluster of farm building and diary-farm infrastructure situated near the centre. There are 5 existing houses on the subject site, including the historic 'Chudleigh' homestead on the south bank of the Springs Creek headwater springs. Shelter belts, including poplar and macrocarpa species, line Springs Road but otherwise the site is free of any significant vegetation with the exception of around the homestead and Springs Creek headwaters.

2.2. Drainage Features

Springs Creek is a spring fed tributary of the Ararira/LII River with headwater springs situated within the grounds of the historic 'Chudleigh' homestead. Springs Creek traverses the eastern half of the site before linking with the Ararira/LII River some 400m downstream of the confluence of the L1 River and Liffey Stream. The creek bed alignment has been modified over time to straighten the channel and improve its drainage function.

Lincoln Main Drain (LMD) is a spring-fed classified drainage channel that crosses the northeast portion of the site from northwest to southeast and serves as the main drain outlet for the Te Whāriki subdivision. The LMD is a formalised drainage channel some 1.5 to 2.5m deep with steep banks and discharges into the Ararira/LII River some 185m downstream of the confluence of the LI River and Liffey Stream.

Collins Road Drain is a classified drainage channel running alongside Collins Road on the south boundary of the site and discharging into the Ararira/LII River in the southeast corner of the site. There are 3 branch drains extending into the lowest parts of the site and connecting to numerous springs. Collins Road drain was formalised over 100 years ago to drain swampy land adjacent to the Ararira/LII River to increase agricultural production.

Baseflow in Springs Creek, Lincoln Main Drain, and Collins Drain is dominated by groundwater discharges from artesian springs.

There is an unnamed private drain (unclassified) on the western boundary of the site which discharge into the SDC classified drainage network in Collins Road. The SDC drain flows southwest along Collins Road then connects with a larger drain that follows Sergeants Road until it enters the Ararira/LII River approximately 3.4 km downstream from the site. The unnamed drain is believed to be a natural ephemeral watercourse that was formalised as a drain over 100 years ago. The tail end of the Paparua Stockwater Race network discharges into the northern end of this drain (this is formally the end of the stockwater race) and provides more regular flows (subject to water demand upstream). Stormwater runoff from the Verdeco Park development including any secondary overland flow is directed to this unnamed drain.

2.3. Ground Conditions

A geotechnical investigation and assessment of suitability for subdivision has been carried out by Coffey Services Ltd as described in their *Geotechnical Assessment Report* for 1491 Springs Road Lincoln (Ref. 773-CHCGE280252 dated October 2020).

The ground model for the site is described as interbedded alluvium consisting of soft to very stiff silts, sandy silts and silty sands to varying depth from 1 to 5.5m, overlying interbedded alluvium deposits typically consisting of sand and gravel deposits with some layers of silt, sandy silt and silty sand to greater than 20m depth (Springston Formation). The eastern edge of the site has potentially organic deposits in the low-lying areas (further investigation required to confirm).

Groundwater is shallower in the eastern portions of the site and gradually deepens to the west as ground levels rise to around 2 to 3m below ground level. Groundwater levels on the eastern edge of the site are dominated by the water level in the Ararira/LII River which is in turn affected by water levels in Te Waihora/Lake Ellesmere and regular maintenance of the drainage network to remove weeds and sediment. Small rainfall events mostly infiltrate into the soils, but more substantial rainfall events, particularly in winter, can produce overland runoff.

2.4. Groundwater & Springs

The Environment Canterbury (ECan) GIS database shows 12 wells within the plan change site. The wells are used for domestic supply (4), irrigation and/or stockwater (5), and groundwater quality and water level observations (3). The productive water supply wells range in depth from 19m to 28m. The highest measured depth to groundwater in shallow wells near the site varies between 0.2 and 0.42 m below ground level.

The groundwater table level will influence the depth of stormwater management systems, particularly on the lower lying land on the eastern portion of the site where groundwater levels are influenced by the water level in the Ararira/LII River.

There are a number of artesian springs and associated land drains located across the site that will be incorporated into the overall development plan.

2.5. Existing Infrastructure

There is no existing SDC infrastructure located within the site. Existing dwellings located within the site have on-site supply wells and wastewater systems, as well as private connections for power and telecommunications. Infrastructure to neighbouring residential subdivisions to the north can be extended to the proposed development.

Stormwater drains located on both the western and eastern boundaries of the site have the potential to be utilised as the stormwater discharge points for the proposed development. Both drains ultimately discharge to the Ararira/LII River . Further discussion of stormwater is found in Section 3.

An existing sewer rising main is located within Springs Road, immediately north of the proposed development site. This existing Ø140mm rising main originates from the wastewater pump station in Verdeco Park and discharges into the Springston/Prebbleton rising main at the intersection of Gerald Street / Springs Road, which then discharges to the Allendale Pump Station located immediately to the north of the development site. From the Allendale Pump station wastewater is pumped to 'The Pines' Wastewater Treatment Plant in Rolleston via the Selwyn Road Pump Station. Further discussion of sewer infrastructure is found in Section 4.

There is an existing Ø200mm uPVC water supply main located within Springs Road which extends to the Verdeco Park Business Zone immediately opposite the driveway to No. 1491 Springs Road. Further discussion of water supply is found in Section 5.

3. Stormwater

3.1. Eastern Catchment

The eastern catchment is bounded by Springs Road, Collins Road, Ararira/LII River and Te Whāriki Subdivision to the west, south, east and north respectively, and generally falls west to east towards the Ararira/LII River .

Springs Creek is a small spring-fed watercourse that bisects the eastern catchment and discharges into the Ararira/LII River . The Springs Creek alignment has been partially straightened to improve its drainage function and increase usable area for farming. There are also numerous land drains within the farm that typically originate at existing springs and provide land drainage to reduce waterlogging of the soil and increase productivity . There is a classified drain along the north side of Collins Road known as Collins Drain, with 3 branch drains extending into the site.

The proposed receiving environment for stormwater discharge from the eastern catchment is the Ararira/LII River which runs along the eastern boundary of the site. The Ararira/LII River is a spring fed river which begins at the confluence of the LI and Springs Creeks approximately 1 km south of the Lincoln township. The river flows into the northern end of Te Waihora / Lake Ellesmere some 10 km downstream. The full length of the river is characterised and influenced by land drainage and agricultural land use.

3.2. Western Catchment

The potential receiving environment for stormwater discharge from the western catchment is an existing private drain which runs along the western boundary of the site. The drain is classified as a private drain conveying overland flow including stormwater discharge from the Verdeco Park development. There are several options to convey the water currently carried by this drain including piping it or using an engineered channel. The expected peak flow through the current drain will need to be calculated in order to appropriately design the chosen conveyance method to ensure that flooding onsite of upstream properties does not occur.

Existing overland drainage from Verdeco Park subdivision to the north of the site has been modified and diverted westwards as part of the subdivision development. There is a formed swale along the common boundary that conveys overland runoff and excess stormwater from the Verdeco Park Stormwater Management Area (adjacent to Springs Road) to the unnamed drain to the west.

3.3. Stormwater Management

By developing the site to residential land use there will be an increase in the impervious areas and hence stormwater runoff. The additional runoff will be associated with rooves, driveways and hardstand surfaces which will require treatment and attenuation to manage quality and quantity before being discharged to the receiving environment.

Initial observations indicate that across most of the site ground conditions consist of poorly drained soils and relatively high groundwater levels that would suggest that stormwater generated from individual lots may not be able to be discharged to ground and therefore will need to be managed with surface facilities. For the higher parts of the western catchment (i.e., west of Springs Road) disposal to ground may be feasible (to be further investigated during subdivision design stage). For the purpose of this assessment it is assumed that all additional stormwater resulting from the development will be managed using constructed Stormwater Management Areas to treat and attenuate runoff before discharging to the receiving environment.

Stormwater Management Areas (SMA'S) are proposed at the downslope end of each catchment to provide stormwater treatment and attenuation following the principles of the *Wetlands and Waterways Design Guide* (WWGD) published by Christchurch City Council (CCC, 2012). The SMA'S will consist of ;

- a first flush basin to capture and remove total suspended solids in the runoff generated by the first 20 mm of rainfall on the catchment (primary treatment);

- a wetland to provide water quality polishing in rainfall events up to the first flush depth of 20 mm (secondary treatment), and provide live storage in large rainfall events exceeding the 20% AEP event; and
- a detention basin to provide water quantity attenuation in large rainfall events greater than the first flush event, but up to the 2% AEP.

Refer to Appendix A for the *Stormwater Concept Design Report* prepared by e2 Environmental which provides a high-level analysis undertaken for the concept design of the required stormwater management areas. The report demonstrates how the proposed stormwater management meets legislative requirements and documents the methodology behind the calculations.

From a stormwater perspective, the plan change can be supported with areas set-aside for stormwater treatment and attenuation as outlined above.

3.4. Diversion of Drains

Existing drains within the site may be diverted to maximise the opportunity for developable land, improve the amenity value by naturalisation of formal land drains, provide compensatory flood storage volume, and to achieve stormwater quality objectives.

The Lincoln Main Drain is to be diverted to the northern boundary of the site. This presents the opportunity to naturalise and enhance the amenity values of this drain. This will not affect its primary function as main drain outlet to the Te Whāriki subdivision.

Branch drains connecting to the Collins Drain will be diverted around proposed Stormwater Management Areas to avoid mixing of clean spring waters and untreated stormwater runoff. Where appropriate (and feasible) spring flows will be used to maintain baseflow through wetland treatment areas.

There are a number of smaller springs and associated land drains located across the site that will be incorporated into the development at the subdivision design stage.

3.5. Flood Management

The lower parts of the site next to the Arariri/LII River are susceptible to surface water ponding and flooding in high rainfall and flood events, including overtopping of the Arariri/LII River and tributaries in extreme events. Detailed model results showing the extent and flood depth are available to view on the SDC's website and are presented in the *Stormwater Concept Design Report* in Appendix A. Options for flood management are also presented.

Flood modelling for the 0.2% AEP indicates flooding of the Arariri/LII River floodplain next to the Arariri/LII River to a maximum level of approximately RL 4m (New Zealand Vertical Datum 2016). Parts of the site above RL 4m are not subject to inundation and can be safety developed. Areas of the site below the RL 4m contour line can potentially be developed as larger residential lots subject to setting minimum building platform levels and allowing part of these lots to flood in extreme events.

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 towards the Stormwater Management Areas. Flood levels will be controlled by the stormwater basin/wetland outlet structures. Compensatory storage may be required to offset embankments and structures constructed for the stormwater management areas in the Arariri/LII river floodplain.

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 shown in the flood models, and in particular Te Whāriki subdivision, have been modified and mitigated by subdivision development upslope and the flood models will need to be updated. It is considered that any adverse stormwater effects can be appropriately mitigated through stormwater management areas in the ODP and minimum floor level rules at the time of subdivision and / or residential development.

4. Wastewater

4.1. Reticulation

The majority of new lots can be serviced by gravity sewer network discharging to new pump stations located at the west and east ends of the site (lowest elevation). Lots that cannot be serviced by gravity sewer will utilise local pressure sewer to discharge into the gravity network.

The final number and locations of sewer pump stations will be determined during subdivision design in consultation with SDC. It is envisaged there will be at least two pump stations located to the west and east margins of the site (lowest elevation).

The pump station servicing the area east of Springs Road will discharge via a new rising main laid directly across to the SDC Allendale Pump Station some 900m to the northeast. This avoids adding any extra load to the existing local sewer infrastructure to the north of the site.

If developed first, the pump station servicing the area to the west of Springs Road can initially discharge into the existing Ø140mm sewer rising main Springs Road, and then be modified to discharge to the gravity network draining to the eastern pump station once this is developed to avoid adding additional load to the existing Springston/Prebbleton rising main.

A third pump station may be required to service the north-eastern portion of the site north of Springs Creek to avoid a siphon or deep sewer crossing under the creek bed. This pump station would pump into the same rising main to the Allendale Pump Station. An alternative solution is to service this area with local pressure sewer.

4.2. Network Capacity

Refer to the Wastewater Network Capacity Assessment prepared by WSP attached as Appendix B for an assessment of the capacity of the Allendale Pump Station and rising main network to Rolleston. In their assessment WSP concluded that the addition of the proposed wastewater flows from the plan change area does not cause any significant problems at Allendale Pump Station and Selwyn Road pump stations during dry weather. During wet weather the peak flow to Allendale Pump Station is greater than its capacity and overflow to the emergency storage facility at Allendale is predicted. Allendale Pump Station has sufficient emergency storage to act as a buffer for the additional flows entering the system from the ODP area.

The capacity of the existing Ø140mm sewer rising main in Springs Road and the Springston/Prebbleton rising main discharging to the Allendale Pump Station has not been assessed. However, increased demand on this pipeline due to population growth in Springston and Prebbleton can be expected. A new rising main from the proposed eastern pump station directly to the Allendale Pump Station avoids any local network constraints.

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 Lincoln township reticulated supply extends along Springs Road to the Verdeco Park Business Zone, opposite the plan change site. As reported by WSP in their memo in Appendix C, upgrades of existing pipes in Springs Road may be required to ensure adequate water supply.

Additional connections to other parts of the Lincoln township reticulation network to the northeast such as Te Raki Drive (via the Allendale pump station site) and Liffey Springs Drive 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 C for an assessment of the upgrades required to the SDC water supply network to service the plan change area. Two upgrade options were considered in their assessment including upgrading the existing SDC bore facility at Vernon Drive and water supply mains to the site, and development of a new supply bore in the proposed development area. WSP concluded there are there are no water supply issues which would impede rezoning of this land for residential use.

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

6. Power / Telecommunications

6.1. Power

There is existing 11kV and 33kV electricity network bordering the site 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. 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 Springs Road can be extended from the Verdeco Boulevard intersection to the site 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 Springs Road and Collins Road. A connection onto Moirs Lane has been proposed to provide a link to Ellesmere Road.

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.

Concrete footpaths with broom or exposed aggregate finish are proposed in the roading network in accordance with SDC Engineering Code of Practice and in keeping with other recent subdivisions in Lincoln. 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 either northeast to southwest (western catchment) towards the drain on the western boundary or west to east towards the Ararira/LII River (eastern catchment), at an average gradient of 1:180 and with height difference of approximately 8 metres total elevation change from the Ararira/LII River (RL 3m) to the highest point west of Springs Road (RL 12m in terms of New Zealand Vertical Datum 2016).

Bulk earthwork design will be determined by providing overland flow paths along roads and achieving 1:500 (absolute minimum) grade 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.

A former borrow pit located to the northwest of Springs Road and Collins Road intersection has been identified, and it is understood environmental investigation and reporting has been carried out previously. Options for remediation for residential land use or setting aside for alternative land use such as reserve area will be investigated during the subdivision design stage.

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

Stormwater runoff from the majority of the site will be conveyed by a network of swales and pipes to two proposed Stormwater Management Areas for treatment and attenuation before being discharged into the Ararira/LII River to the east and an existing private drain to the west of the site. Detailed design of the SMA's will be determined by the developer in collaboration with SDC at the subdivision stage and in accordance with Environment Canterbury requirements.

The majority of new sites can be serviced by gravity sewer network discharging to new pump station(s) located to the west of Springs Road and at the east end of the site (lowest elevation). Sites that cannot be serviced by gravity sewer will utilise Local Pressure Sewer to discharge into the gravity network. The eastern pump station will discharge via a new pumping rising main directly across to the SDC operated Allendale Pump Station some 900m to the northeast of the site. The Allendale Pump Station has sufficient emergency storage to act as a buffer for additional flows entering the system from the plan change area.

The water reticulation will be an extension of the existing water reticulation network bordering the site. Upgrades of existing pipes in Springs Road may be required to ensure adequate water supply. Additional connections to other parts of the SDC network to the northeast will be determined at the subdivision stage to increase network connectivity and resilience.

Existing electricity and fibre broadband networks in the surrounding developments to the north can be extended to service the proposed plan change area.

From an infrastructure perspective, the plan change can be supported by extension of infrastructure servicing neighbouring developments and provision of stormwater management areas within the development.

APPENDIX A | STORMWATER CONCEPT DESIGN REPORT

CARTER GROUP

22 October 2020

LINCOLN SOUTH PLAN CHANGE

Stormwater Concept Design Report

e2environmental CONSULTING ENGINEERS

CARTER GROUP

22 October 2020

LINCOLN SOUTH PLAN CHANGE

Stormwater Concept Design Report

Quality Control			
Author	*Daniel McMullan*	Client	*Carter Group*
Reviewed by	*Andrew Tisch*	Date Issued	*22 October 2020*
Approved by	*Andrew Tisch*	Revision No.	*2*
Doc Name/Location	*S:\Projects\20055 Lincoln South PC\Deliv\rpt 201022 Lincoln South PC Stormwater Concept.docx*		

Table of Contents

Project Personnel

Developer:

Owner	Carter Group Ltd

Principal Designer:

Name	Andrew Tisch, Principal Engineer, and Daniel McMullan Assistant Engineer
Company	e2Environmental Ltd
Address	P O Box 31159, Ilam, Christchurch 8044
Phone	021 90 65 38
Email	andrew.tisch@e2environmental.com

1 Introduction

This report focusses on the following:

- **Treatment of stormwater in the first flush event;**
- **Attenuation of stormwater in large rainfall events; and**
- **Management of overland flow paths and ponded water in large flood events.**

1.1 Background

This report supports an application for a private plan change to the Selwyn District Council (SDC) on a block of land south of the Lincoln township, just north of Collins Road and west of the Ararira/LII river (see Figure 1). e2Environmental Ltd (e2) has been engaged to provide technical advice regarding the management of stormwater from both a water quality and a water quantity perspective.

1.2 Report Purpose

The purpose of this report is to document the high-level analysis undertaken by e2 for the concept design of stormwater management areas. The report demonstrates how the proposed stormwater management meets legislative requirements and documents the methodology behind the calculations.

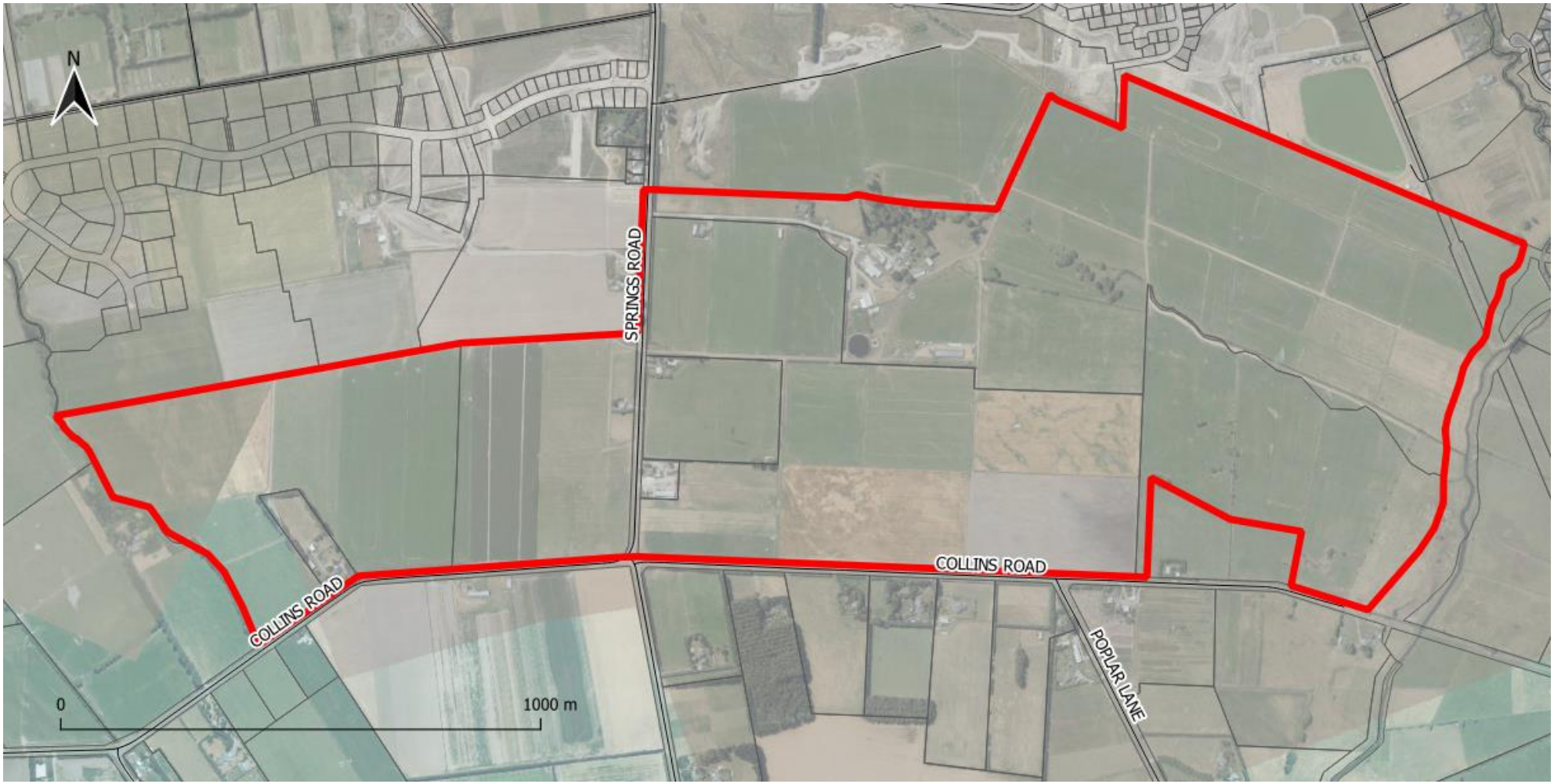


Figure 1 *Site area (highlighted by red outline)*

2 Design Specifics

2.1 Legislative Requirements Specific to the Design

Stormwater discharge in Lincoln needs to be authorised by one of the approval options outlined below:

1. A rule in the Environmental Canterbury (Ecan) Land and Water Regional Plan (LWRP). *This activity will not meet the relevant rule(s) in the LWRP*.
2. An existing global stormwater consent held by SDC. *The global consent CRC184822 covers an area north of the site and therefore cannot be used*.
3. A site-specific discharge consent from Ecan. *This is the only approval route available for the proposed site discharges.*

As much of the site is near the south boundary of the SDC global consent area we have assumed that the stormwater treatment and attenuation conditions in the consent will be appropriate for the site. This is based on geotechnical findings to date that show that soil and hydrogeological conditions are sufficiently similar to the area covered by the consent; and that SDC will have similar development drivers for new developments in Lincoln.

Relevant design requirements from the global consent include:

- The stormwater drainage network to have capacity to convey stormwater from the contributing catchment from events up to and including a 10% AEP;
- Provide overland flow paths for secondary flows in excess of a 10% AEP event away from buildings and private property;
- Provide peak flow attenuation for events up to a 2% AEP for storm durations up to the critical duration of the waterway into which it discharges for discharges into surface water. Detention basins will, either alone or in combination with other devices, attenuate flows so that the post-development flows do not exceed the pre-development flows for events up to a 2% AEP event of any duration;
- Provide retention for all events up to a 2% AEP for discharges to land.
- Provide primary and secondary treatment in series (a treatment train), to remove at least 75 percent of total suspended solids from the discharge on a long-term average basis.
- Design of all devices to allow for climate change in scenario RCP8.5 out to the years 2081 to 2100.
- The ‘first flush’ rainfall depth for water quality treatment of 20 mm; and
- Treatment wetlands will, either alone or in combination with other devices, attenuate flows so that the post-development flows do not exceed the pre-development discharge rate for the 50%, 10% and 2% AEP design storm events for durations up to and including 12 hours.

Additional design performance requirements have been specified based on Christchurch City Council’s (CCC) Waterways, Wetlands, and Drainage Guide (WWDG).

2.2 Catchments

The site for proposed development has been split into three catchments identified as the western catchment, an eastern catchment, and a north-eastern catchment. The western and eastern catchment boundary has been defined based on a natural ridge approximately 175 m west of Springs Road. The eastern and north-eastern catchment boundary has been defined based on location of Springs Creek. Additionally, we understand that overland flow

from land to the north of the western catchment has been effectively cut off (T. McLeod, personal communication, October 21, 2020). Refer to Figure 2 for a plan showing the catchment extents, and Table 1 which provides assorted catchment details.

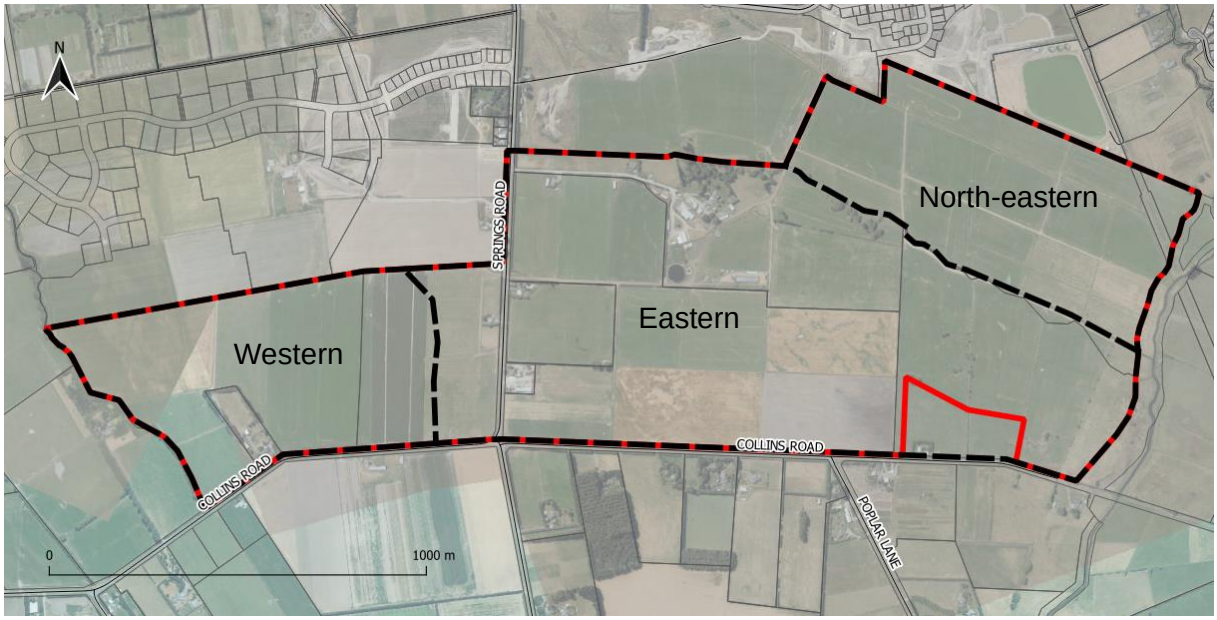


Figure 2 Site catchments (defined by black dashed line)

Table 1 Catchment details

Catchment:	Western Catchment	Eastern Catchment	North-Eastern Catchment	Source
Area:	39.5 ha	114.0 ha	40.7 ha	GIS / 2016 LiDAR
Assumed drainage:	Moderate	Poor	Poor	On-site geotechnical investigations of soils
Estimated time of concentration (approximate):	1 hour	2 hours	1 hour	Calculations based on WWDG

2.3 Design Philosophy

The design of the stormwater management area (SMA) has followed the process laid out in the WWDG (CCC, 2012). The SMA will consist of:

- A first flush basin to capture and remove total suspended solids in the runoff generated by the first 20 mm of rainfall on the catchment (primary treatment);
- A wetland to provide water quality polishing in rainfall events up to the first flush depth of 20 mm (secondary treatment), and provide live storage in large rainfall events exceeding the 20% AEP event; and
- A detention basin to provide water quantity attenuation in large rainfall events greater than the first flush event, but up to the 2% AEP.

This is presented in a conceptual diagram in Figure 13. Attenuation will be provided by controlled outlets with the provision of storage.

A SMA is proposed for each of the three catchments.

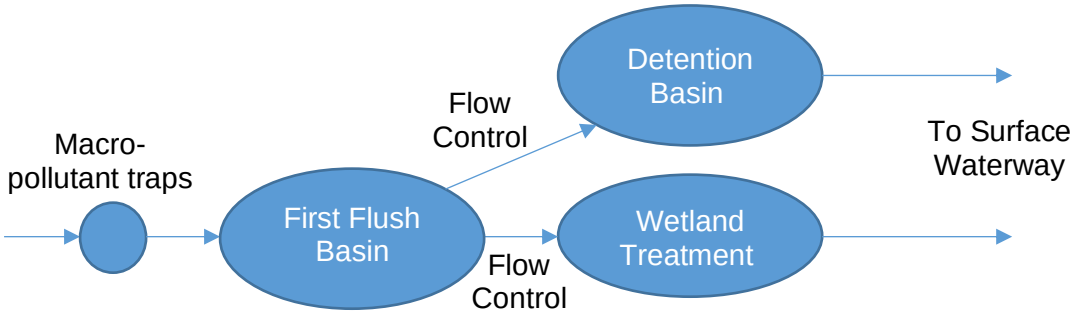


Figure 3 Approximate conceptual stormwater management area

2.4 Stormwater Management Areas

The required volumes and areas for each catchment's SMA has been estimated using a high-level rational method calculation (refer to Table 2). Due to the high-level approach, there is some inherent uncertainty for the stormwater runoff volumes; however, the approach taken is expected to be conservative and suitable for the requirements of this report. Further analysis will be required for the detailed design of these SMAs. Additional storage volume is available if required for the east and north-eastern catchments within flood zone #1 (detailed in Section 2.5).

Table 2 Stormwater management area details

	Western Catchment		Eastern Catchment		North-Eastern Catchment	
	Volume	**Area**	**Volume**	**Area**	**Volume**	**Area**
First Flush Basin	4,980 m³	1.0 ha	14,360 m³	2.9 ha	5,120 m³	1.0 ha
Detention Basin	3,200 m³	0.5 ha	2,500 m³	0.4 ha	900 m³	0.15 ha
Wetland	6,640 m³	1.3 ha	19,150 m³	3.8 ha	6,830 m³	1.4 ha

The following assumptions have been made:

- First flush basins have been assumed to have an average depth of 0.5 m of live storage due to the likely available depth for a small embankment to contain floodwaters on the natural slope of the land;
- Detention basins have been assumed to have an average depth of 0.6 m of storage due to the likely available depth for a small embankment to contain floodwaters on the natural slope of the land;
- Wetlands have been assumed to have an average depth of 0.5 m of live storage above their live operating water level. This is a typical depth of live storage recommended by CCC in the WWDG;
- Wetlands have an average operating water depth of 0.25 m, a vegetation porosity of 0.75, and a hydraulic residence time (HRT) of two days. Note that the SDC global consent may allow for an HRT of at least 24 hrs, which would reduce wetland area. However, as the SMA is likely to be smaller than the flood management area, a 2 day HRT could be accommodated within the area.

- That water can be conveyed to each of these stormwater management areas from their contributing catchments;
- That the proposed development will have a density approximately equivalent to the Residential New Neighbourhood in CCC's district plan and outlined in the WWDG (CCC, 2020);
- That the stormwater management areas can also be utilised for flood storage in the 0.5% and 0.2% AEP flood events;
- That the Ararira/LII River has a time of concentration of less than 12 hours, and that the 12 hour rainfall event is the critical duration for volume in the SMA. Further analysis during future design will confirm the critical storm events for the SMA;
- That no soakage to ground will be possible; and
- That design rainfall depths and intensities are consistent across the development.

2.5 Qualitative Flood Management

Flood management is required to ensure that floodwaters in the 0.5% AEP and 0.2% AEP flood events are safely managed away from people and property. These events have been modelled by SDC in a large catchment-wide two-dimensional hydraulic model which represents the floodplain by a 10 m coarse rectangular grid[1]. Detailed model results showing extent and flood depth are available to view on SDC's website, and is shown below in Figure 4. The broad flood extents have been approximately digitised and are presented in Appendix A.

In general, ground levels on lots will be set above road levels so that in large flood events the roads act as secondary flow paths. These secondary flow paths will need to safely convey floodwaters to their existing flow path location at the boundary of the proposed development (i.e. the management of secondary flow paths should maintain the site's hydraulic neutrality). There are eight key areas which require varying levels of engineering design (conceptually at this stage) to ensure the overland flow paths and flooded areas are safely managed. The following options are proposed in Table 3 (the areas these number relate to are presented in Figure A1 in Appendix A by the numbers with the yellow buffer).

[1] The model simplifies the topography of the land into a grid with cells that are 10m wide by 10m long, where each cell has an average elevation of the true topography in the extent of the cell. This means that small drains common on farms are not as well represented.

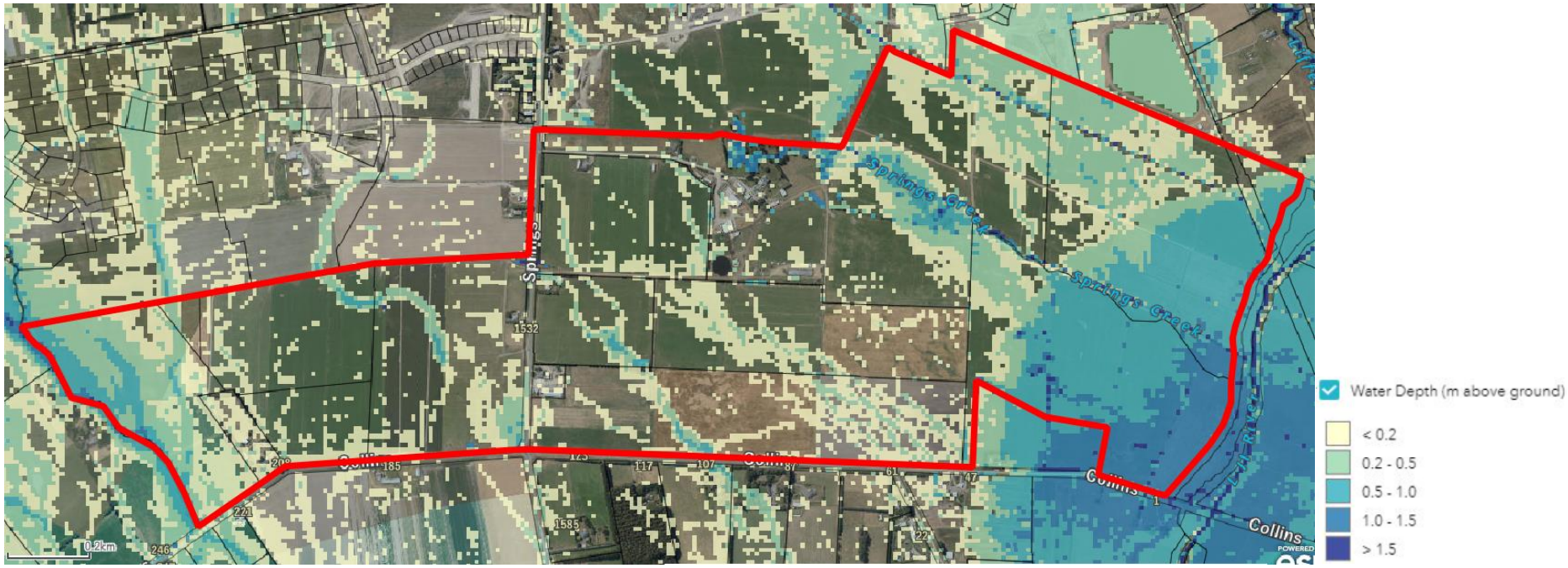


Figure 4 Screenshot of SDC's flood modelling results in a 0.2% AEP flood event [2]

[2] Selwyn District Council, 2019, *Selwyn's flooding and coastal hazards*. Retrieved October 12, 2020 from https://apps.canterburymaps.govt.nz/SelwynNaturalHazards/

Table 3 Flood management areas

Flood Zone # (see Figure A1)	Flood zone description	Option for flood management
1	Deep ponded water (Ararira/ LII floodplain)	Exclude deeper areas from development. Option for development of shallower areas or raising of ground level will require compensatory storage elsewhere. Utilise land for SMA.
2	Overland flow path (from Te Whariki)	Collect run-on floodwaters from upstream of site and contain overland flow path within designated flow path. Note that the model results are pre-Te Whariki development. SMA, roads and naturalised drains will change this overland flow path. It is expected flooding can be contained.
3	Overland flow path	Contain overland flow path within 80 m wide zone around Springs Creek.
4	Overland flow path	Existing overland flow path from rainfall onto site area. Manage overland flow path with on-site drainage infrastructure. Lot re-grading and road construction would modify drainage paths and direct overland flow eastwards to SMA.
5	Overland flow path	Existing overland flow path from rainfall onto site area. Manage overland flow path with on-site drainage infrastructure. Lot re-grading and road construction would modify drainage paths and direct overland flow eastwards to SMA.
6	Ponded water	If the current representation of flooding by the model is accurate, the storage provided by this area will need to be maintained, or compensatory storage would need to be provided elsewhere in the same catchment to provide similar flow characteristics, such as within flood zone #1. Further detailed investigations may indicate that the SDC model is overly conservative due to the coarseness of the model and so flood extents may be reduced if demonstrated by future investigations (i.e. culverts and/or drains not represented in the model may have created the ponding area due to the lack of an outlet for the depression area). Additionally, we understand that ground levels since the time that the LiDAR was flown have been modified by filling (T. McLeod, personal communication, October 21, 2020).
7	Overland flow path	Flow at time of model development now cut off by Verdeco Park swale along boundary. Flow path from on-site rainfall to be managed by on-site drainage infrastructure. Lot re-grading and road construction would modify drainage paths and direct overland flow eastwards to SMA.
8	Overland flow path from channel breakout	Seek to optimise the flow conveyance of the floodplain to the east of the drain in order to reduce the flood extents, and allow a greater area of development. Compensatory storage may be required. Detailed analysis would be required as part of this.

A Section 106 assessment (based on the Resource Management Act) is required where land proposed for development may be at significant risk from natural hazards. In general, the Section 106 assessment should include:

- a combined assessment of the likelihood of the natural hazards occurring;
- the material damage that would result from natural hazards to the development site, other land or structures;
- any likely subsequent use of the land that would accelerate or worsen the damage predicted from a natural hazard; and
- Proposed finished floor levels.

2.6 Contaminant Removal Rates

Contaminant removal rates have been calculated based on Table 6-6 of the WWDG for a combination of a first flush basin and wetland in each SMA, with inflow contaminant concentrations based on Table 6-3 of the WWDG (see Table 4 below).

Table 4 Average contaminant loads into the first flush basin and out of the wetland

Pollutant	***Inflow flow-weighted mean concentration (mg/m³)***	***Estimated removal rates***	***Outflow flow-weighted mean concentration (mg/m³)***
Total suspended solids (TSS)	33,000 – 200,000	84% - 96%	1,320 – 32,000
Total Phosphorus (TP)	260	64% - 96%	10.4 – 93.6
Total Nitrogen (TN)	2,500	52% - 84%	400 – 1,200
Chemical Oxygen Demand (COD)	35,600	*Not given in WWDG*	-
Biological Oxygen Demand (BOD)	7,000	36% - 76%	1,680 – 4,480
Zinc	400	64% - 96%	16 – 144
Copper	50	64% - 96%	2 – 18
Lead	75	64% - 96%	3 - 27
Hydrocarbons	500	*Not given in WWDG*	-

2.7 Additional Information

Table 5 below details the rainfall depths sourced from HIRDS V4 that have been used in this report's analysis.

Table 5 HIRDS V4 rainfall depths (mm) – RCP8.5 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h
2	**50%**	6.08	8.06	9.66	13.5	18.9	31.4	42.4
5	**20%**	8.98	11.8	14.1	19.4	26.9	44.3	59.2
10	**10%**	11.4	14.9	17.7	24.2	33.4	54.4	72.3
50	**2%**	18.2	23.4	27.6	37.3	50.8	81.1	106

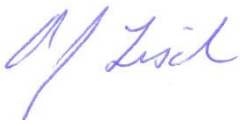
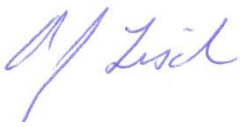
3 Quality Control

The design of this development complies with the following documents:

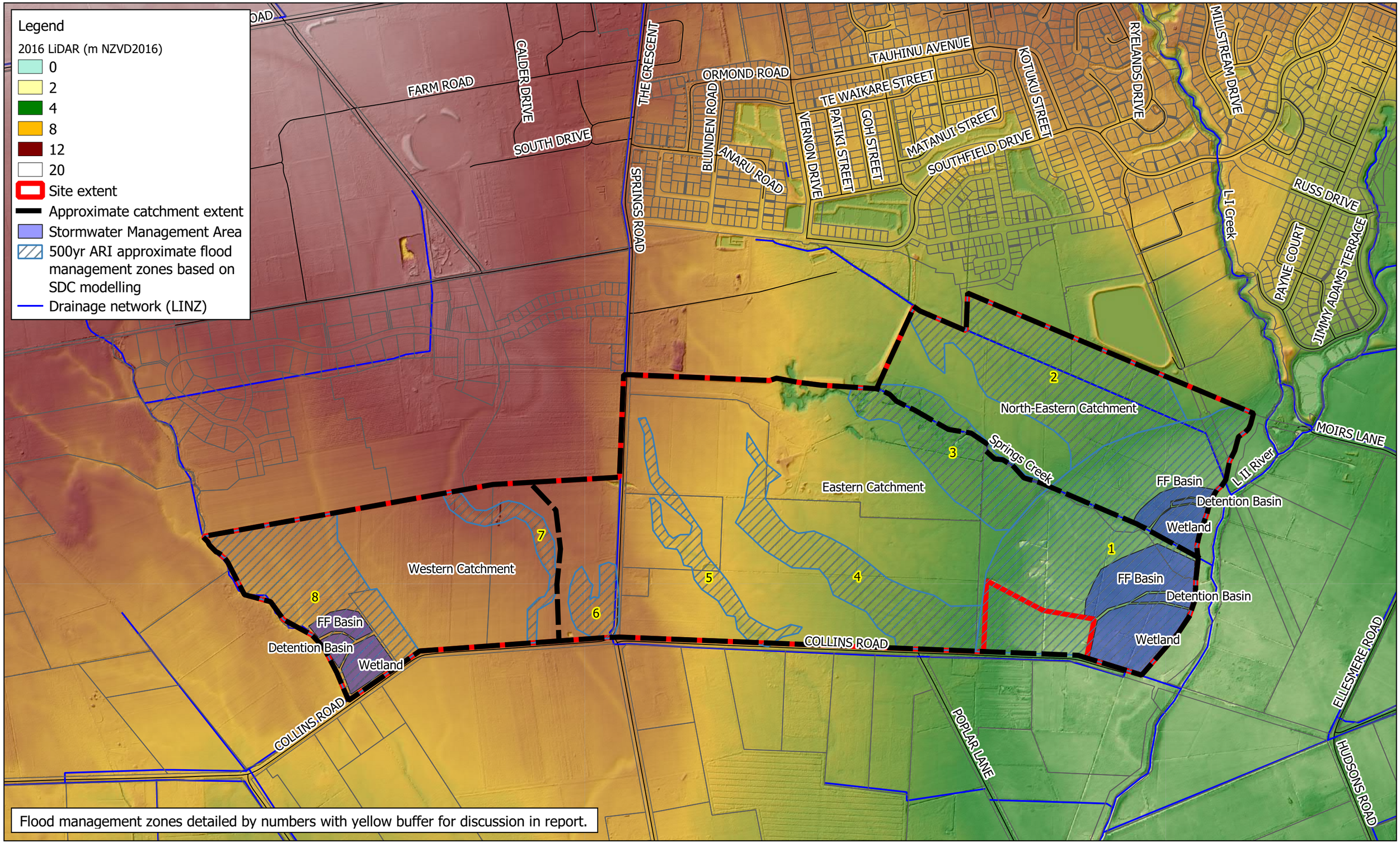
- CCC Waterways and Wetlands Design Guide
- New Zealand Building Code Clause E1

4 Design Report Approvals

This report has been:

Task	Initial	Signature	Date
Prepared by:	Daniel McMullan, e2		October 22, 2020
Reviewed by:	Andrew Tisch, e2		October 22, 2020
Approved by:	Andrew Tisch, e2		October 22, 2020

Appendix A – Concept Plans



Paper Size A3

100 0 100 200 300 400 m

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

N

e2 environmental CONSULTING CIVIL ENGINEERS

Lincoln South Plan Change

Figure A1: Initial Stormwater Management Areas

Job Number	20055
Revision	4
Date	2020/10/22

e2 Environmental Ltd. Unit 1/46 Acheron Drive PO Box 31159. ChristchurchP 64 3 358 4955 W www.e2environmental.com

APPENDIX B | WASTEWATER CAPACITY ASSESSMENT

Memorandum

To	Tim Carter, Bruce Van Duyn
Copy	Sue Harrison, Murray England
From	Lyndsey Foster, Charlotte Mills
Office	Christchurch
Date	21 October 2020
File/Ref	3-C2210.00
Subject	Lincoln South Plan Change Wastewater Capacity Assessment

1 Summary

WSP was engaged by Rolleston Industrial Developments Ltd. to complete a wastewater network capacity assessment for a proposed development at 1491 Springs Road, Lincoln. The development will be of approximately 160 ha, with 2,000 lots proposed.

The assessment has focused on the capacity of the trunk system (i.e. Allendale and Selwyn Road pump stations) and has directly connected the development flows to Allendale pump station in Lincoln. Options to look at whether there is capacity in the local reticulation for the development flows should be looked at once detailed layout of the development is determined.

During dry weather flow the proposed flows can be catered for with the duty pumps at the two pump stations. During wet weather the peak flow to Allendale PS is greater than its capacity and overflow to the emergency storage facility is predicted. The predicted overflow volume takes up 2% of the total storage available.

It should be noted that in the wet weather assessment that flow from the development is loaded to the model as a constant peak design value and therefore conservatively represents the volume of wastewater loaded to the network. Because of this, the predicted overflow volume is conservative. Therefore, in our professional opinion, the wastewater network has capacity to receive the residential re-zoning of this land for the plan change application.

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

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 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. An overview of the system is presented in Figure 1.

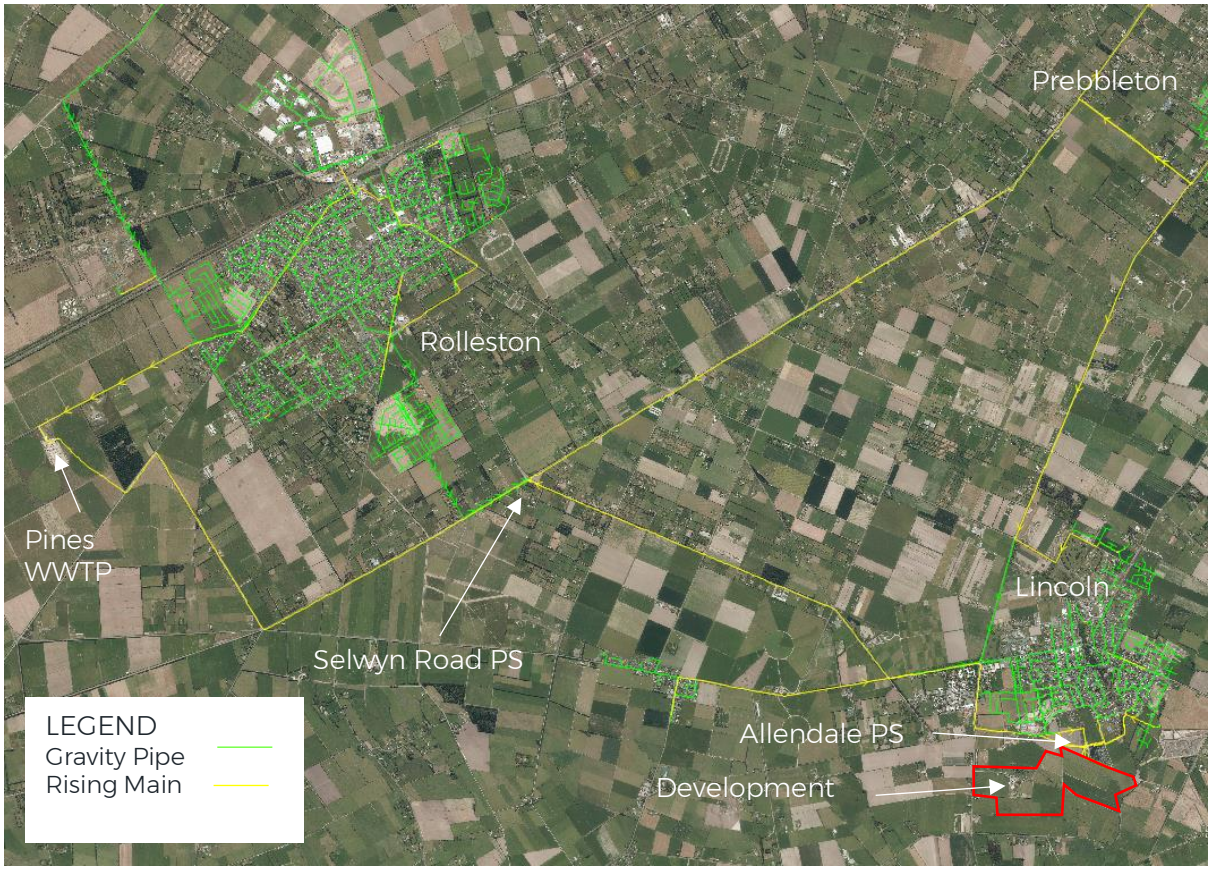


Figure 1: Wastewater System Overview

- 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

- It has been assumed that the development connects directly to Allendale Pump Station;
- Flows from the plan change area were calculated using the following assumptions:
  - 2000 lots will be developed (email from Bruce Van Duyn on 13 October 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 wet weather is 2.5 (SDC's Engineering Code of Practice);
  - The peaking factor for wet 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 Developed Plan Change Area

Plan Change Area	Proposed No. of Lots	Population	Calculated ADWF (L/s)	Calculated PWWF (L/s)
1491 Springs Rd	2000	5400	13.75	68.75

3 Modelling Methodology

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 a new sub-catchment representing the development was included in both.
3 The dry weather scenario was updated to include the assumed for the development population to allow the impact of the diurnal flow from the development 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.

4 Modelling Results

To assess the potential impact of the plan change in the wastewater network, the operation of two pump stations was analysed – Allendale PS, and Selwyn Road PS. Allendale PS pumps through to Selwyn Road PS, which then pumps to the Pines WWTP.

4.1 Dry Weather

4.1.1 Allendale PS

Allendale PS has three pumps, operating under a duty/assist/assist regime. During the dry weather simulation, only the duty pump is predicted to operate. The addition of the proposed flows from the plan change, does not cause either of the assist pumps to operate.

4.1.2 Selwyn Road PS

Selwyn Road PS has four pumps, operating under a duty/assist/assist/assist regime. During the dry weather simulation, only the duty pump is predicted to operate. The addition of the proposed flows from the plan change, does not cause any of the standby pumps to operate.

4.2 Wet Weather

4.2.1 Allendale PS

During the wet weather simulation, all three pumps are predicted to operate in the Base scenario to cater for the predicted peak flow. With the addition of the proposed flows from the plan change the predicted peak flow exceeds the pump station capacity for a longer period. The volume of the operational storage is exceeded and 700 m^3 is predicted to overflow to the emergency storage facility beside the pump station (the old Lincoln WWTP SBR tanks pond). However, there is plenty of capacity in the emergency storage, as there is close to 600 m^3 of storage in the SBR tanks and the pond provides approximately 30,000 m^3 of storage.

4.2.2 Selwyn Road PS

During the wet weather simulation, all four pumps are predicted to operate in the base scenario. The peak flow to the station does not increase with the addition of the development flows, as Allendale is already predicted to run at full capacity in the Base scenario. The peak flow to Selwyn Road pump station does last for a longer period.

5 Conclusions

The addition of the proposed wastewater flows from the plan change area do not cause any significant problems at Allendale and Selwyn Road pump stations during dry weather.

During wet weather the peak flow to Allendale PS is greater than its capacity and overflow to the emergency storage facility is predicted. The predicted overflow volume only takes up 2% of the total storage available. In addition, it should be noted that in the wet weather assessment that flow from the development is loaded to the model as a constant peak design value and therefore conservatively represents the volume of wastewater loaded to the network. Because of this, the overflow volume presented in the above results is conservative.

Should spill to the storage tanks and WWTP pond be unacceptable to SDC during wet weather then Allendale and Selwyn Road pump station will require upgrade to cater for the predicted peak wet weather flows.

6 Limitations

- This assessment has not considered whether there are options for the development to connect to the local network. This should be considered when the model is updated with the local network data and further details of the layout of the development are known.
- This assessment has not considered whether the Pines WWTP has capacity to accept flow from the development

Prepared by:	Reviewed by:	Approved for Release by:
		
Lyndsey Foster	**Charlotte Mills**	**Sue Harrison**
Wastewater Modeller	Principal Environmental Engineer	Project Director

APPENDIX C | WATER SUPPLY CAPACITY ASSESSMENT

Memorandum

To	Tim Carter, Bruce Van Duyn
Copy	Sue Harrison, Murray England
From	Dan Edwards
Office	Christchurch
Date	21 October 2020
File/Ref	3-C2210.00
Subject	Lincoln South Plan Change Water Supply

1 Summary

WSP was engaged by Rolleston Industrial Developments Ltd to complete a water supply network capacity assessment at the proposed development at 1491 Springs Road, Lincoln, to assess the suitability of rezoning the site for residential use. This assessment has aligned with the Selwyn District Council (Council) objectives as part of their Master Planning when proposing upgrades to the network.

There are two options considered in this assessment for supplying water to the proposed development:

- Upgrade existing well site at Vernon Drive and upgrade the Water Supply mains servicing the proposed development area.
- Develop new well site(s) in the proposed development area in south Lincoln.

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

2 Assumptions

2.1 Demand at 1491 Springs Road Development

The demand at 1491 Springs Road Development was added to the demand in the 2020 peak day model. The demand assumptions are as follows:

- 2000 lots will be developed (email from Bruce Van Duyn on 13/10/2020)
- Lincoln domestic peak day water demand is 2135 L/property/day (WSP 2020 model update)
- Lincoln domestic peak factor is 2.2. (WSP 2017 model verification). This was applied to the water demand only, not the leakage.

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

- Lincoln leakage is 73 L/property/day (Thomas Consultants Water Balance 2019 Water Balance Report). This is applied on a flat profile (peak factor = 1).

Table 1 below summarises the Water Supply demand at the proposed development:

Table 1. Water Supply Demand at the Proposed Development

Area	Properties	Demand (L/prop/day)	Peak Factor	Leakage (L/prop/day)	Average Demand (L/s)	Peak Demand (L/s)
1491 Springs Rd	2000	2135	2.2	73	51.1	110.4

3 Water Supply Infrastructure Recommendations

3.1 Option 1: Upgrade Vernon Dr Well

3.1.1 Summary

This option involves supplying water from the Vernon Dr well to the proposed site. Council have expressed they would install additional well capacity at Vernon Drive as the priority if required, to accommodate future demand.

3.1.2 Methodology

The Vernon Dr well was not in the latest model update. It was included in this model assuming a fixed head, with a delivery pressure of 40m. The delivery pressure was estimated based on the delivery pressure from the other wells throughout Lincoln.

The proposed development was modelled with two connections to the existing network: one into the new DN 200 uPVC main on Springs Road, and the other into the DN 200 uPVC main at the south end of Vernon Drive (see Figure 1).

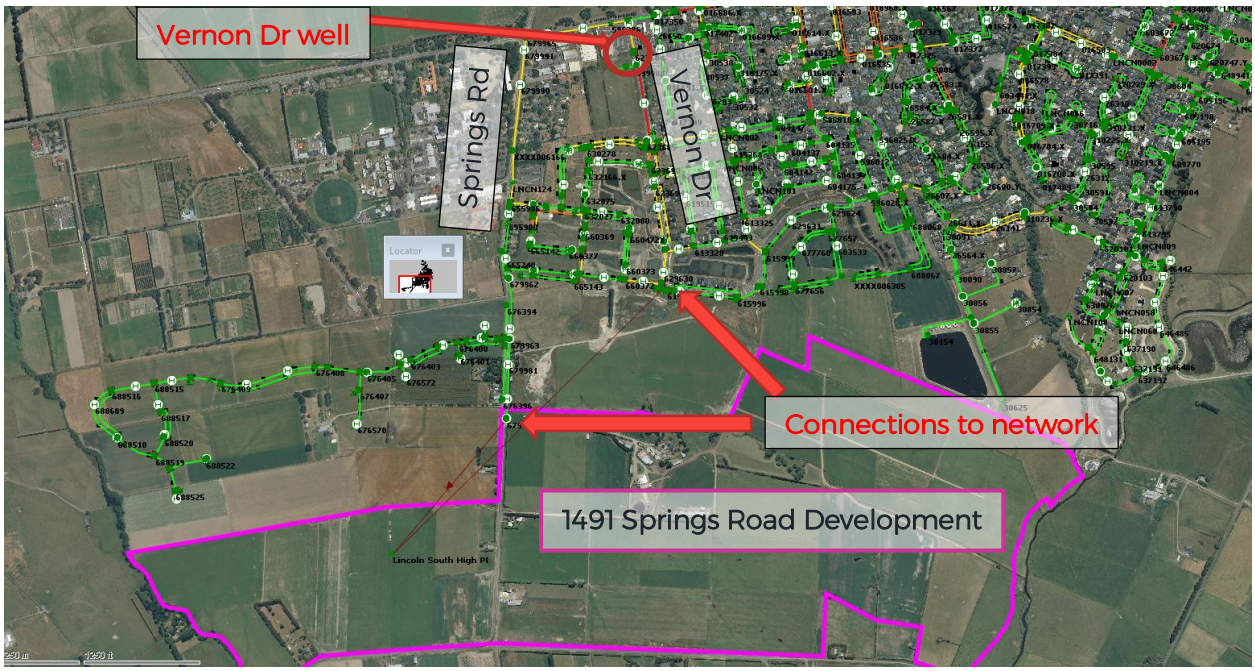


Figure 1. The proposed development site, water supply infrastructure and connections in South Lincoln.

3.1.3 Results + Recommendations

The existing network could not deliver Level of Service pressure to the proposed development. There were low pressures throughout the model, especially in Northern and South-Western Lincoln (see Figure 2). This is because the existing pipes are required to deliver higher flow than designed for, resulting in high headlosses.

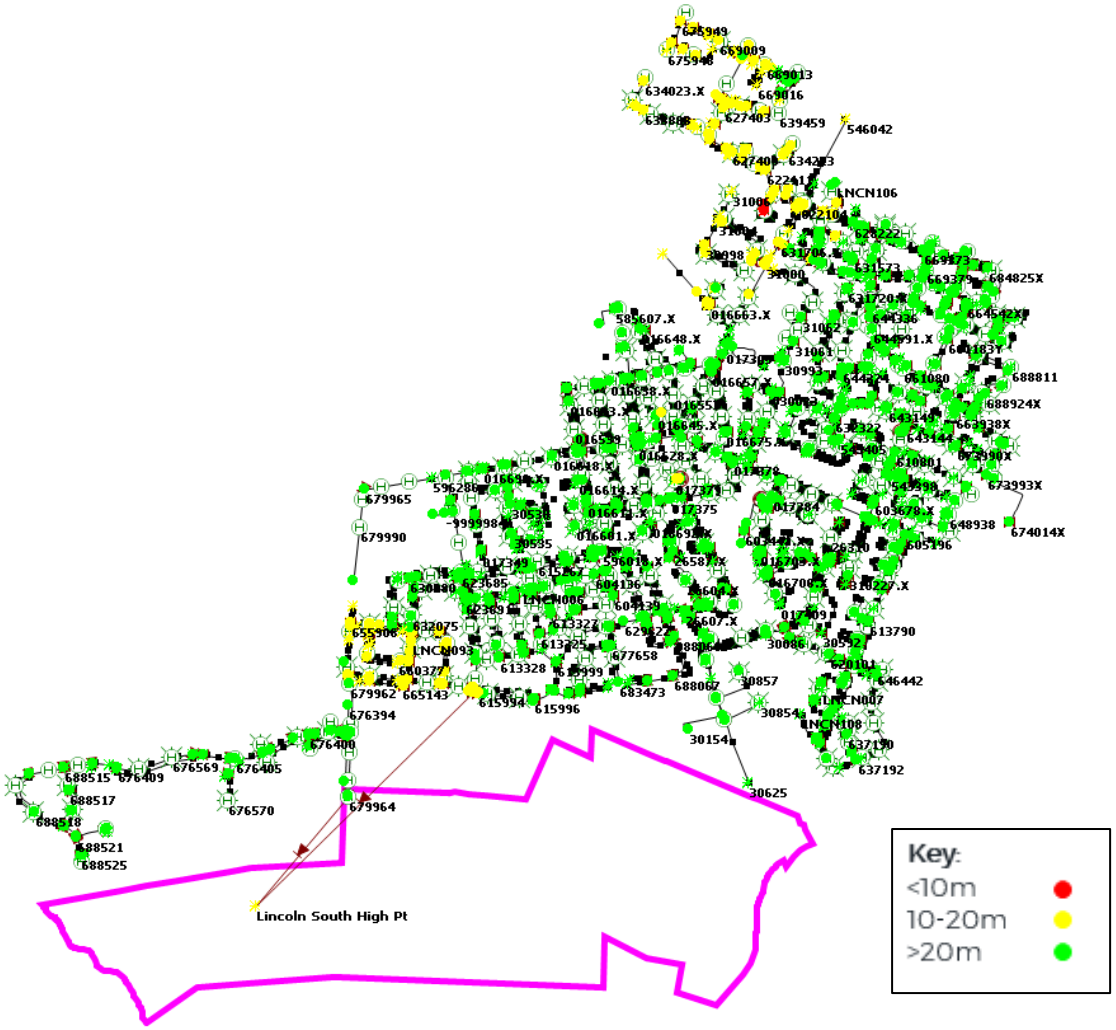


Figure 2. The network pressure with the proposed development demand and existing network.

It is noted that there is a gap in the ring-main to the south-west of Lincoln in the current peak day model. However, a model was run connecting this with a DN 200 main which is Council's intention. The Level of Service pressure in the network was still inadequate, so upgrades are proposed.

The pipes servicing the proposed development from the Vernon Dr well site need to be up-sized to support the future demand from the proposed development (see Figure 3). It is recommended that the ring main around the SW edge of Lincoln is upsized to DN 300 uPVC, and the ring-main is fully connected. This pipe size is appropriate, as it achieves maximum headlosses on the peak day less than the design constraint of 3m/km. It also ensures that Level of Service pressure throughout the network is adequate in South Lincoln.

There are a few locations in central and northern Lincoln with pressures slightly below 20m in this scenario (see yellow nodes in Figure 3). The minimum pressure is 15.1m at one isolated node. The current network also experiences some pressure issues in central and northern Lincoln, so the proposed development with the upgraded ring-main does not worsen the Level of Service pressure throughout the network in central and northern Lincoln.

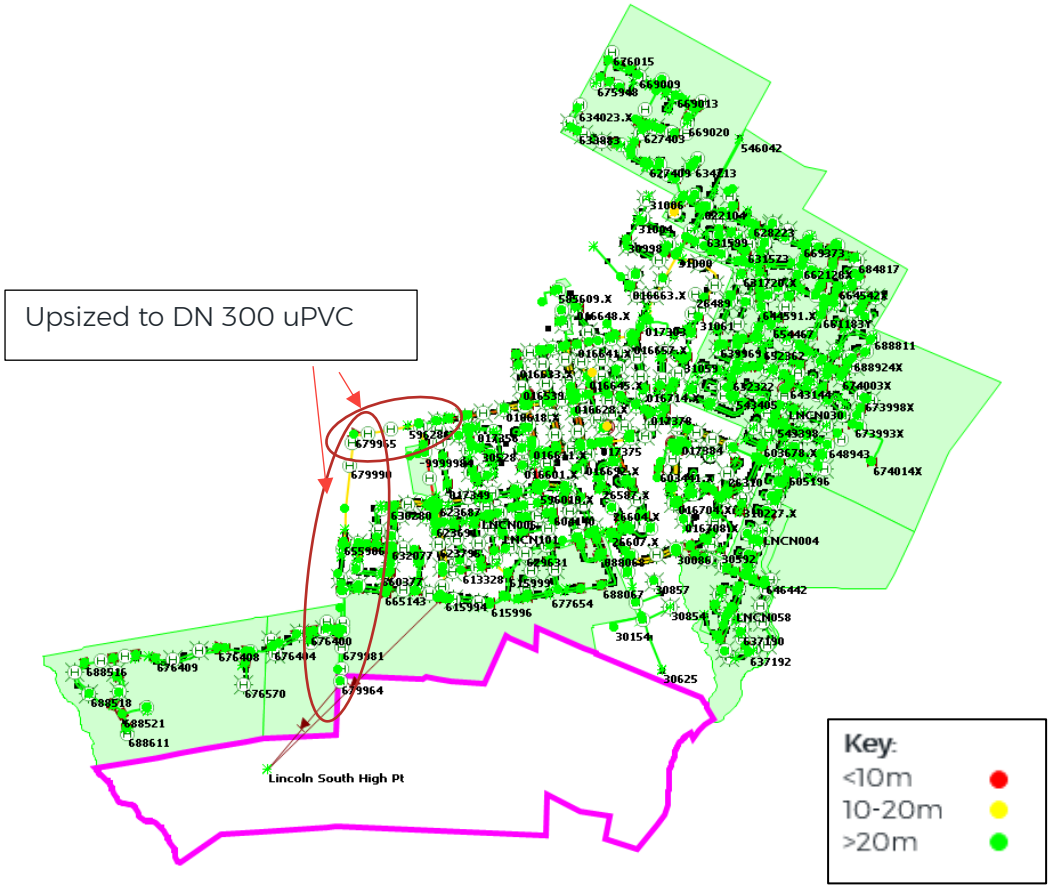


Figure 3. The network pressure with the proposed development demand and upgrades to the ring-main.

Under this scenario, there are relatively high headlosses in the trunk main on Vernon Drive (see Figure 4). The maximum headloss is 13.9m/km on the peak day. This does not affect the Level of Service in South-West Lincoln. However, this trunk main may require an upgrade to improve its resilience, by reducing its rate of failure.

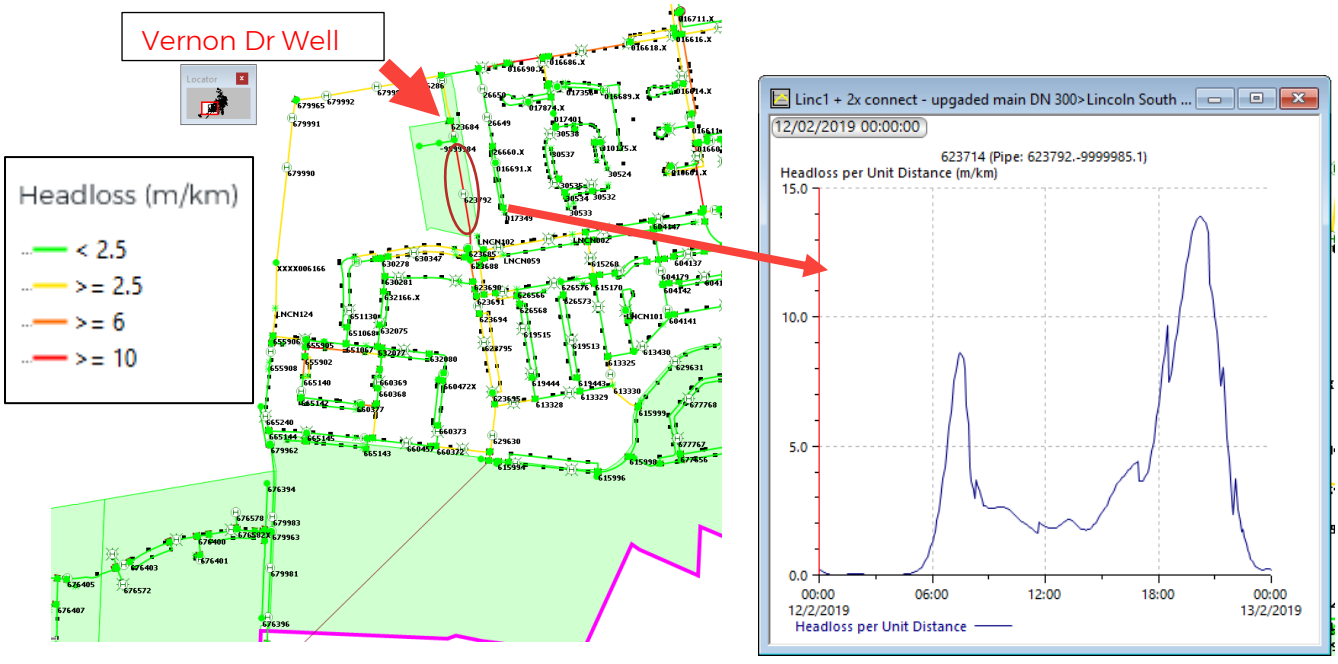


Figure 4. Headlosses (m/km) in South-Western Lincoln.

The Vernon Dr well is required to provide up to 150L/s during the peak day with the proposed development connected. The WSP 2017 Master Planning project recommended installing a

well providing up to 100L/s. This well site could be further developed in line with Council's long-term planning.

3.2 Option 2: Install New Well in South Lincoln

WSP understands that there are multiple existing wells on the proposed development site (Canterbury Maps) (see Figure 5). One of these wells has been tested up to 45 L/s specific yield. In general, Lincoln has accessible groundwater aquifers for drinking water abstraction. There is potential for a new well site to be developed to the south of Lincoln by converting the existing dairy wells or drilling a new site.

Figure 5. Image of Wells in South Lincoln (Canterbury Maps). Note that this information has not been confirmed by WSP.

This option is subject to groundwater abstraction constraints. It is unknown whether the groundwater is suitable for municipal drinking water. The potential source will require treatment to ensure it complies with DWSNZ.

Subject to Council's intentions, this option may either supplement water from the existing network, or it may be used to supply the wider Lincoln township.

4 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, such as those in ODP1, 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:
		
Dan Edwards	Estelle Boivin	Sue Harrison
Graduate Engineer - Water	Principal Hydraulic Modeller - Water	Project Director

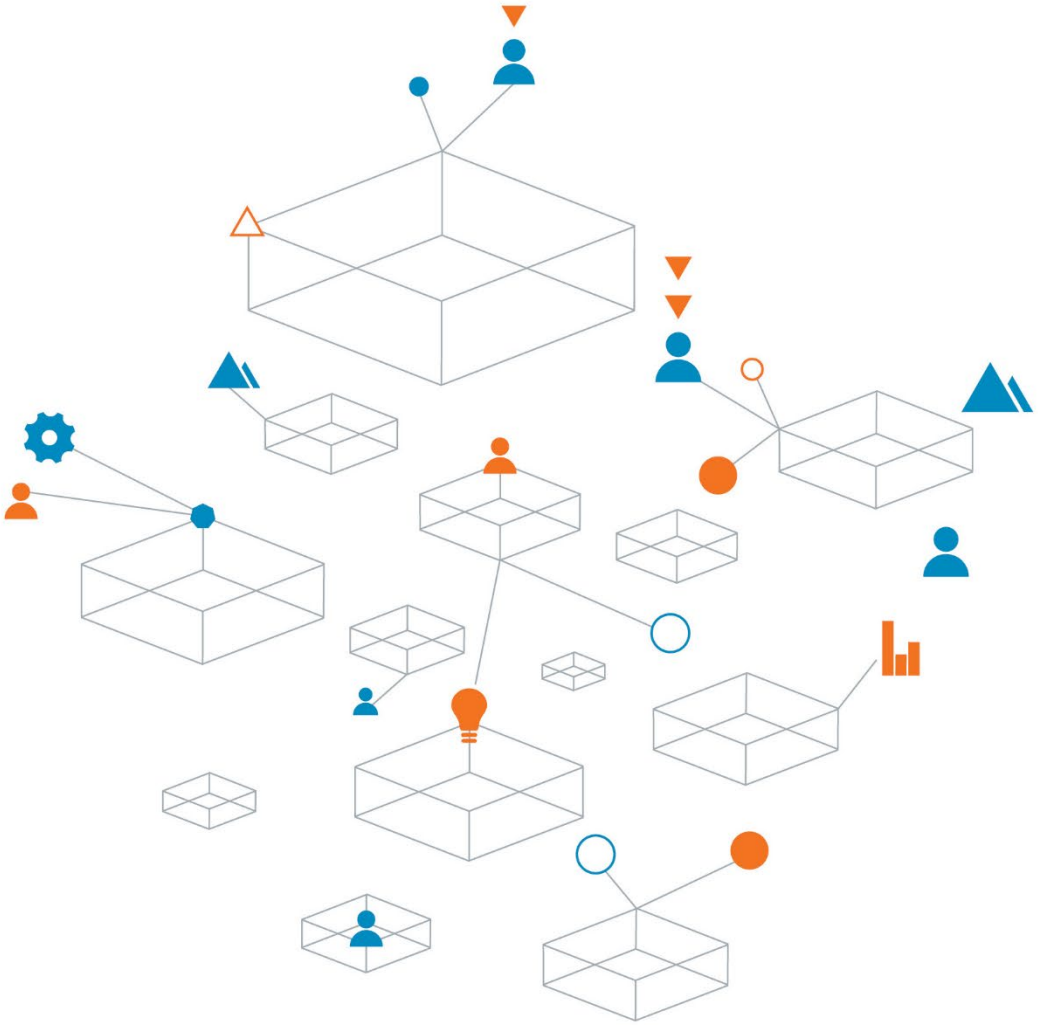
Appendix B

Geotechnical Assessment

Rolleston Industrial Developments Ltd
1491 Springs Road, Lincoln
773-CHCGE280252

Geotechnical Assessment Report – Rev 1

20 October 2020



Trust is the cornerstone of all our projects

This page has been left intentionally blank

1/254 Montreal Street
Christchurch Central City
8013 New Zealand

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

20 October 2020

Our ref: 773-CHCGE280252

Rolleston Industrial Developments Ltd
ASB House, 166 Cashel Street
Christchurch Central

Attention: Tim Carter / Bruce Van Duyn

Executive Summary: 1491 Springs Road, Lincoln – Geotechnical Assessment to support a Plan Change application

Rolleston Industrial Developments 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 at 1491 Springs Road, Lincoln, Canterbury. The purpose of this report is to support a Plan Change application for the construction of approximately 2,000 new residential Lots at the site.

The site investigations and preliminary liquefaction assessment indicates that the site is predominantly TC1-like. Other geotechnical hazards (erosion, slippage and inundation) are considered 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 be carried out at the subdivision consent stage.

If you have any queries, please contact he undersigned.

For and on behalf of Coffey

Chris Thompson
BSc (Tech)
Associate Engineering Geologist

1491 Springs Road, Lincoln

Prepared for
Rolleston Industrial Developments 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

20 October 2020

773-CHCGE280252

Quality information

Revision history

Revision	Description	Date	Originator	Reviewer	Approver
V1	GAR	20/10/2020	CT	RB	CT
V0	GAR	15/10/2020	CT	RB	CT

Distribution

Report Status	No. of copies	Format	Distributed to	Date
Final	1	PDF	Bruce Van Duyn – Rolleston Industrial Developments	20/10/2020

Table of contents

Tables

Appendices

1. Introduction

Rolleston Industrial Developments 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 at 1491 Springs Road, Lincoln, Canterbury. The purpose of this report is to support a Plan Change application for the construction of approximately 2,000 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

An investigation methodology for the 178 Ha 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 walkover to assess geotechnical hazards.
- Completion of 20 piezocone penetration tests (CPTs). The CPT tests were the primary investigation tool used to develop the preliminary ground model at the site.
- Three multi-channel analysis of surface waves (MASW) geophysical investigation lines with a total length of 2.6km were measured to supplement the CPTs and provide continuous profiles of information about soils below CPT refusal depths.
- 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).
- New geotechnical investigation data.
- Project correspondence with the wider Plan Change consultants engaged by Rolleston Industrial Developments 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 a series of land parcels totalling 178 Ha located to the south of Lincoln, bordering the existing Te Whariki and Verdeco Park subdivisions. The overall site has a gentle downslope east from Springs Road towards the “L II” River. It also slopes gently down to the west from a high point just west of Springs Road.

There are a number of springs and associated drains / waterways located within the Plan Change area that will be incorporated into the overall development plan. The site is predominantly used for grazing and some cropping. To the west of Springs Road, a small area has been used as a borrow area for sourcing gravel and was backfilled in the past 5 to 10 years.

4. Site investigation

The location of the geotechnical investigations carried out on the site to develop the ground model, along with the location of the MASW lines, are provided in Figure 1 (in Appendix A). The CPT results are summarised below. Investigation results are presented in Appendix B.

Table 1: CPT investigation summary

Reference	Depth of test (metres below ground level) – 1 DP	Depth to groundwater (as measured in CPT hole)	Termination criteria
CPT 01	7.5	2.78	Effective refusal
CPT 02	5.21	1.96	Effective refusal
CPT 03	5.83	2.17	Effective refusal
CPT 04	6.24	1.25	Effective refusal
CPT 05	4.37	1.37	Effective refusal
CPT 06	12.02	1.26	Effective refusal
CPT 07	4.15	0.90	Effective refusal
CPT 08	5.24	1.50	Effective refusal
CPT 09	4.94	1.52	Effective refusal
CPT 10	6.34	1.48	Effective refusal
CPT 11	5.91	2.58	Effective refusal
CPT 12	6.65	1.75	Effective refusal
CPT 13	7.82	1.50	Effective refusal
CPT 14	4.36	0.61	Effective refusal
CPT 15	4.91	0.46	Effective refusal
CPT 16	2.28	Not encountered	Effective refusal
CPT 17	5.60	2.50	Effective refusal
CPT 18	2.22	Not encountered	Effective refusal
CPT 19	7.62	3.40	Effective refusal
CPT 20	1.53	Not encountered	Effective refusal

Note: CPT20 was carried out through a previously remediated fill area so is not indicative of the general area.

4.1. MASW profiles results

The MASW geophysical survey was measured in three profiles totalling 2.6 km in length, two east-west across the site and one north-south as shown in Figure 1 (Appendix A) and in Figure 1 of the geophysics report (Appendix C). The MASW profiles are considered to be good data that captures the ground profile and soil conditions below the generally shallow depth of refusal of the CPTs above. The MASW profiles show that non-liquefying gravels are consistently present over the site below the weaker upper soil layers whose properties have been measured in more detail by the CPTs, and that these gravels increase in density with depth.

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 Lincoln University strong motion sensor recorded the following peak ground accelerations (PGA):

- 4 September 2010: 0.437g
- 22 February 2011: 0.12g
- Later 2011 earthquakes: <0.1g

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.
- 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 near the geological boundary of "Grey to brown alluvium, comprising silty sub-angular gravel and sand forming alluvial fans (Q1a)" (also known as colluvium) and "Grey river alluvium, comprising gravel, sand and silt, in active floodplains (Q1a)." of the Springston Formation.

6.2. Groundwater

Based on the observed groundwater levels recorded from the CPTs, the groundwater appears to be shallower in the eastern portions of the site and gradually deepens to the west. Conservatively, for the initial liquefaction assessment, we have used a groundwater level of 1.0mbgl for the eastern portion and 2.0m to 2.5mbgl for the western portion of the site. This can be refined later.

[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.
[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

6.3. Investigation findings

Twenty CPTs and the MASW geophysical investigation have been used to develop the ground model for the 1491 Springs Road subdivision. A summary of the ground model is provided below:

Table 2: Ground profile

Description		Strength/ consistency	Thickness (m)	Depth to top of layer (mbgl)
Springston Formation	Sandy silt and organic silt (topsoil)		0.3 to 0.4	0.0
	Interbedded alluvium: Silt, sandy silt and silty sand	Soft to very stiff	West of Springs Road – 1.0 to 2.2 East of Springs Road – 3.5 to 5.5	0.3 to 0.4
	Interbedded alluvium: typically sand and gravel deposits with some layers of silt, sandy silt and silty sand	Medium dense to dense, non-liquefiable	>20m	West of Springs Road – 1.0 to 2.2 East of Springs Road – 3.5 to 5.5

The above ground profile is simplified as an illustration; however, the actual ground profile includes a highly interbedded (interfingered) layering of silty alluvium and sandy / gravel alluvium. These layers have different geotechnical properties (strength) and are present in various thicknesses across the site, as shown in the CPT investigations. The eastern edge of the site has potentially organic deposits in the low-lying area, however, this will be further investigated during the subdivision consent stage once the overall development plan is confirmed.

The MASW geophysical investigation has confirmed that relatively dense non-liquefiable deposits are present below the termination depth of the CPTs conducted. The assessment of these deposits as being non-liquefiable is based on the shear wave velocities recorded being greater than 200m/s and increasing with depth.

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.

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

Soils that are usually considered to be liquefiable comprise saturated geologically young (i.e. Holocene and late Pleistocene) loose sands and silts. With this in mind, we consider that the interbedded silt / sandy silt / silty sand overbank deposits of the Springston Formation may be susceptible to liquefaction and that a triggering analysis will determine which soil layers will liquefy when subjected to the SLS and ULS earthquake demands.

SLS and ULS design earthquake scenarios are assessed using the parameters provided by the MBIE Guidance for an Importance Level 2 (IL2) structure and a Class D subsoil site. The earthquake parameters adopted for design and for the liquefaction analysis are presented in Table 3.

Table 3: Earthquake scenario and parameters for analysis

Earthquake scenario	Moment magnitude (M_w)	α_{max} (g)
SLS	7.5	0.13
	6.0	0.19
ULS	7.5	0.35

The liquefaction triggering analysis was carried out for the CPTs shown on the site plan (Appendix A) using the Boulanger and Idriss (2014) method[4] and proprietary liquefaction assessment software[5], in accordance with the updates to the MBIE Guidance[1] (Issue 7 October 2014).

For a more accurate representation of the stratified soils in the CPT profiles, the auto transition layer detection (ATL) function was selected in the Geologismiki software. This function addresses the disparity between friction and end tip recordings of a CPT where the tip recordings are influenced by a softer layer above or beneath a harder / denser layer.

The liquefaction triggering analyses show that under SLS and ULS conditions, some of the interbedded silt / sandy silt / silty sand overbank deposits encountered at each CPT location are vulnerable to liquefaction whereas the clay-like soils in the eastern portion are considered unlikely to liquefy.

7.3.2. Free-field settlements

The type of settlement that is most commonly estimated when liquefaction analysis is conducted (refer to Section 6.3) is referred to as the *free-field settlement*. Free-field settlement is the component of land settlement that does not take account of foundation influences (e.g. loads and stiffness), or the effects of ground loss, lateral spread, strength degradation, sand ejecta and ground cracks.

According to the MBIE Guidance, an “Index Value” for categorising future expected land performance can be assigned by analysing the upper 10m of the soil profile. The rationale for this is that liquefaction in the upper 10m of the profile is known to be most manifested at the ground surface. Where CPTs refused before 10m, we have assigned Technical Categories based on the results of the MASW confirming dense non-liquefiable deposits below termination depths of the CPTs.

The estimated free-field settlement values and the correlated residential foundation Technical Category, as defined by Table 3.1 of the MBIE Guidance, are given in Table 4.

[4] Boulanger, R.W., Idriss, I.M., CPT and SPT liquefaction triggering procedures, Report No. UCD/CGM-14/01, April 2014, Centre for Geotechnical Modelling, Department of Civil and Environmental Engineering at the University of California, Davis, California
[5] Geologismiki Geotechnical Software, CLiq v.3.0.3.2 – CPT Liquefaction Assessment Software

Table 4: Estimated "free-field" post-liquefaction ground surface settlements and Technical Category[6]

CPT Location	Termination Depth (mbgl)	Free-field settlements to refusal depth (mm)		MBIE Technical Category
		SLS	ULS	TC
CPT01	7.5	~15	~25	TC1
CPT02	5.21	~10	~25	TC1
CPT03	5.83	<5	<10	TC1
CPT04	6.24	<15	~20	TC1
CPT05	4.37	<10	~20	TC1
CPT06	12.02	~15	~25	TC1
CPT07	4.15	<5	~10	TC1
CPT08	5.24	<15	~20	TC1
CPT09	4.94	<10	~15	TC1
CPT10	6.34	<10	~25	TC1
CPT11	5.91	~15	~40	TC2
CPT12	6.65	~15	~35	TC2
CPT13	7.82	~25	~50	TC2
CPT14	4.36	<10	~15	TC1
CPT15	4.91	<5	<5	TC1
CPT16	2.28	<5	~25	TC1
CPT17	5.60	<10	~25	TC1
CPT18	2.22	<5	~15	TC1
CPT19	7.62	~15	~25	TC1
CPT20	1.53	N/A	N/A	Not assessed

The CPT analyses show that the site is predominantly TC1-like with small areas that contain TC2-like ground. Once a groundwater monitoring programme has been carried out, we consider that an updated liquefaction analysis will generally reduce the predicted free-field settlements for the currently TC2-like locations as the groundwater measured in the CPT holes is generally deeper than that conservatively assumed for these analyses.

7.3.3. Static settlement

The presence of potentially organic soils in the low-lying eastern portion of the site increases the risk of static settlement in this area. It is likely that this area may be used for stormwater detention basins and as a result of this usage, residential buildings are unlikely. This risk will be assessed further once the overall development plan is confirmed. However, we do not anticipate this limiting development in the area with appropriate geotechnical design and construction.

[6] It should be noted that these settlement estimates only account for the free-field component of the expected settlement. Actual total settlements under SLS or ULS earthquake loading may be greater.

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 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

The overall site is well covered with CPT probes and MASW profile investigations. Based on the on-site testing carried out to date, the majority of the site is TC1-like with some minor pockets of TC2-like performance.

We consider that the site is suitable for development subject to further investigation and design at the subdivision consent stage.

It is likely that additional geotechnical investigation will be required to refine the technical categories for the proposed Lots once a subdivision plan has been further developed. We also recommend that a groundwater monitoring programme is implemented to allow for more accurate liquefaction and ground settlement analyses.

9. Limitations

This report has been prepared solely for the use of our client, Rolleston Industrial Developments 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.

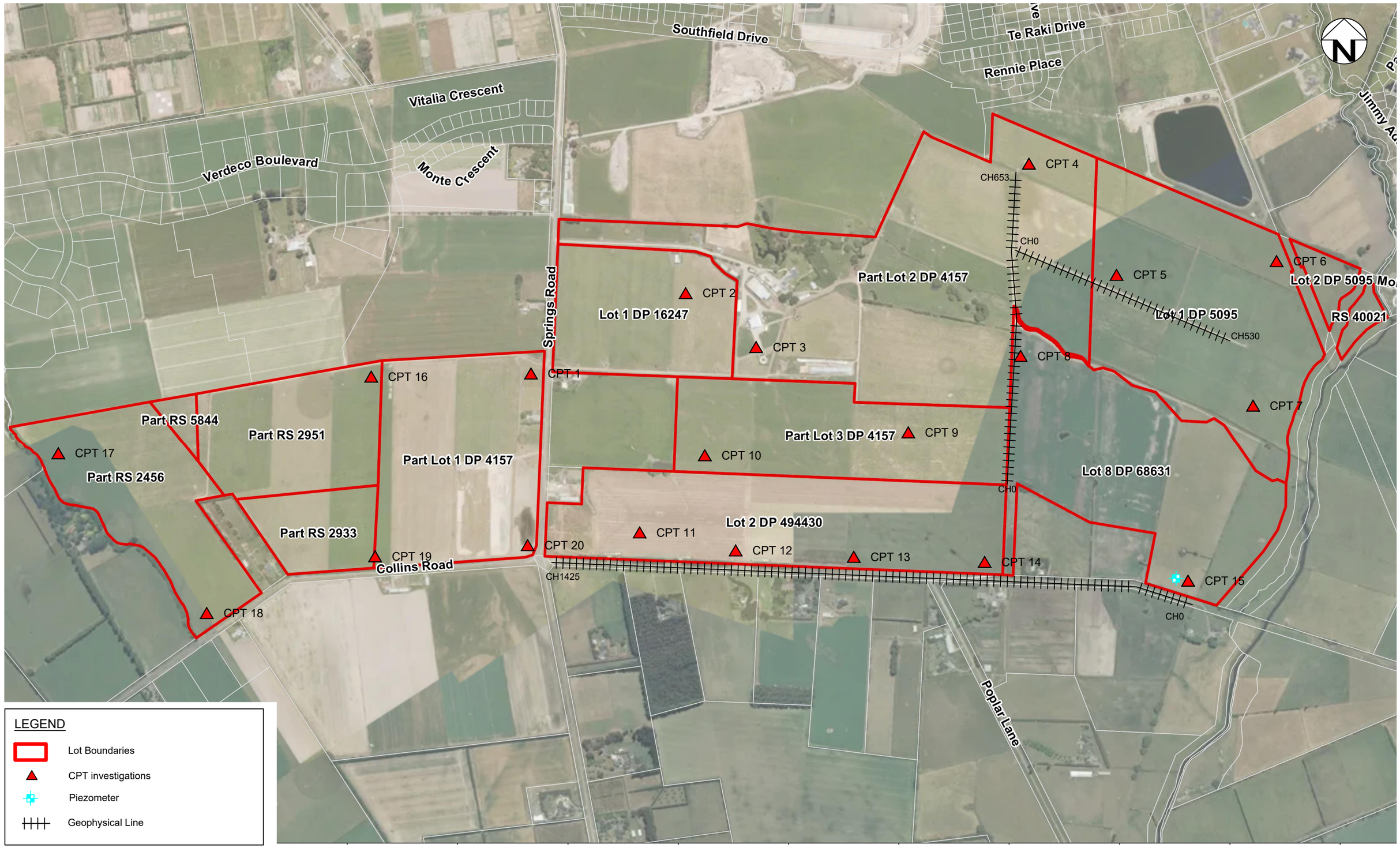
Rely on Coffey for additional assistance

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



LEGEND

- Lot Boundaries
- CPT investigations
- Piezometer
- Geophysical Line

revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE	LM	CT	13/10/2020

100 0 100 200 300 400

Scale (metres) 1:8000

drawn	LM
approved	CT
date	13/10/2020
scale	1:8000
original size	A3

coffey
A TETRA TECH COMPANY

client: Carter Group Ltd

project: 1491 Springs Road
Lincoln, Christchurch

title: Site Investigation Plan

project no: 773-CHCGE280252 | figure no: Figure1 | rev: A

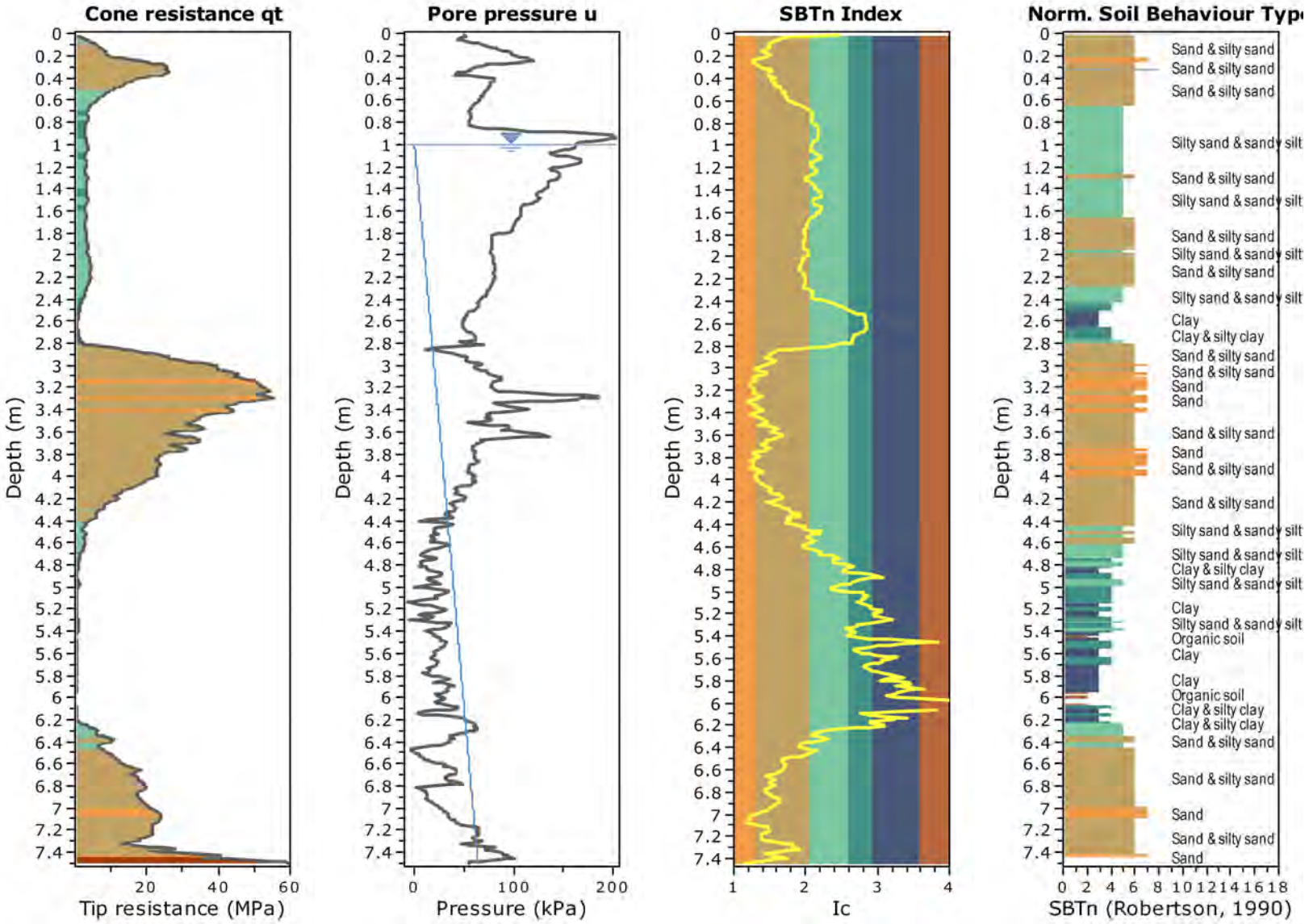
PLOT DATE: 13/10/2020 4:46:28 PM DWG FILE: F:\GENZ\PROJECTS\03 TETRALINX PROJECTS\280000 - 289999\280252 - 1491 SPRINGS ROAD, LINCOLN\06 DRAWINGS\CNZ DRAWINGS\SITE PLAN.DWG

Appendix B - CPT traces

Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 1
Total depth: 7.50 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

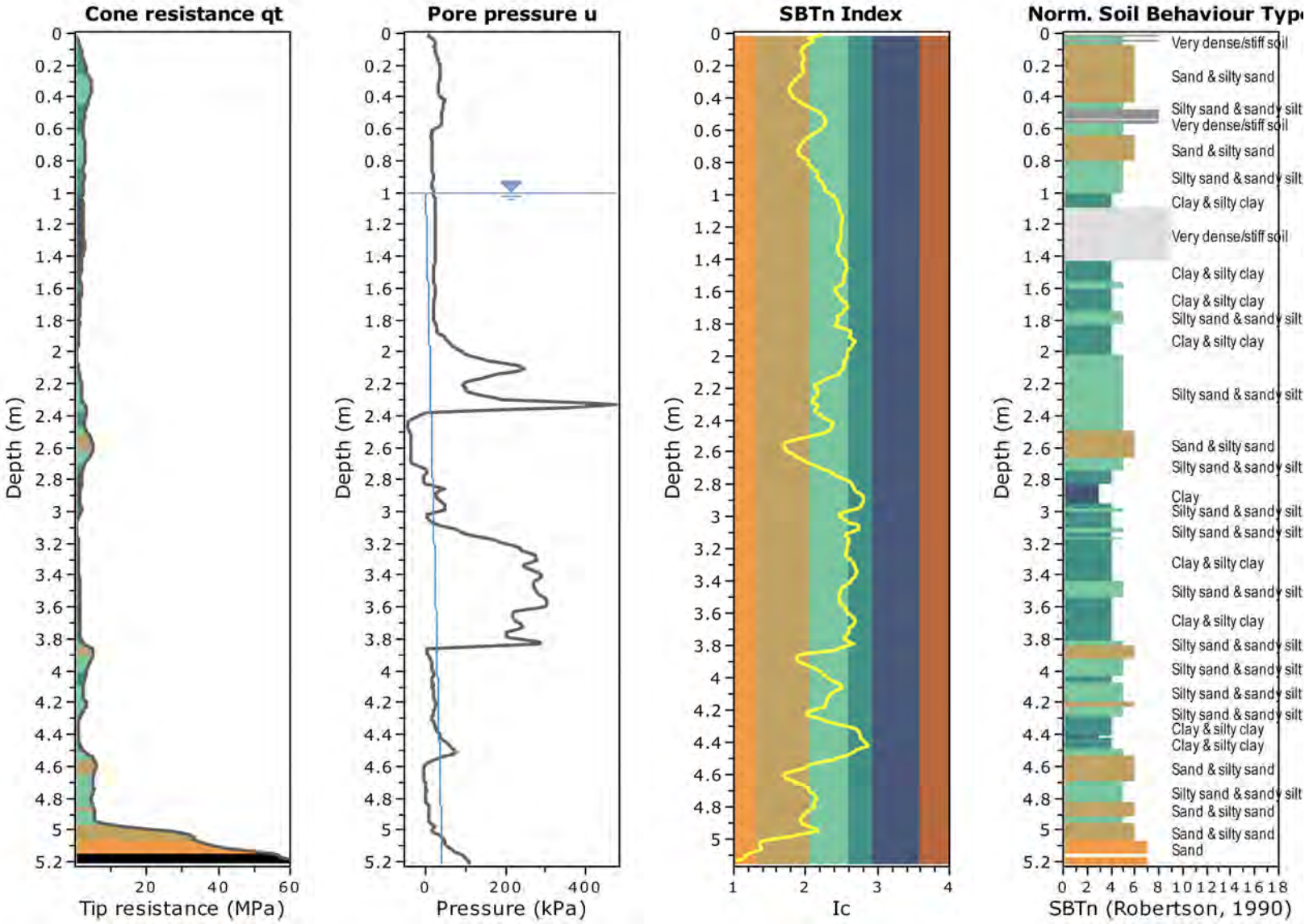
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 2
Total depth: 5.21 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

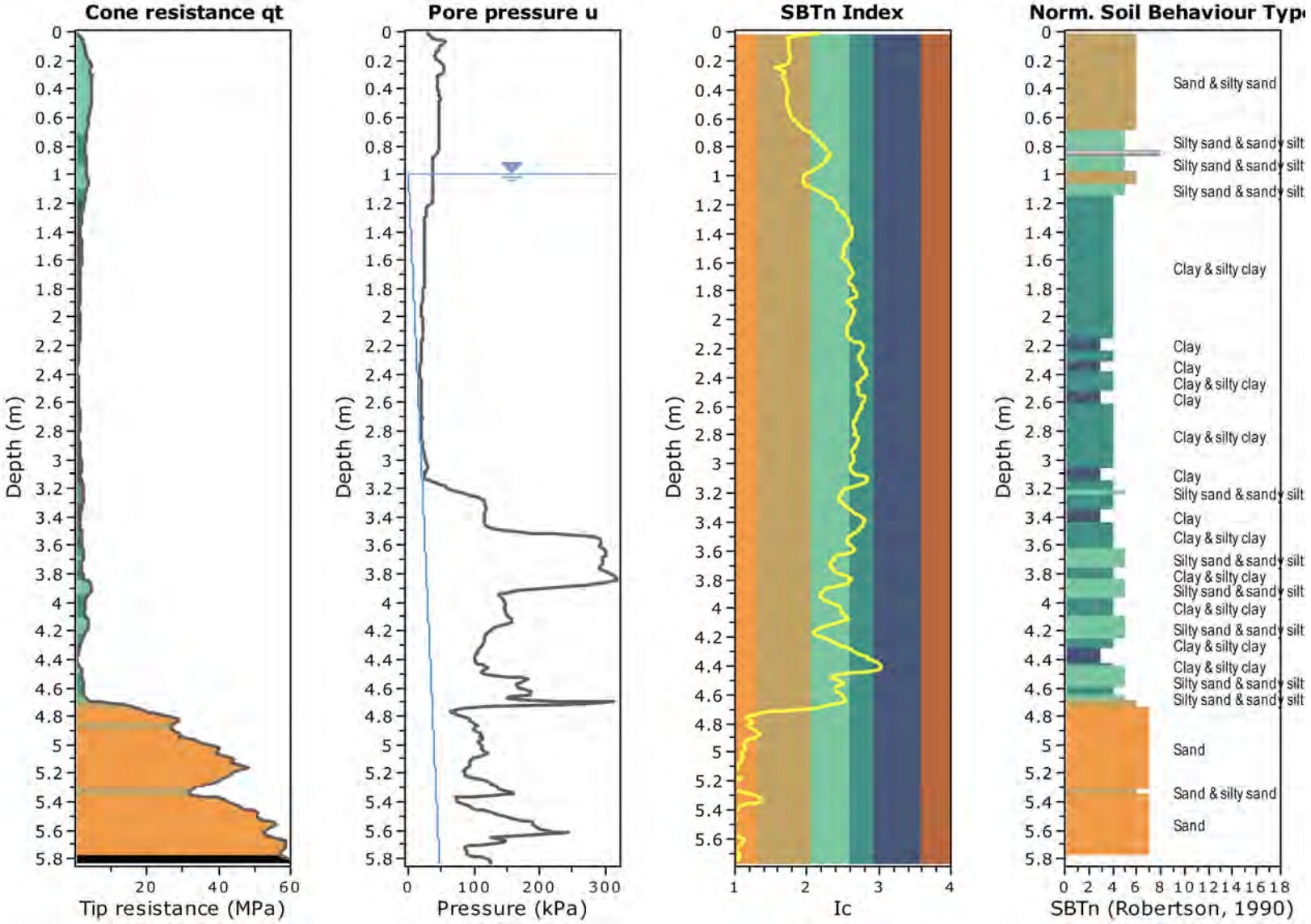
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 3
Total depth: 5.83 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

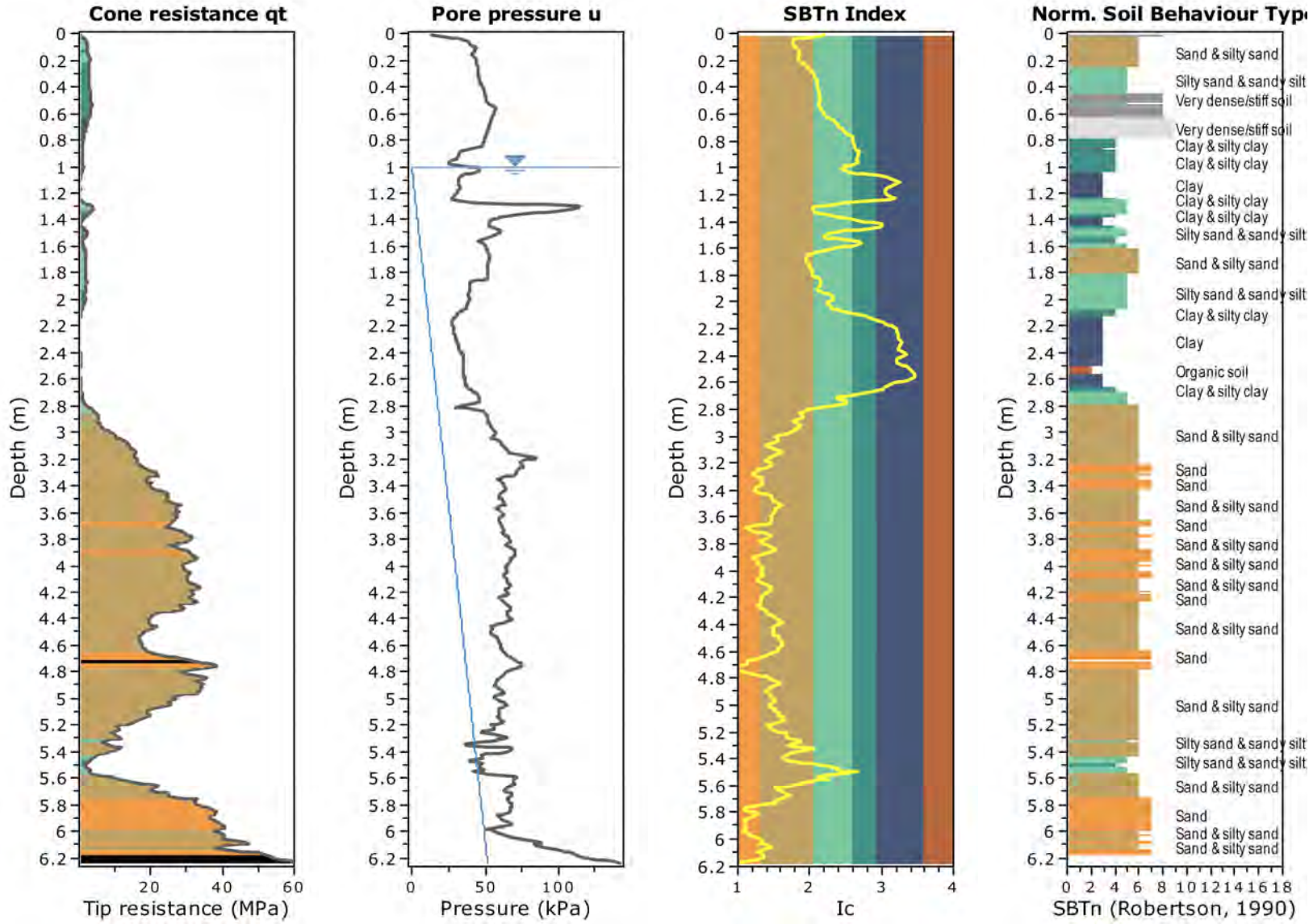
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 4
Total depth: 6.24 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

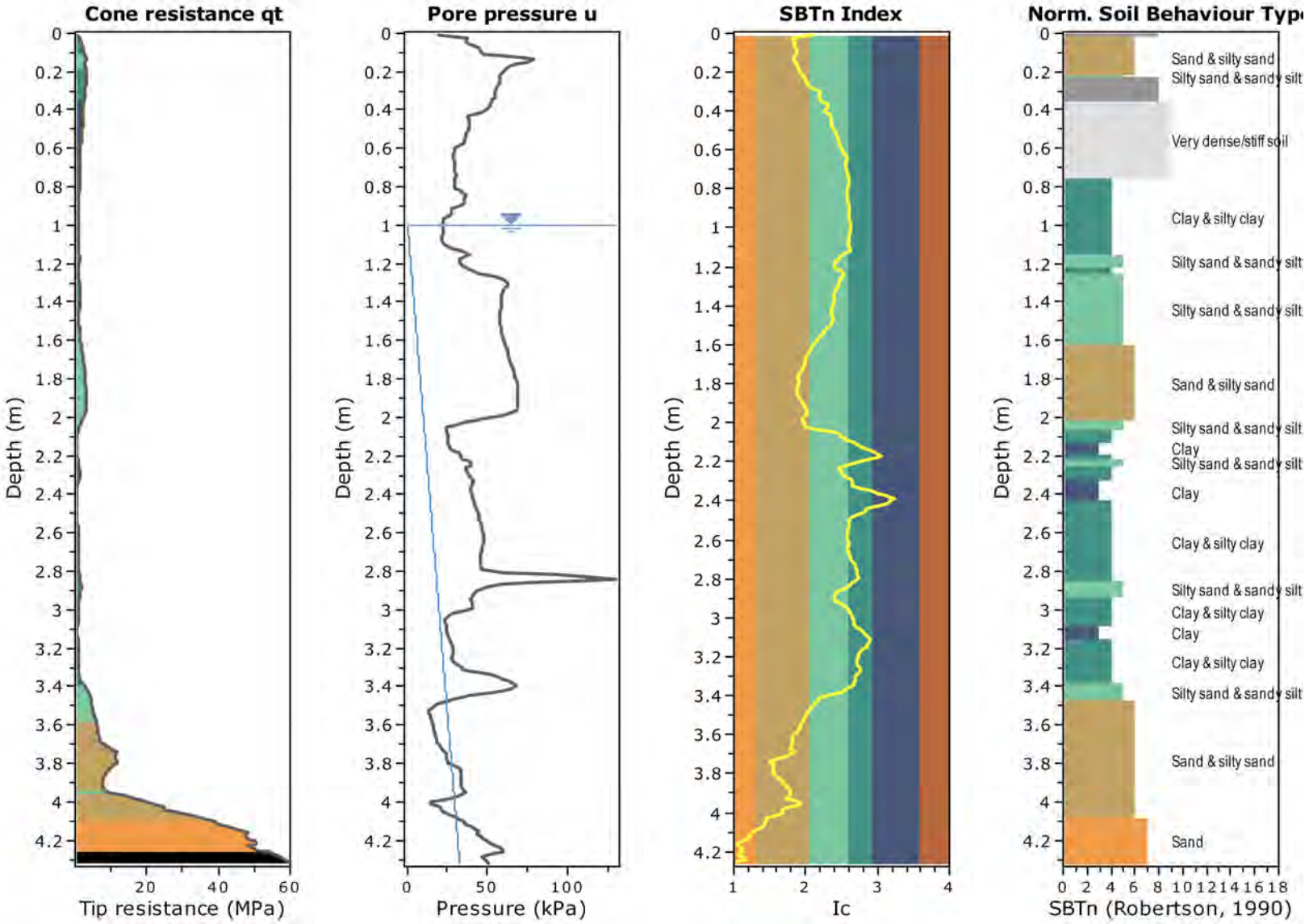
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 5
Total depth: 4.32 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

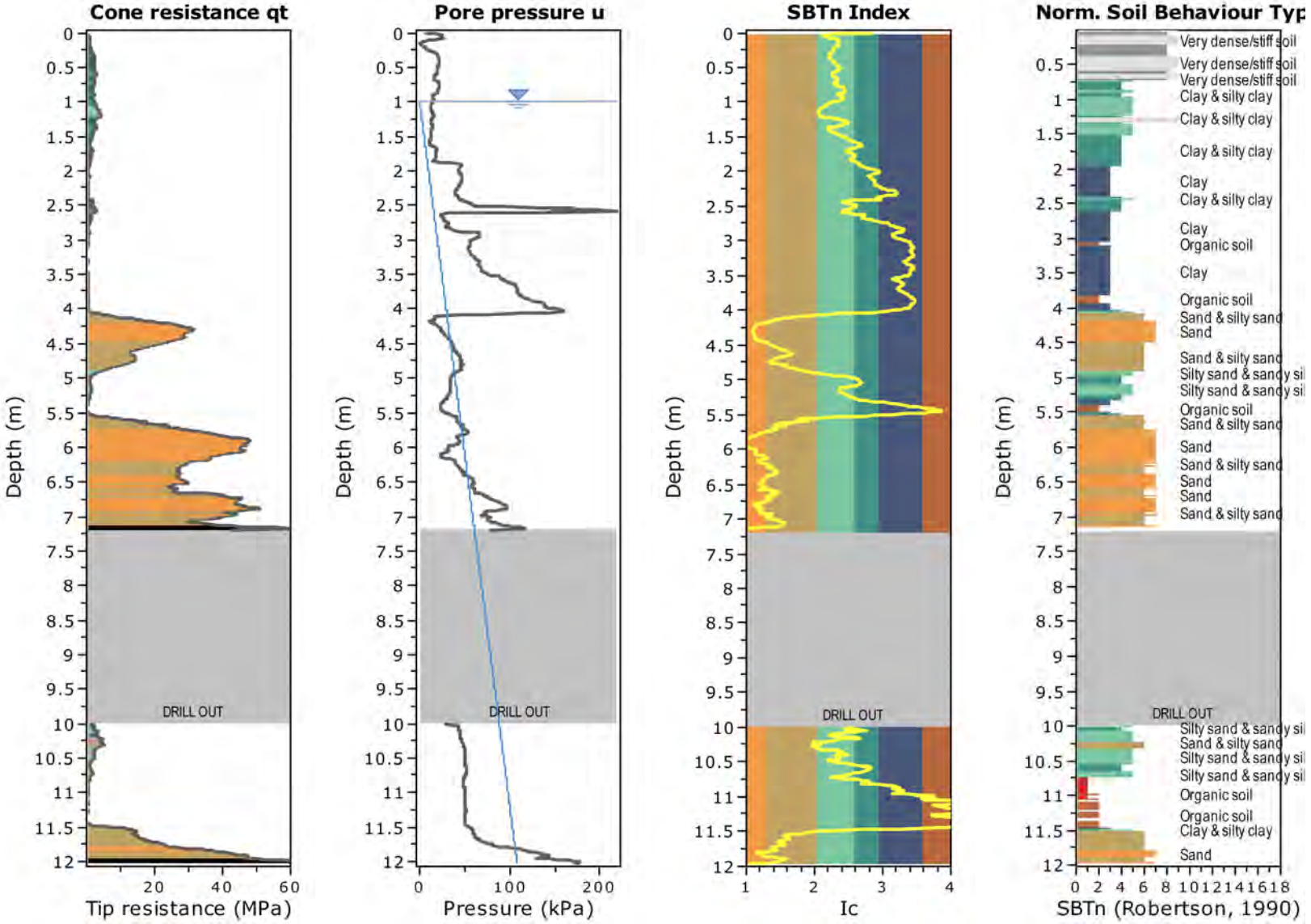
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 6
Total depth: 12.02 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

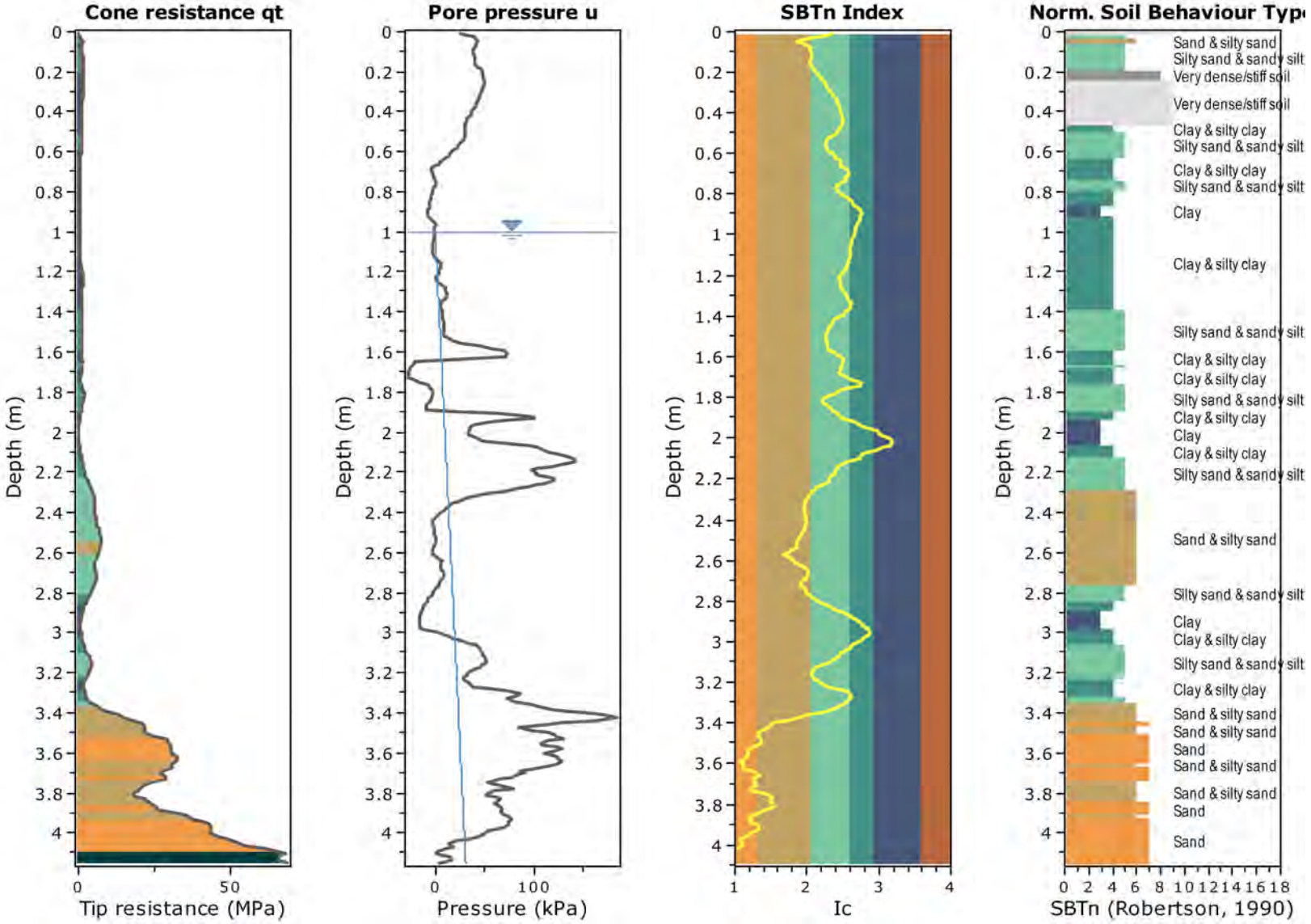
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 7
Total depth: 4.15 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

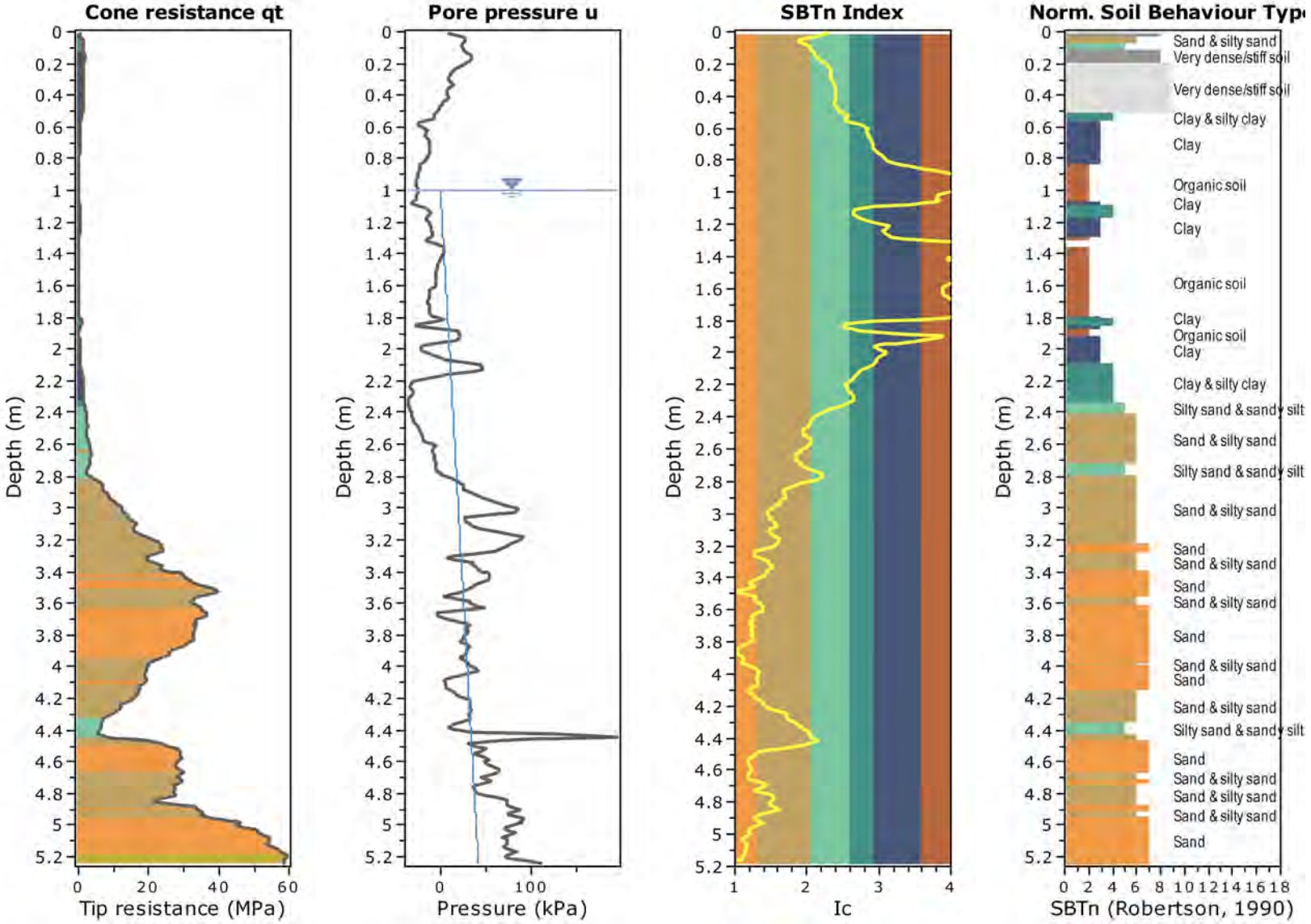
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 8
Total depth: 5.24 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

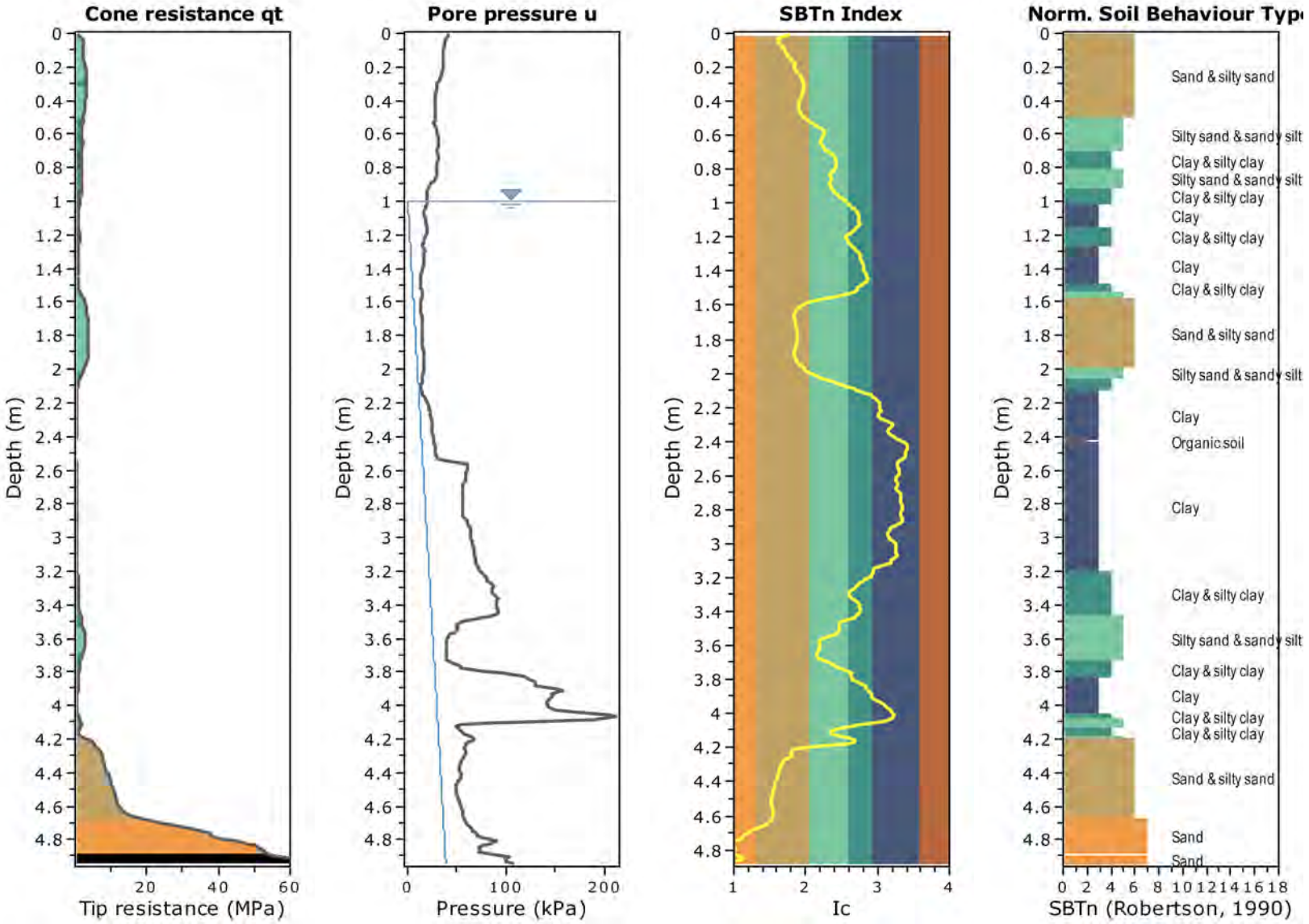
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 9
Total depth: 4.94 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

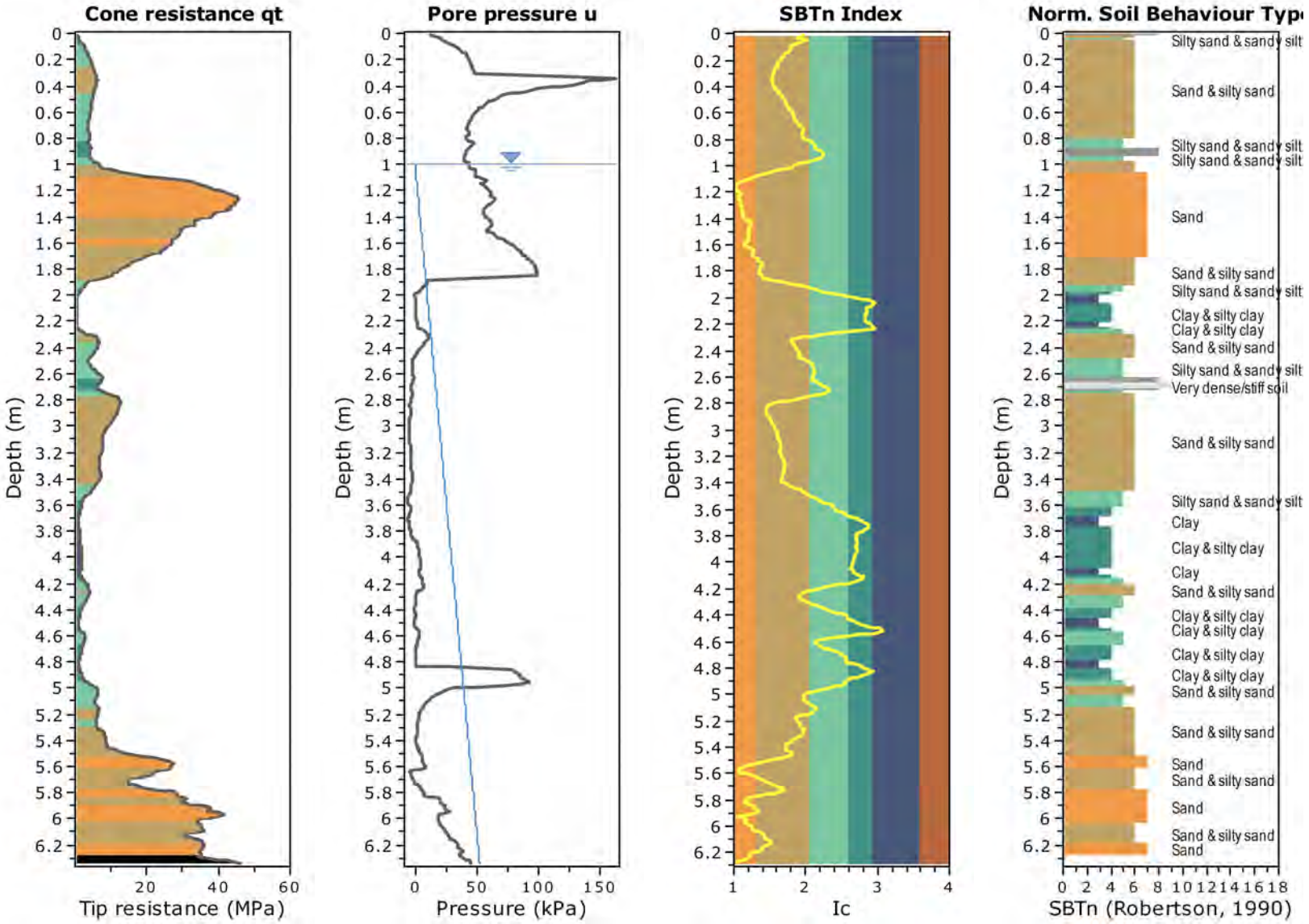
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 10
Total depth: 6.34 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

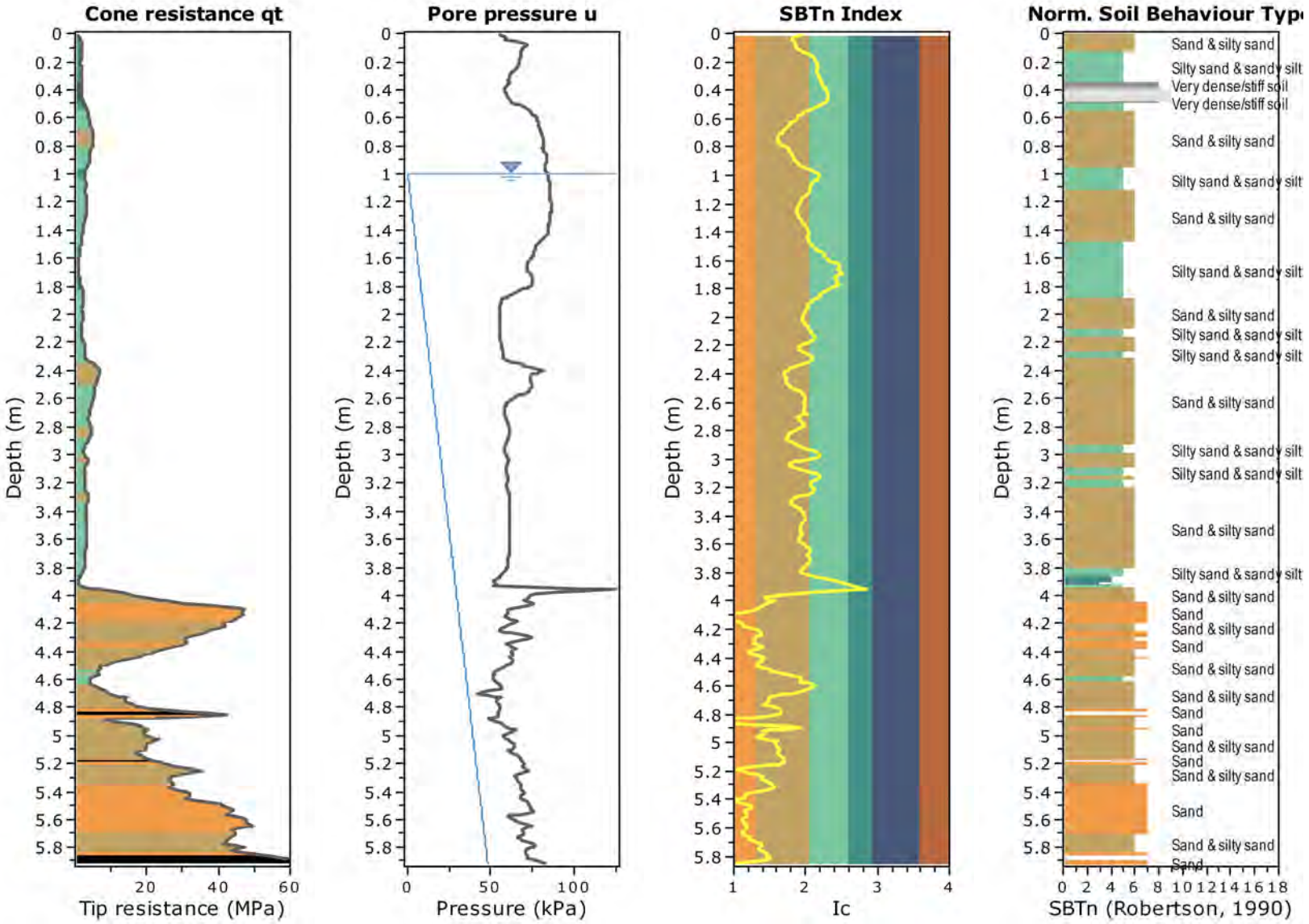
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**

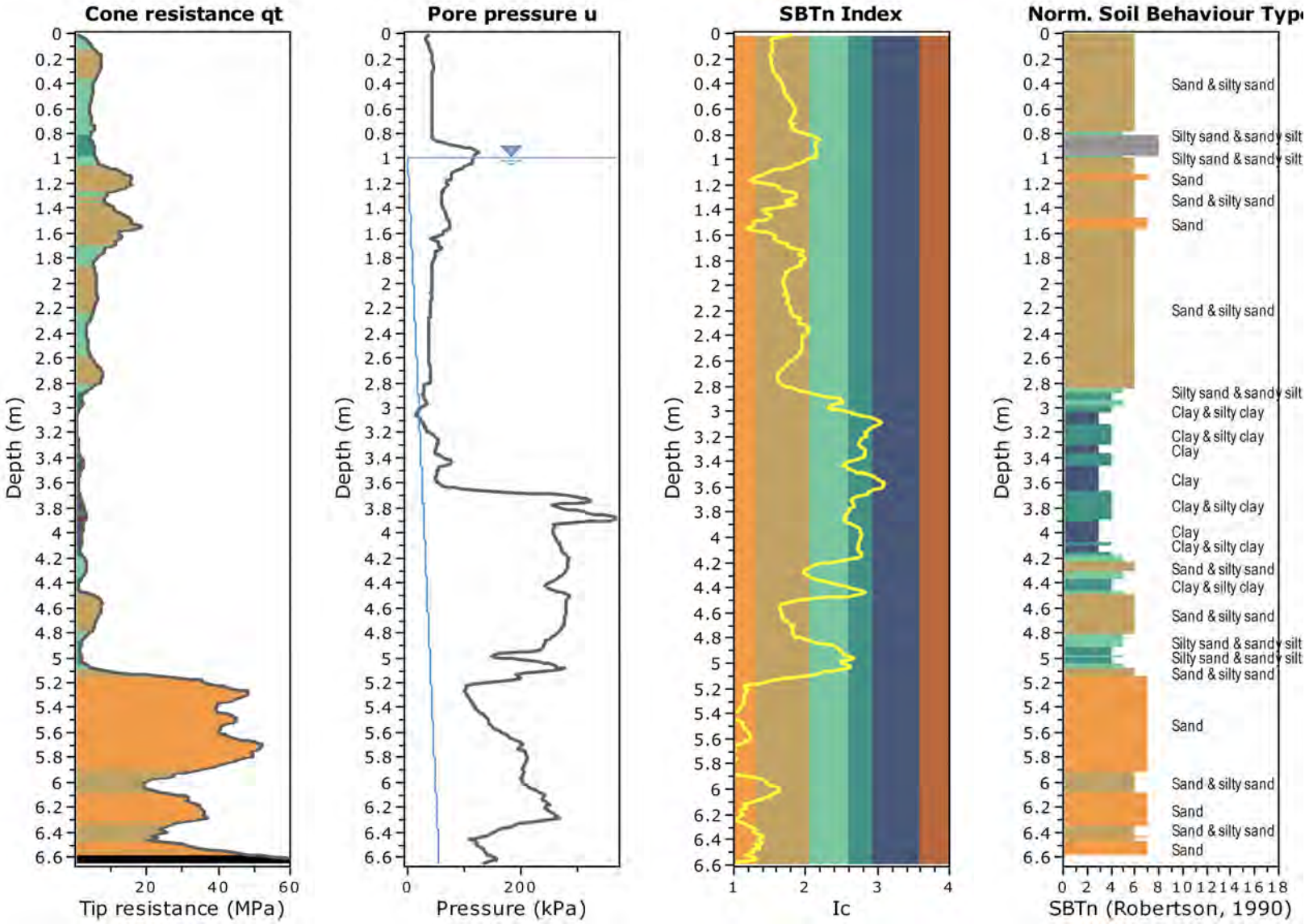
CPT: CPT 11
Total depth: 5.91 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 12
Total depth: 6.65 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

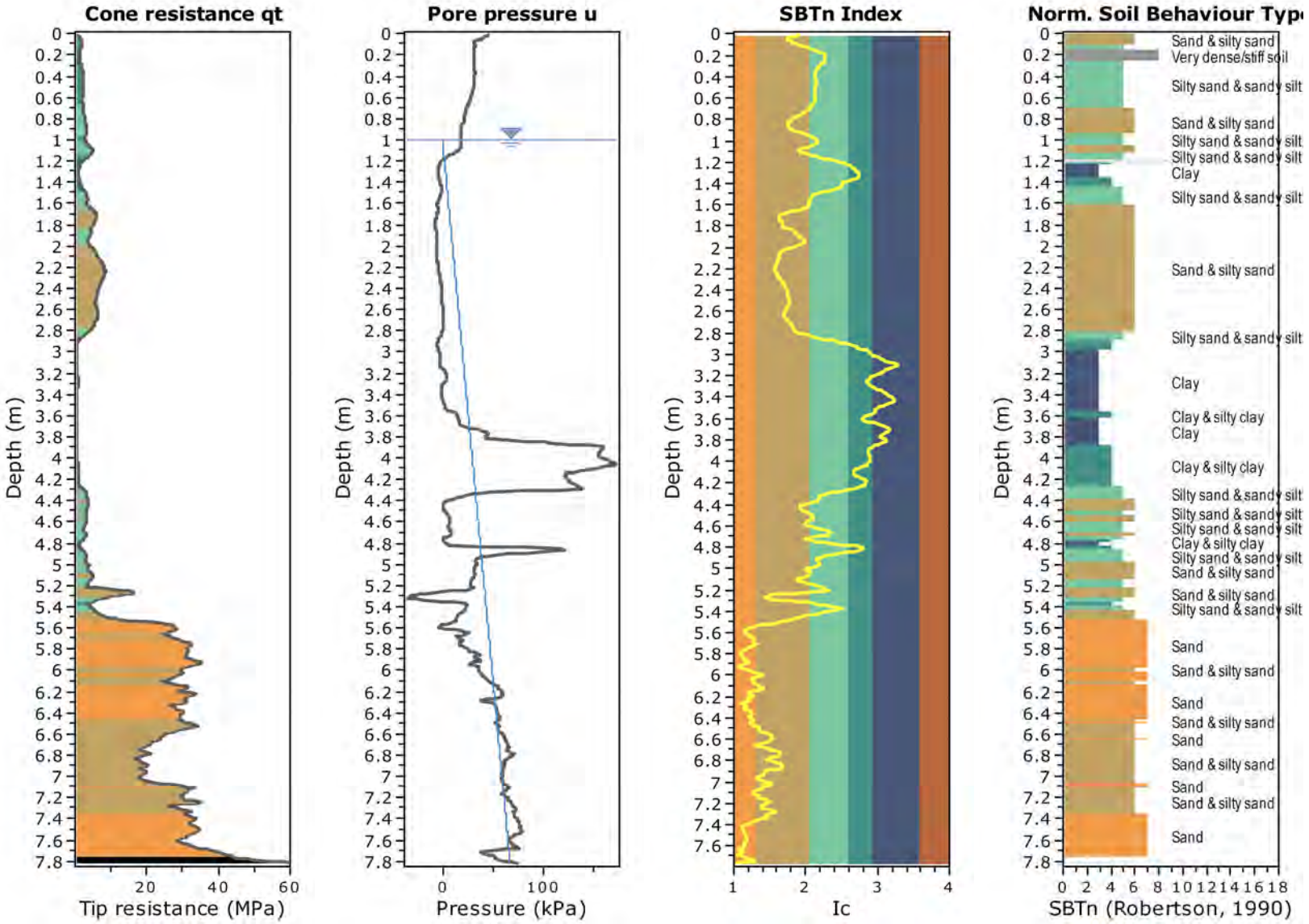
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**

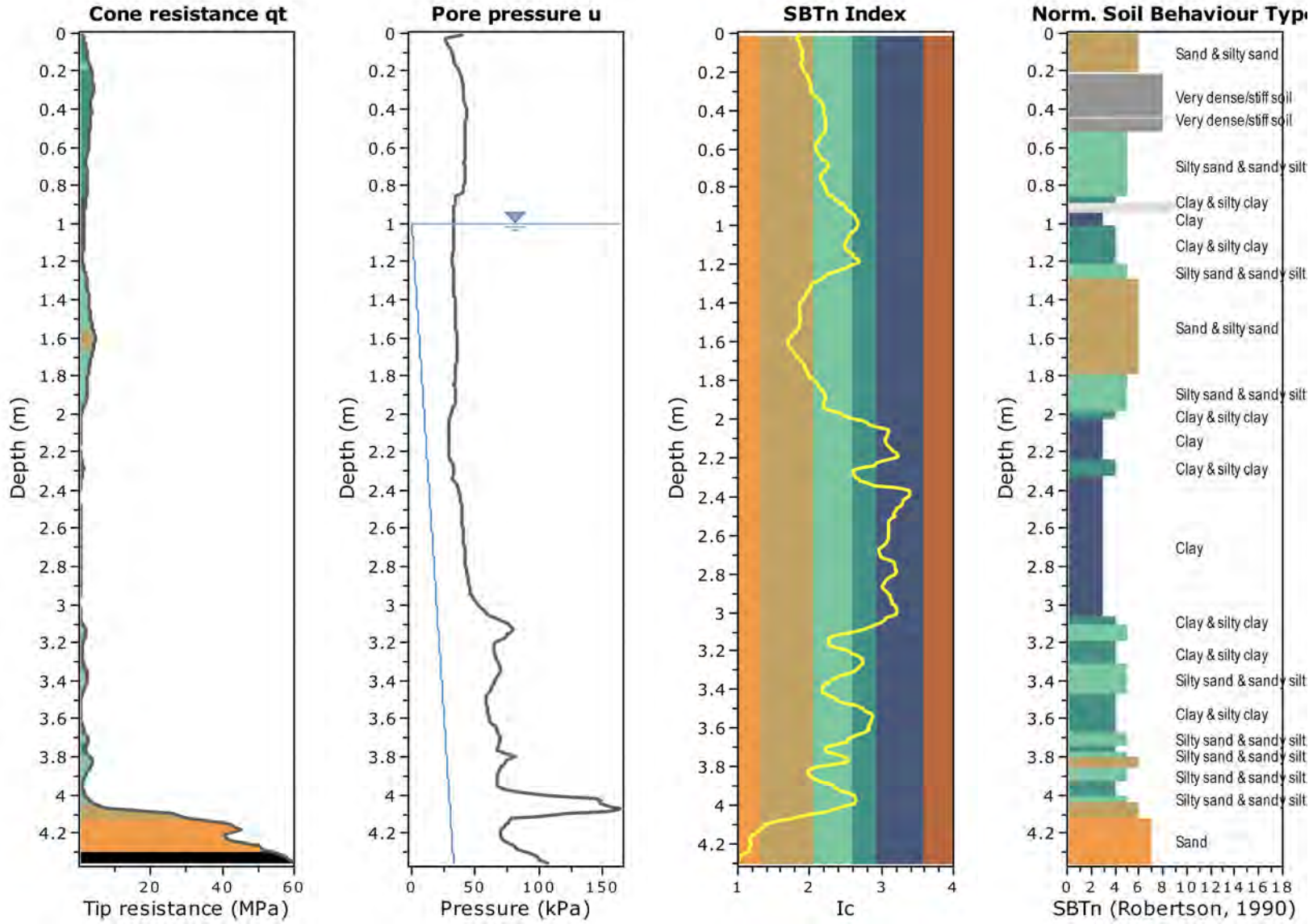
CPT: CPT 13
Total depth: 7.82 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**

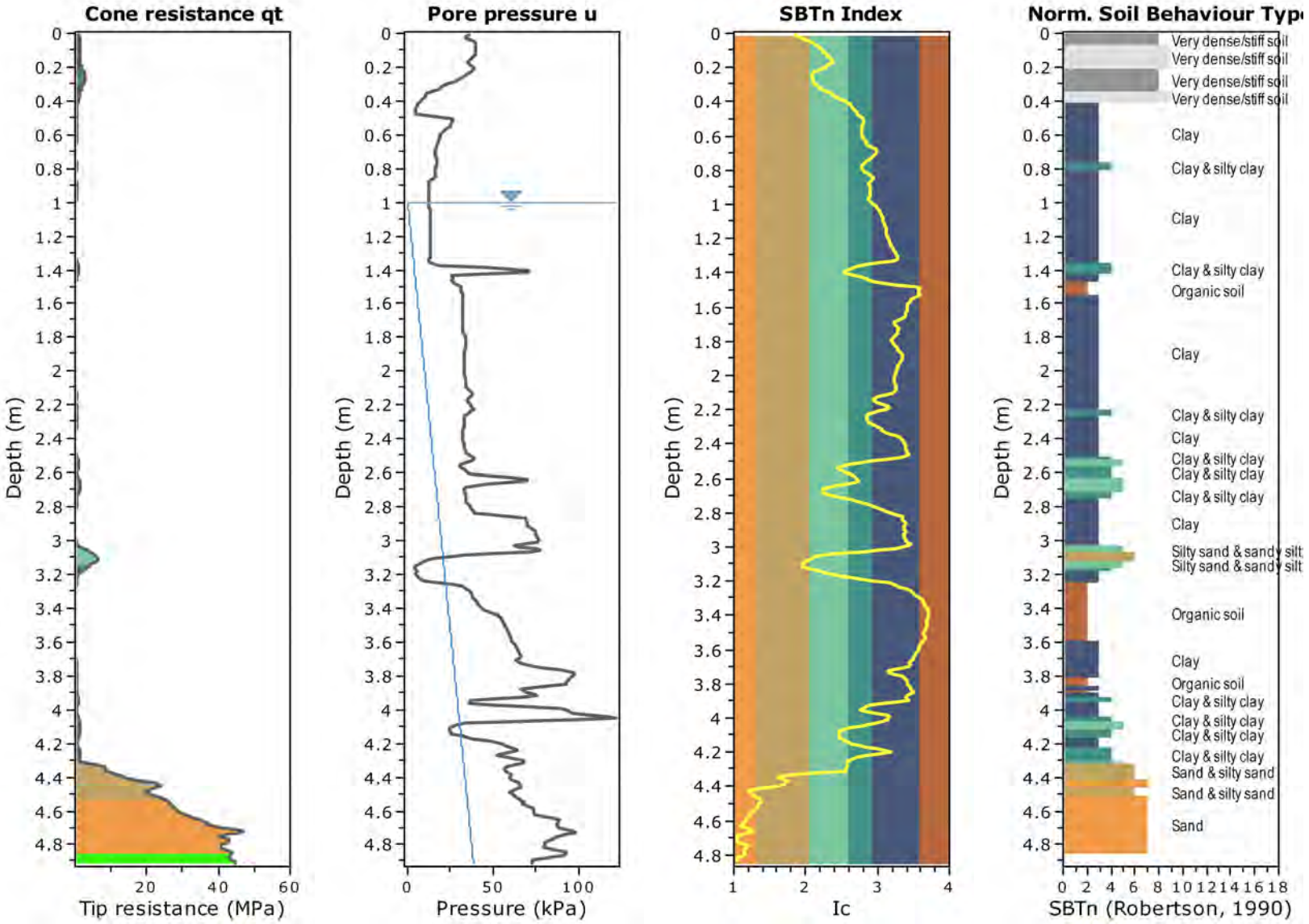
CPT: CPT 14
Total depth: 4.36 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**

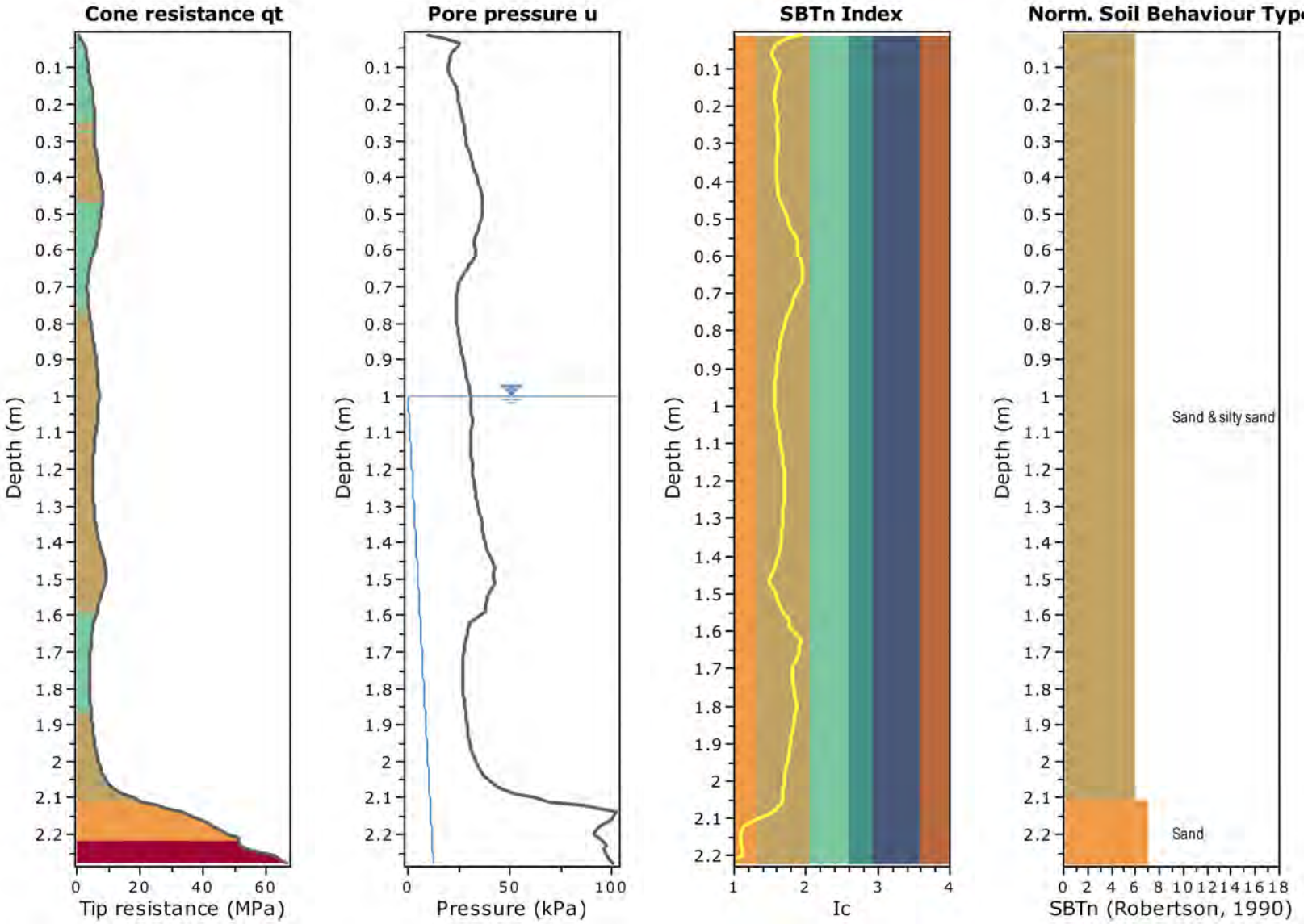
CPT: CPT 15
Total depth: 4.91 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 16
Total depth: 2.28 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

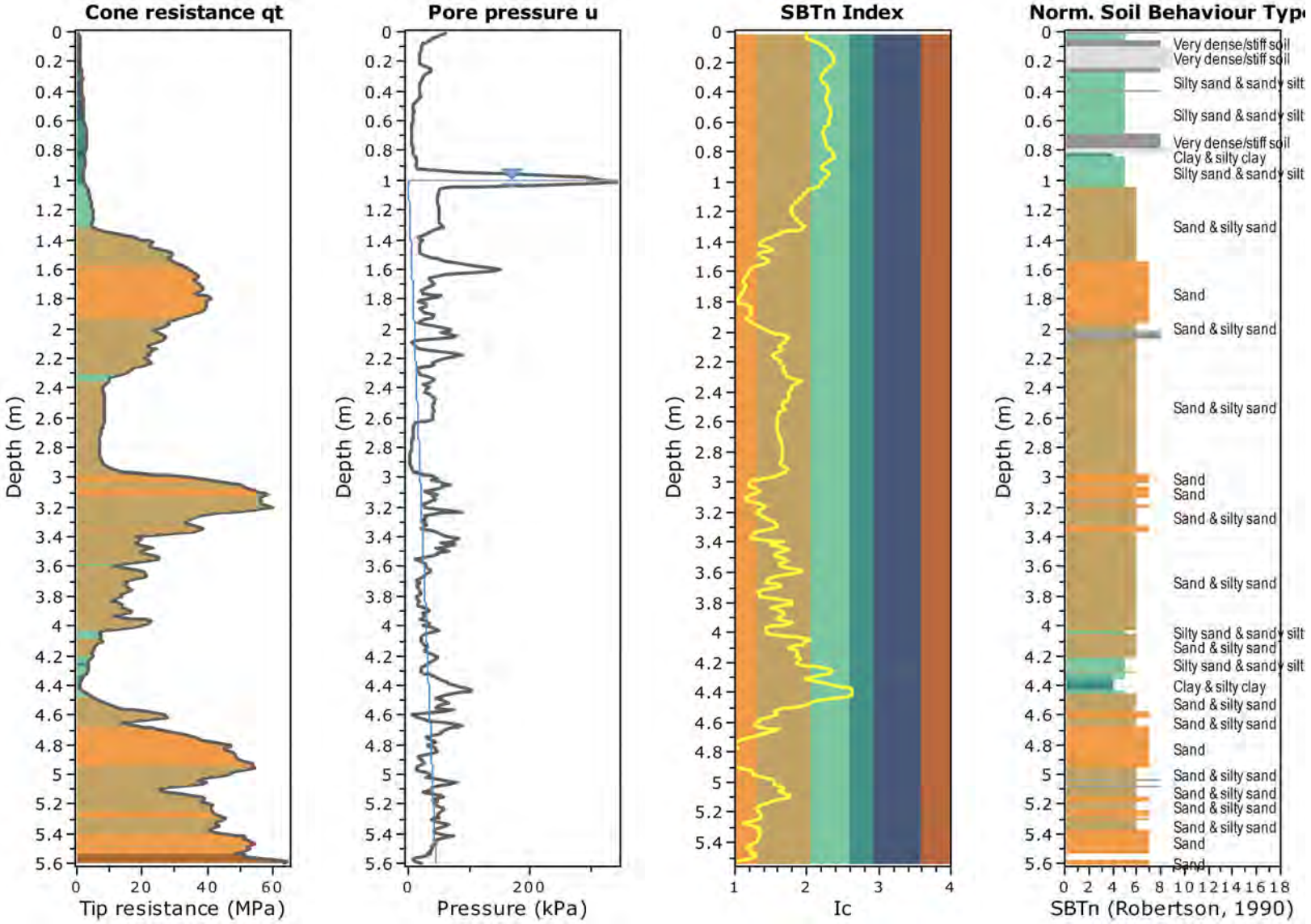
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**

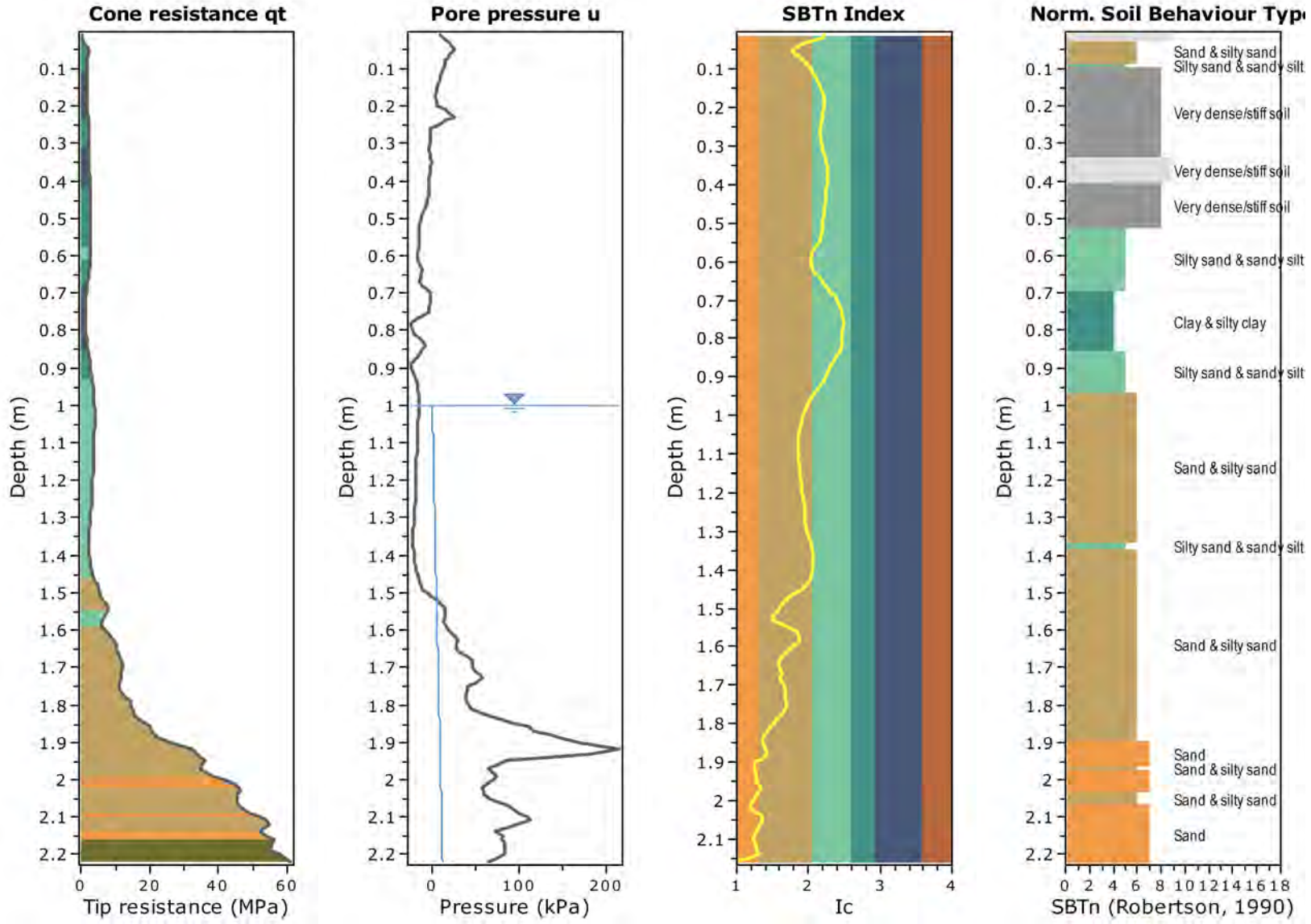
CPT: CPT 17
Total depth: 5.60 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**

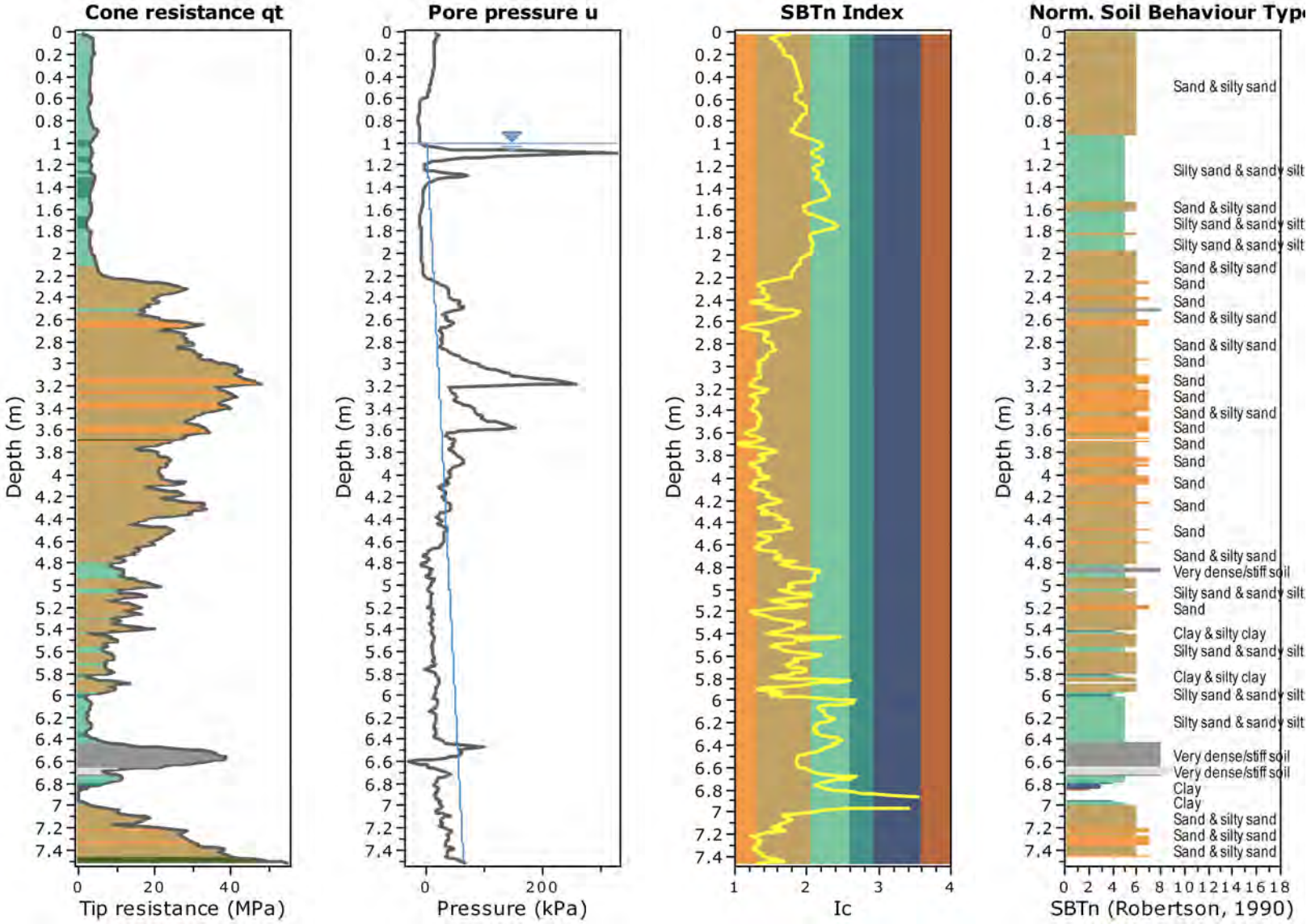
CPT: CPT 18
Total depth: 2.22 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

CPT: CPT 19
Total depth: 7.52 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

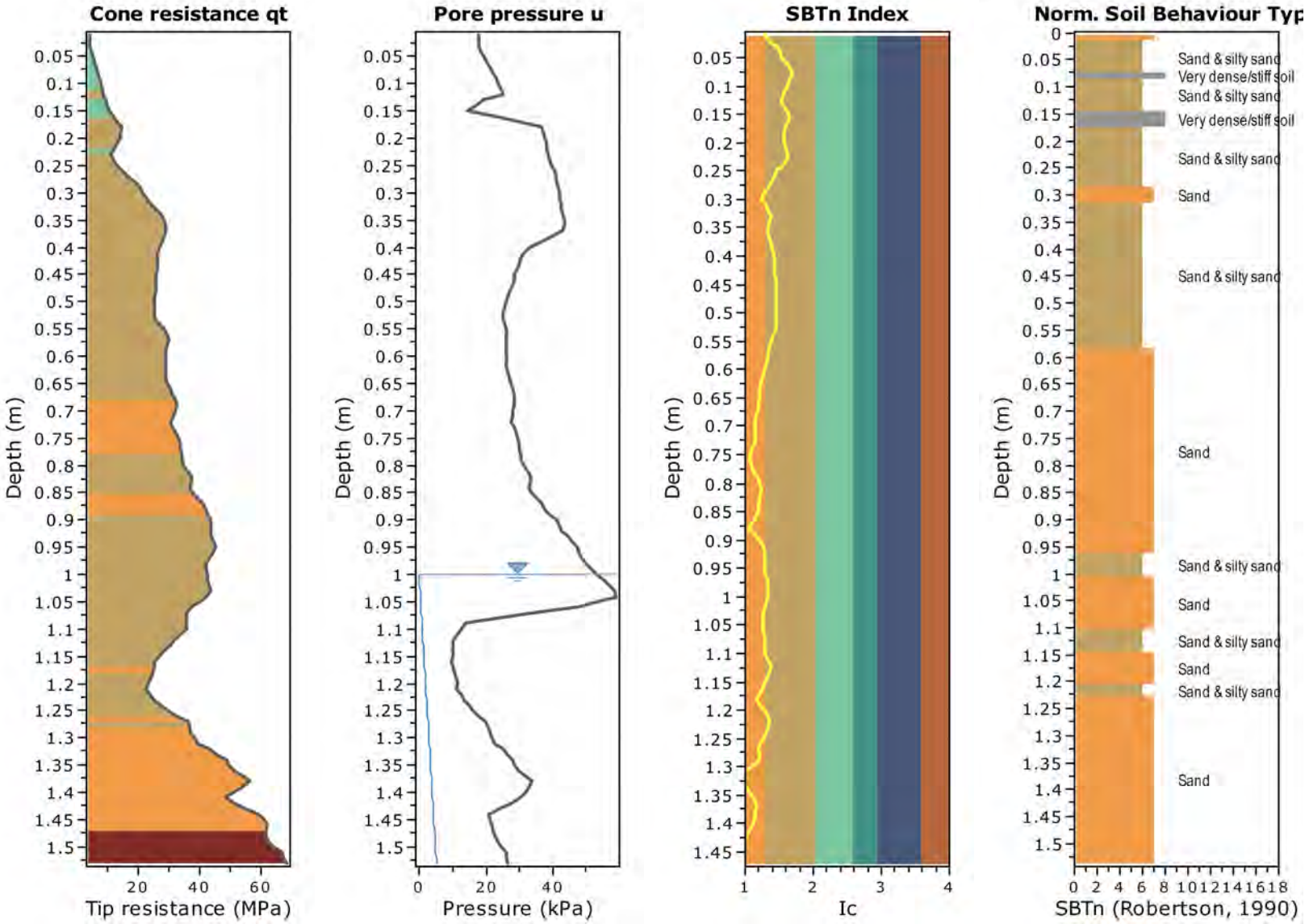
Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**



Coffey
1/254 Montreal Street
Christchurch 8013
www.coffey.com

Project: **Lincoln South**
Location: **1491 Springs Road, Lincoln**

CPT: CPT 20
Total depth: 1.53 m, Date: 13-Oct-20
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:



Appendix C - Geophysical Report

GEOPHYSICAL REPORT

October 2020

1491 Springs Road, Lincoln:

MASW Survey

Report prepared for Coffey Services (NZ) Ltd

Southern Geophysical Ltd

3/28 Tanya St, Bromley, Christchurch 8062

Ph: 03 384 4302

Web: www.southerngeophysical.com

Data collected and report prepared for Southern Geophysical Ltd by:

Christian Rüegg, MSc, Senior Geophysicist

Nick McConachie, BSc, Geophysicist

Internal review by:

Mike Finnemore, PhD, Senior Geophysicist

Table of Contents

SGL Reference: 2054

Report Version 1

Summary:

Southern Geophysical Ltd was contracted to undertake a geophysical survey using Multi-channel Analysis of Surface Waves (MASW) at a site at 1491 Springs Road, Lincoln, Christchurch. The survey was conducted on October 9, 2020, and included three MASW lines (Figure 1). The aim of the survey was to assess the shear-wave velocities of the subsurface to a depth of over 20 m. The results show shear-wave velocities (V_s) varying across the site. The depth to velocities consistent with gravels (180 m/s to 220 m/s) ranges from very near the surface to approximately 15 m depth.

Methodology:

MASW is a geophysical technique that uses the dispersive nature of surface waves to model shear-wave velocity versus depth.

A MASW survey is undertaken as a series of lines or points across the surface of the site. The MASW lines in this survey were acquired using a 24-channel towed seismic array, with 4.5 Hz geophones. The geophone spacing was 1 m and the source offset was 10 m. The seismic source was an 8 lb sledgehammer impacting an aluminium plate. Recording parameters for the MASW survey were set with a 0.125 ms sample interval, 1.5 s record length, 24 dB gains, and a geophone trigger system. Shot records were acquired at 10 m spacing along the MASW lines.

The shot records were processed using the Kansas Geological Survey software package SurfSeis6++ ©. The geometry for each shot record was set according to the survey parameters and the dispersion curves were generated and edited. The inversions were run using a 10 layer variable depth model. The velocity data was interpolated into 2D profiles showing V_s variations with depth (Figures 2 to 6). The output shear-wave velocity data is included as data files (CSV format), supplementary to this report.

Survey positions were recorded using a Geo 7X Trimble GNSS system with a Tornado antenna. The GNSS positions were differentially corrected using a local GeoNet base station. The GNSS points were output in the Mt Pleasant 2000 datum, with heights in Mean Sea Level (MSL). The accuracy of the survey positions is +/- 0.1 m. The site had minor changes in topography (heights ranging from 3.07 to 9.96 MSL), but the changes were very gradual across a large area.

Results:

Three MASW lines were acquired at the site with a total line length of 2.6 kilometres (Figure 1). The ground conditions were farm tracks and roads for MASW 1 and 2, and a roadside grass verge for MASW 3.

The MASW profiles have been plotted at a 1:2000 scaling ratio in order to show all the data in one display (Figure 2), as well as at a 1:700 scaling ratio to show more detail along each MASW line (Figures 3 to 6).

In homogenous soils, with gradually increasing shear-wave velocities and no sharp lateral discontinuities, the accuracy of the shear-wave velocities derived from the MASW processing is considered to be +/- 10%.[1] The quality of the seismic data and the dispersion curves used in this report is excellent, with a good signal-to-noise ratio. If there is a velocity inversion present in the shear-wave profile (decreasing velocity with depth), the shear-wave velocity of the reduced velocity zone and the thickness of that zone can often be underestimated by the inversion process.

Conclusions:

While the limitations of the MASW method should be considered when evaluating these results, the quality of the data collected at the site and the confidence in the shear-wave velocities derived from the MASW data is high. It is suggested that the 200 m/s shear-wave velocity contour likely correlates with a gravel surface, however the results should be correlated with intrusive ground tests to confirm the site geology.

[1] Stephenson, W.J., Louie, J.N., Pullammanappallil, S., Williams, R.A., and Odum, J.K. 2005. Blind Shear-wave Velocity Comparison of ReMi and MASW Results with Boreholes to 200 m in Santa Clara Valley: Implications for Earthquake Ground-Motion Assessment. *Bulletin of the Seismological Society of America*, Vol. 95, pp. 2506-2516.

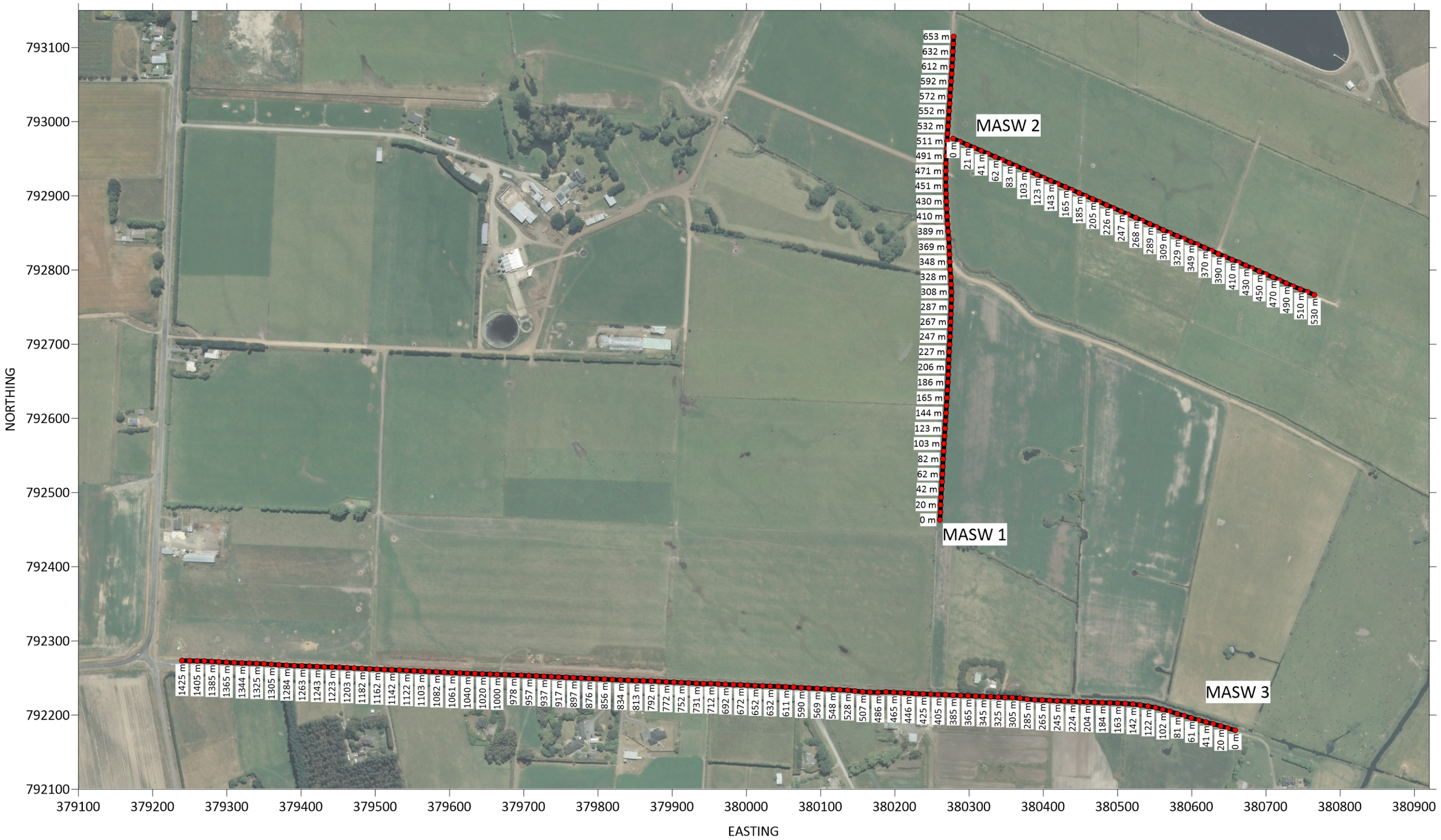
Disclaimer:

This document has been provided by Southern Geophysical Ltd subject to the following:

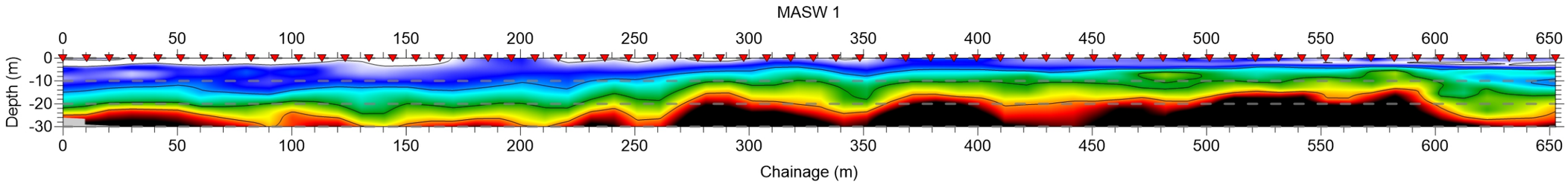
Non-invasive geophysical testing has limitations and is not a complete source of testing. Often there is a need to couple non-invasive methods with invasive testing methods, such as drilling, especially in cases where the non-invasive testing indicates anomalies.

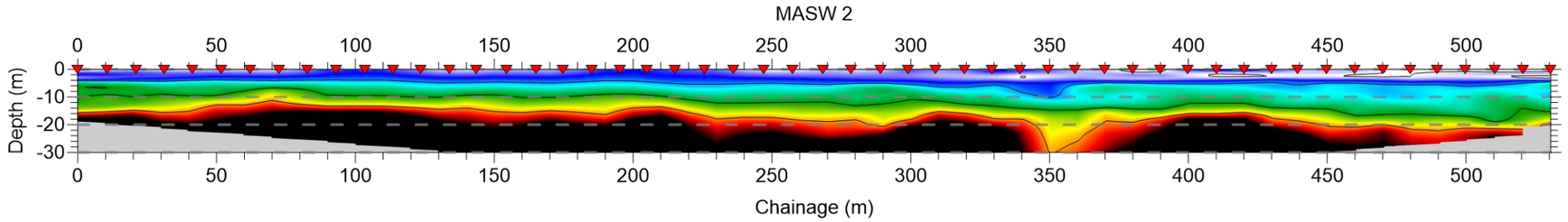
This document has been prepared for the particular purpose outlined in the project proposal and no responsibility is accepted for the use of this document, in whole or in part, in other contexts or for any other purpose. Southern Geophysical Ltd did not perform a complete assessment of all possible conditions or circumstances that may exist at the site. Conditions may exist which were undetectable given the limited nature of the enquiry Southern Geophysical Ltd was retained to undertake with respect to the site. Variations in conditions often occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account. Accordingly, additional studies and actions may be required by the client.

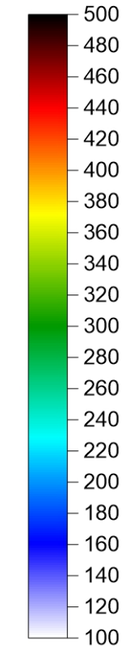
We collected our data and based our report on information which was collected at a specific point in time. The passage of time affects the information and assessment provided by Southern Geophysical Ltd. It is understood that the services provided allowed Southern Geophysical Ltd to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes for whatever reason. Where data is supplied by the client or other sources, including where previous site investigation data have been used, it has been assumed that the information is correct. No responsibility is accepted by Southern Geophysical Ltd for incomplete or inaccurate data supplied by others. This document is provided for sole use by the client and is confidential to that client and its professional advisers. No responsibility whatsoever for the contents of this document will be accepted to any person other than the client. Any use which a third party makes of this document, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Southern Geophysical Ltd accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

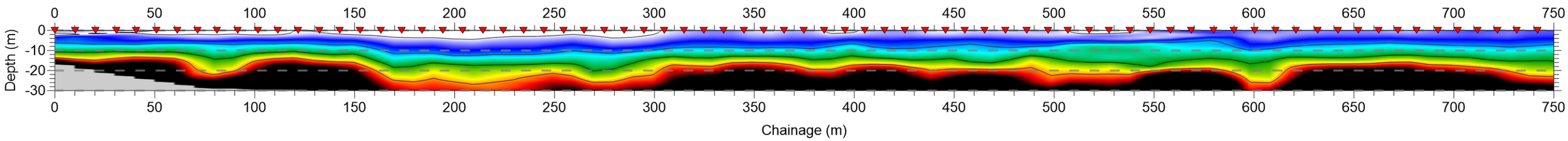


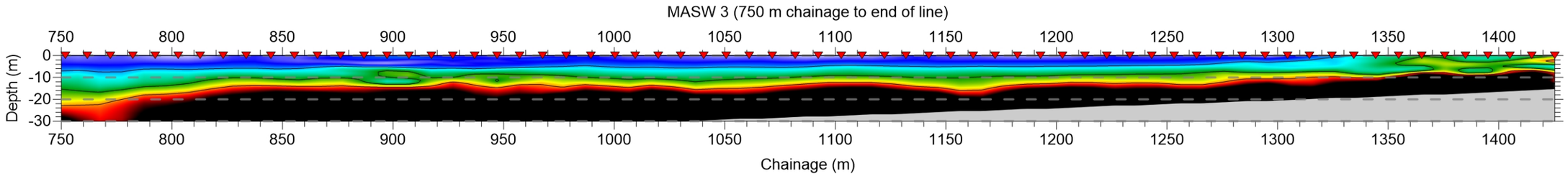
DRAWING- **Figure 1: Geophysical Site Investigation**	NOTES- Coordinates Mount Pleasant 2000 TM Grid. Aerial photograph sourced from LINZ, Crown Copyright © Every second MASW point is labelled with chainage along the line.	N	**Southern Geophysical Ltd**
LOCATION- **1491 Springs Road, Lincoln**	SCALE (m) 0 100 200 300 400	A3	www.southerngeophysical.com











DRAWING- **Figure 2: All MASW Profiles (1:2000 scaling ratio)**

LOCATION- **1491 Springs Road, Lincoln**

NOTES MASW Vs profiles have contour intervals of 100 m/s (Vs).

See site map for location of points.

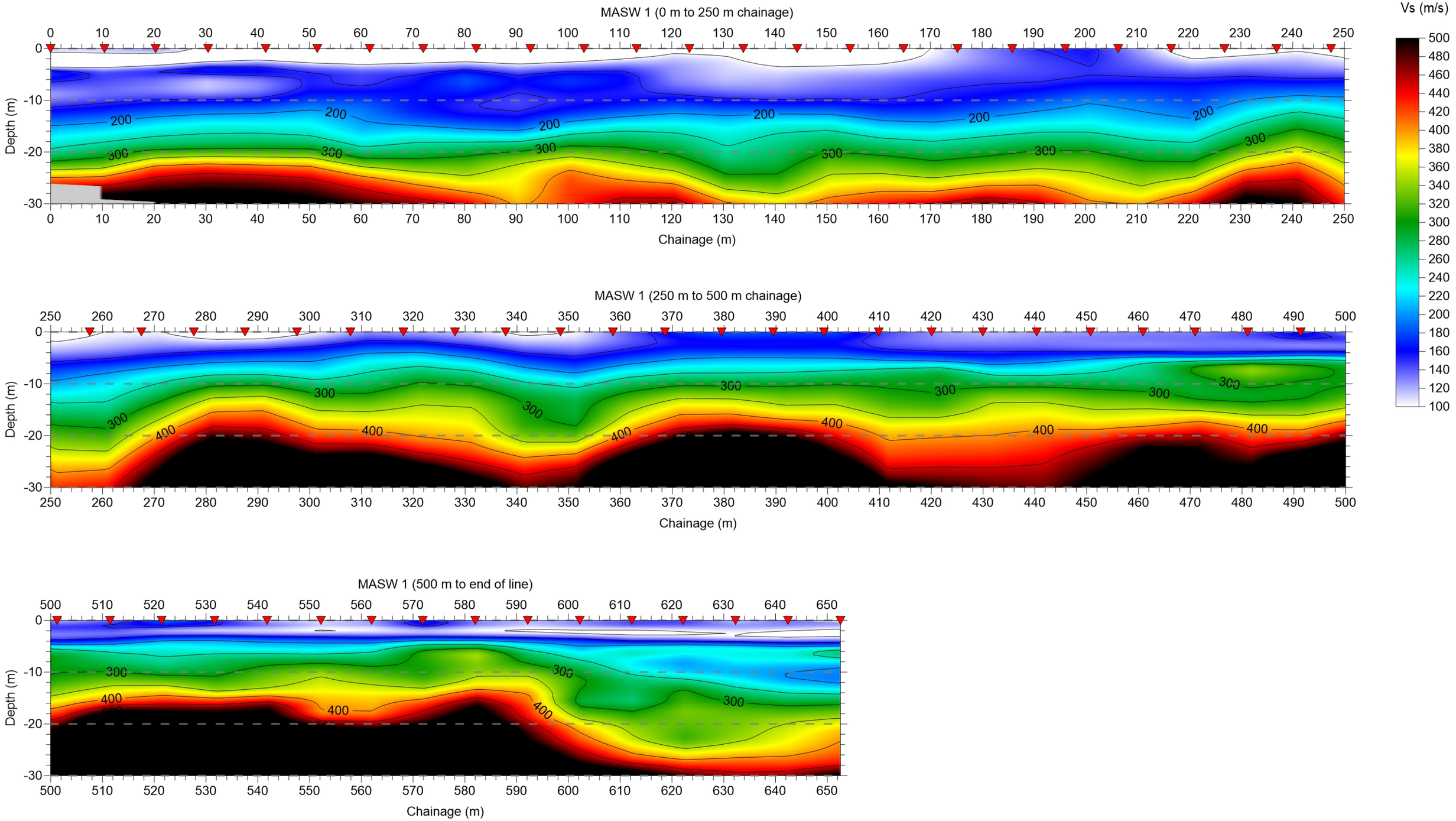
▼ Surface position of MASW shot records (contours interpolated between data points)

No data (insufficient depth imaging with MASW)

A3

Southern Geophysical Ltd

www.southerngeophysical.com



DRAWING- **Figure 3: MASW 1 (1:700 scaling ratio)**

LOCATION- **1491 Springs Road, Lincoln**

NOTES MASW Vs profiles have contour intervals of 50 m/s (Vs).

See site map for location of points.

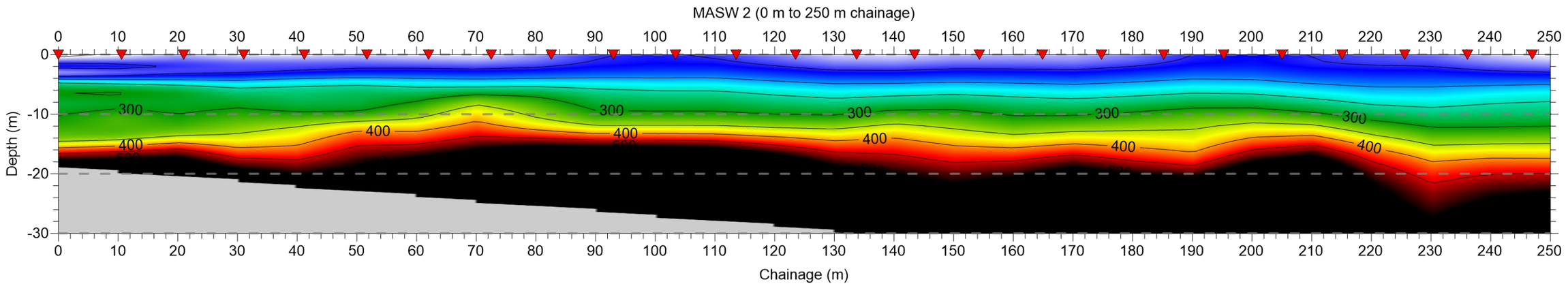
Surface position of MASW shot records (contours interpolated between data points)

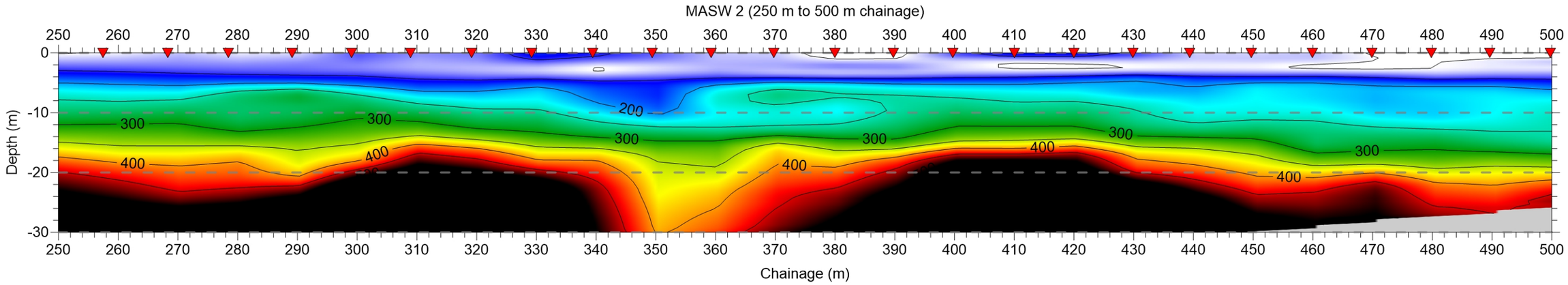
No data (insufficient depth imaging with MASW)

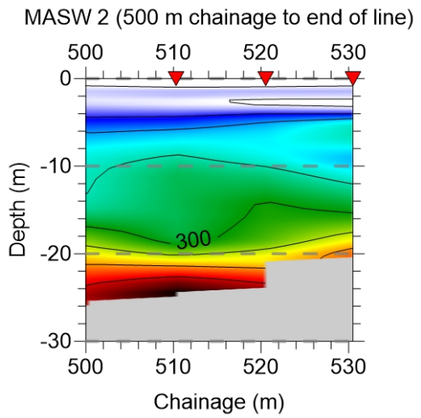
A3

Southern Geophysical Ltd

www.southerngeophysical.com







DRAWING- **Figure 4: MASW 2 (1:700 scaling ratio)**

LOCATION- **1491 Springs Road, Lincoln**

NOTES MASW Vs profiles have contour intervals of 50 m/s (Vs).

See site map for location of points.

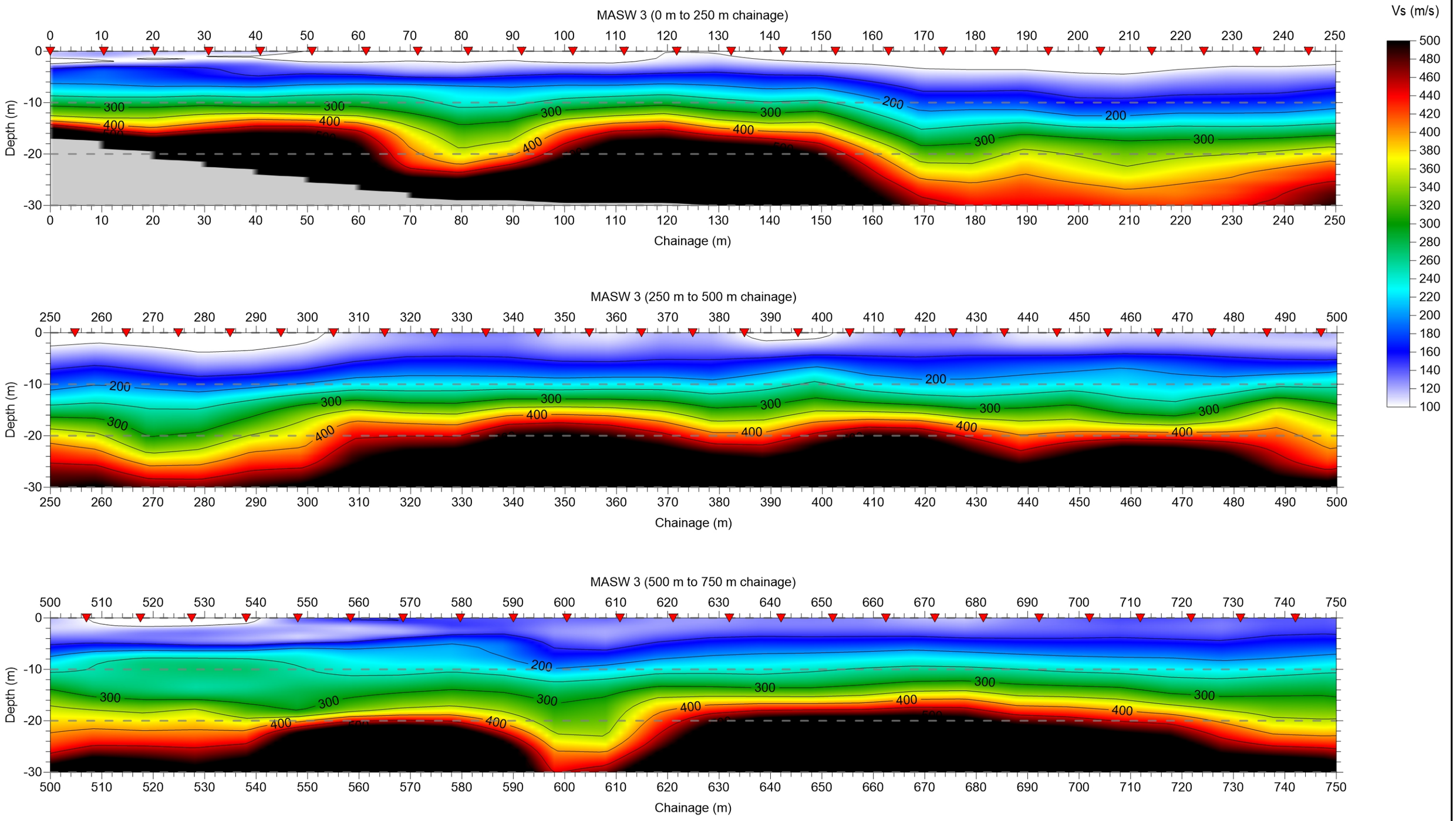
Surface position of MASW shot records (contours interpolated between data points)

No data (insufficient depth imaging with MASW)

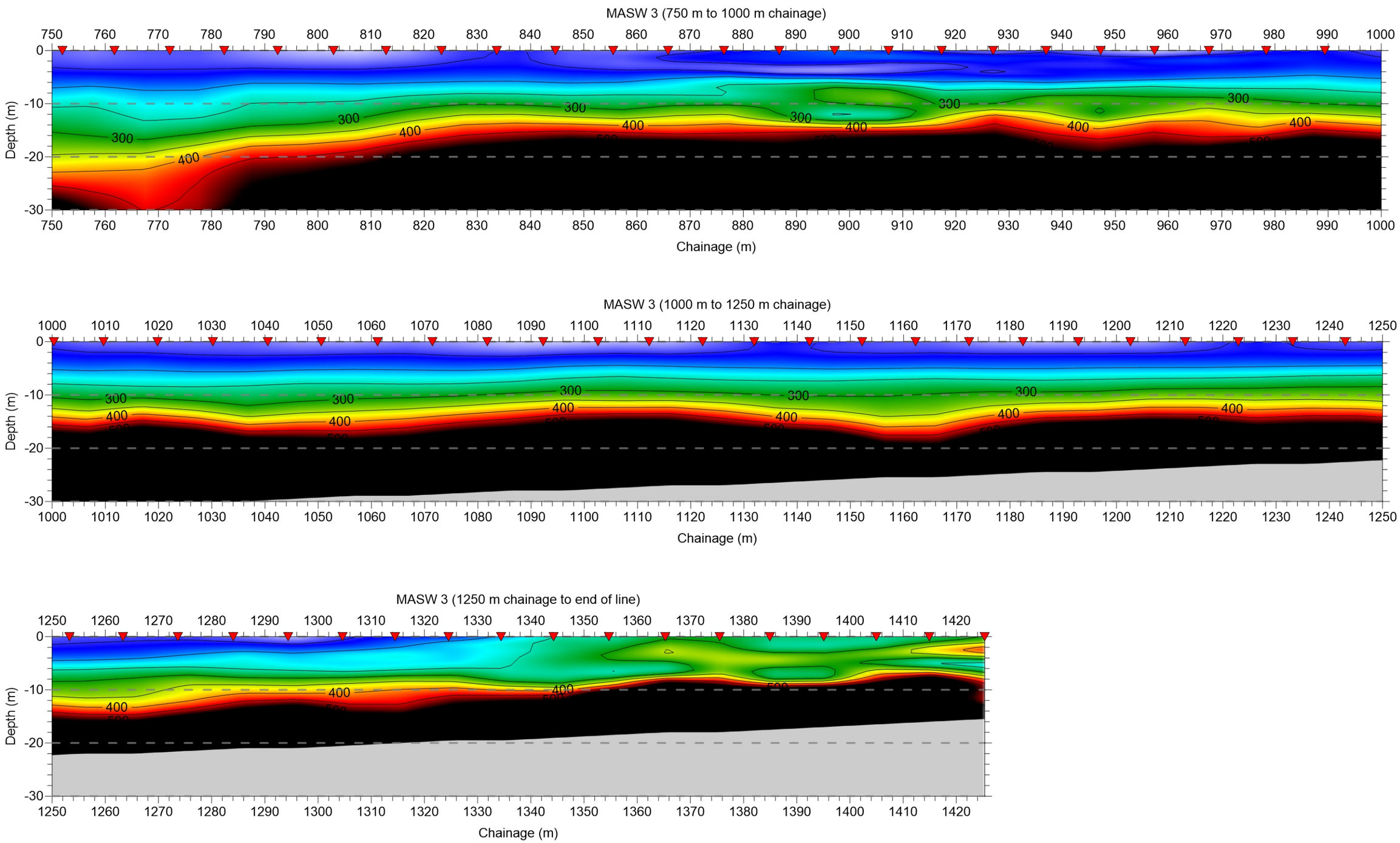
A3

Southern Geophysical Ltd

www.southerngeophysical.com



DRAWING- **Figure 5: MASW 3 (1:700 scaling ratio)**	NOTES MASW Vs profiles have contour intervals of 50 m/s (Vs).	▼ Surface position of MASW shot records (contours interpolated between data points)	**Southern Geophysical Ltd**
LOCATION- **1491 Springs Road, Lincoln**	See site map for location of points.	No data (insufficient depth imaging with MASW)	www.southerngeophysical.com
		A3	



DRAWING- **Figure 6: MASW 3 (1:700 scaling ratio)**	NOTES MASW Vs profiles have contour intervals of 50 m/s (Vs).	Surface position of MASW shot records (contours interpolated between data points)	**Southern Geophysical Ltd**
LOCATION- **1491 Springs Road, Lincoln**	See site map for location of points.	No data (insufficient depth imaging with MASW)	www.southerngeophysical.com
			A3

This page has been left intentionally blank

Appendix C

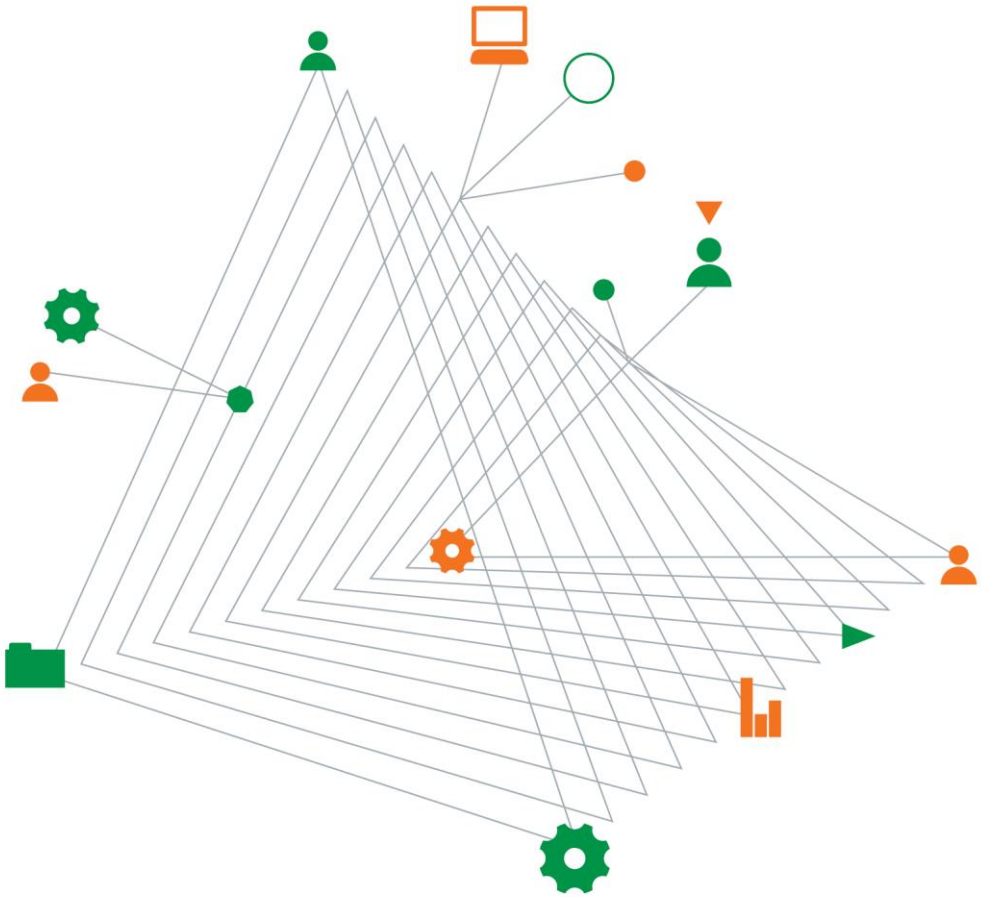
Preliminary Site Investigation (PSI) Report

Rolleston Industrial Developments Limited

Preliminary Site Investigation

1491 Springs Road, Lincoln

19 October 2020



Experience comes to life when it is powered by expertise

This page has been left intentionally blank

Preliminary Site Investigation - 1491 Springs Road, Lincoln

Prepared for
Rolleston Industrial Developments 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

Project Reviewer	Emma Waterhouse Principal Environmental & Social Consultant
Project Manager	Ray Mayor Project Environmental Engineer

19 October 2020

773-CHCGE280252

Quality information

Revision history

Revision	Description	Date	Originator	Reviewer	Approver
v0 draft	Original Draft	14/10/2020	Alistair Brown	Ray Mayor	David Tully

Distribution

Report Status	No. of copies	Format	Distributed to	Date
Final	1	PDF	Rolleston Industrial Developments Ltd	19/10/2020

Table of contents

Tables

Figures

Appendices

1. Introduction

Coffey Services (NZ) Limited (Coffey) has been commissioned by Rolleston Industrial Developments Ltd ('the client') to conduct a Preliminary Site Investigation (PSI) to support the proposed Plan Change and future subdivision for the property located at 1491 Springs Road, Lincoln (the "site", Figure 1).

The proposed Plan Change area comprises a series of land parcels located to the south of Lincoln, bordering the existing Te Whariki and Verdeco Park subdivisions.

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 objective 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 site is located approximately 2.5 km south-west of the central Lincoln township and approximately 20 km south-west of Christchurch's central business district.

The site is bordered by agricultural land-use in all directions with a stream running along the eastern boundary of the site. The site is irregular in shape with predominately flat topography. The details of the site are listed in Table 1.

Table 1: Site information

Address	Legal Description	Property Area (m^2)
1491 Springs Road, Lincoln	LOT 2 DP 494430 PT LOT 1 16247 LOTS 1-2 DP 5095 PT LOTS 1-3 DP 4157 LOT 8 DP 686 31 RS 38994 40021 PT RS 2951 PT RS 5844 PT RS 2456 PT RS 2933 BLK VIII LEESTON S D	1,781,300

2.2. Geology and hydrogeology

The geological map indicates that surface geology consists of OIS1 (Holocene) river deposits which is primarily described as modern river floodplain/low-level degradation tce. Unweathered, variably sorted gravel/sand/silt/clay surfaces <2 degree slope.

The nearest surface water body to the site is the L II River located on the eastern boundary of the site. This river flows in a general southerly direction eventually feeding into Lake Ellesmere approximately 10 km south of the site.

For further information, refer to Coffey's Geotechnical Assessment Report produced in October 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 9 October 2020 and noted that the site contained two HAIL activities identified as more likely than not to have occurred within the site. These HAIL activities are labelled as category G3 (landfill sites) and category G5 (waste disposal to land).

Three investigations were recorded within the Council records for the site, two preliminary site investigations in 2009 and 2011 as well as a detailed site investigation in 2011. These investigation reports were not made available during this PSI, however, due to the date of these investigations

being prior to the current NES regulations coming into effect in 2012, these reports are not considered suitable for use as supporting documentation for any resource consent applications.

2.3.2. Historical aerial photographs

Historical aerial photographs of the site and the surrounding area taken between 1942 and 2017 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 aerial photographs reviewed are included in Appendix A.

The site was in use as potential grazing or agricultural land from the initial 1942 historical aerial image with a single residential structure in the northern section of the site. The site has 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 9 October 2020. Photographs taken during the walkover are included in Appendix B.

Large sections of the site contained grassed areas and no areas of die-off or staining were noted during this walkover. A pit was located covered by hardfill aggregates and some burnt tree material. A series of structures containing general farm storage and equipment were located within the eastern section of the site as well as an above ground fuel storage tank.

An area of excavation can be seen in the central-northern off-site area. These works are not expected to have impacted on the site.

A conversation held with the previous site owner noted a borrow pit within the western section of the site, which it is understood has already had environmental reporting completed for it. This reporting was not available at the time of this investigation. The site owner also noted an offal pit / farm dump in the centre of the western area of the site. On-site observations confirmed the location of the offal pit / farm dump.

3. Summary

Coffey was contracted by the client to conduct a PSI for the property at 1491 Springs Road (the 'site', Figure 1). This investigation has been undertaken to confirm the suitability of the site for 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 and interview with the previous owner on the 9 October 2020.

On the basis of the information reviewed and collected, Coffey has identified a number of actual or potential HAIL activities to have occurred on-site as summarised in Table 2: Identified potential contamination source areas are shown on Figure 1.

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 **moderate** due to: • Relatively long period of use (since prior to 1943). • Likely use of non-environmentally persistent chemicals in the paddocks. • Potential down-gradient groundwater users.
	Storage of farm related chemicals	Site walkover observations	The considered risk potential to the underlying soil and groundwater is considered **low** due to: • Presence of concrete floors preventing any spilt/leaked chemical contacting with soil/water. • No evidence of spills or staining on floor.
Storage tanks or drums for fuel, chemicals or liquid waste (HAIL Category A17)	Bulk petrol storage	Site walkover observations	The risk potential to the underlying soil and groundwater is considered **moderate** due to: • Evidence of spills or staining on surrounding ground.
Landfill sites (HAIL Category G3)	Land filling activities	Environment Canterbury's LLUR	The risk potential to the underlying soil and groundwater is considered **low** due to: • No visible presence of large earthmoving in historical aerial photographs.
Waste disposal to land (HAIL Category G5)	Farm dump / offal pit	Environment Canterbury's LLUR, site walkover observations	The risk potential to the underlying soil and groundwater is considered **high** due to: • Known offal pit / farm dump. • Contents of the pit are unknown.

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.
- Ecosystems associated with springs and other water bodies within the boundaries of the site and immediately off-site to the east.

4. Recommendations

Due to the 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 and waterways associated with the identified potential sources of contamination are considered low to high (refer to Table 2 above), depending on the activity identified. However, 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 and remediated (if appropriate) and waste material and soils impacted by the presence of the offal pit / farm dump be removed during any future redevelopment works within the site.

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) and / or remediation works (i.e. remediation and validation of farm dumps / offal pits) being carried out prior to any earthworks and or building consents being granted.

Coffey recommends sampling is undertaken in the vicinity of the identified sources of contamination in addition to soil characterisation samples taken from grazing areas to create a detailed site investigation (DSI) prior to earthworks consent being granted to ensure elevated heavy metals and excessive use of fertilisers are not present. It is also recommended that all waste material and soils impacted by the presence of the offal pit / farm dump be removed during any redevelopment works within the site.

5. Limitations

The findings of this report should be read together with “Important Information ‘About Your Coffey Environmental Report’ (attached).

6. References

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.

Edbrooke S.W., Forsyth, P.J., and Jongens, R. **(2014).** Geological Map of New Zealand 1:250 000. Prepared by Edbrooke S.W., Forsyth, P.J., and Jongens, R. Lower Hutt, New Zealand. Institute of Geological and Nuclear Sciences Limited (GNS).

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

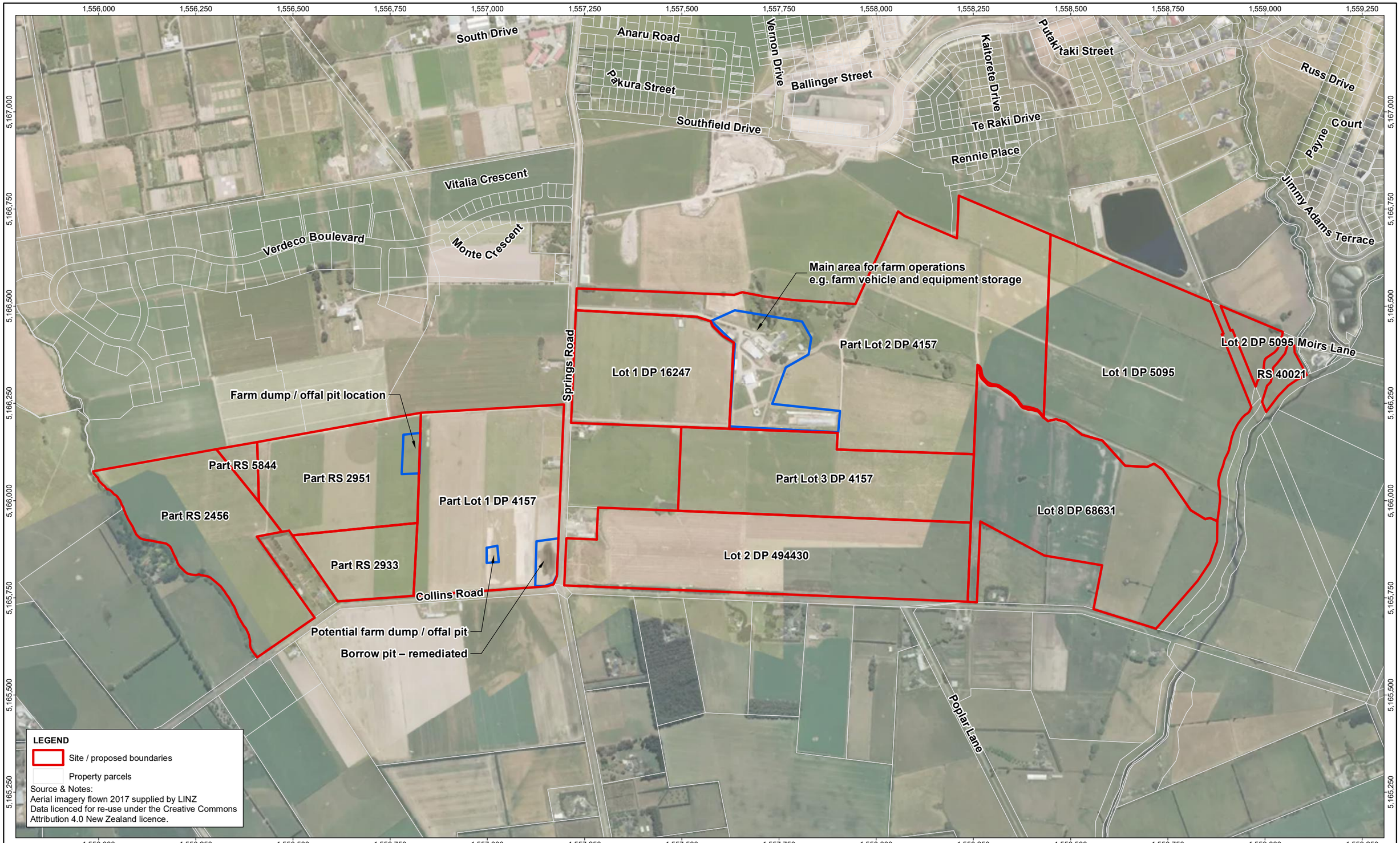
The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists or engineers based on their interpretation of field 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



revision no.	description	drawn	approved	date
A	ORIGINAL ISSUE	RZ	RM	14.10.20

0 100 200 300 400
SCALE 1:9,000 (A3) METRES

Projection: NZGD 2000 New Zealand Transverse Mercator

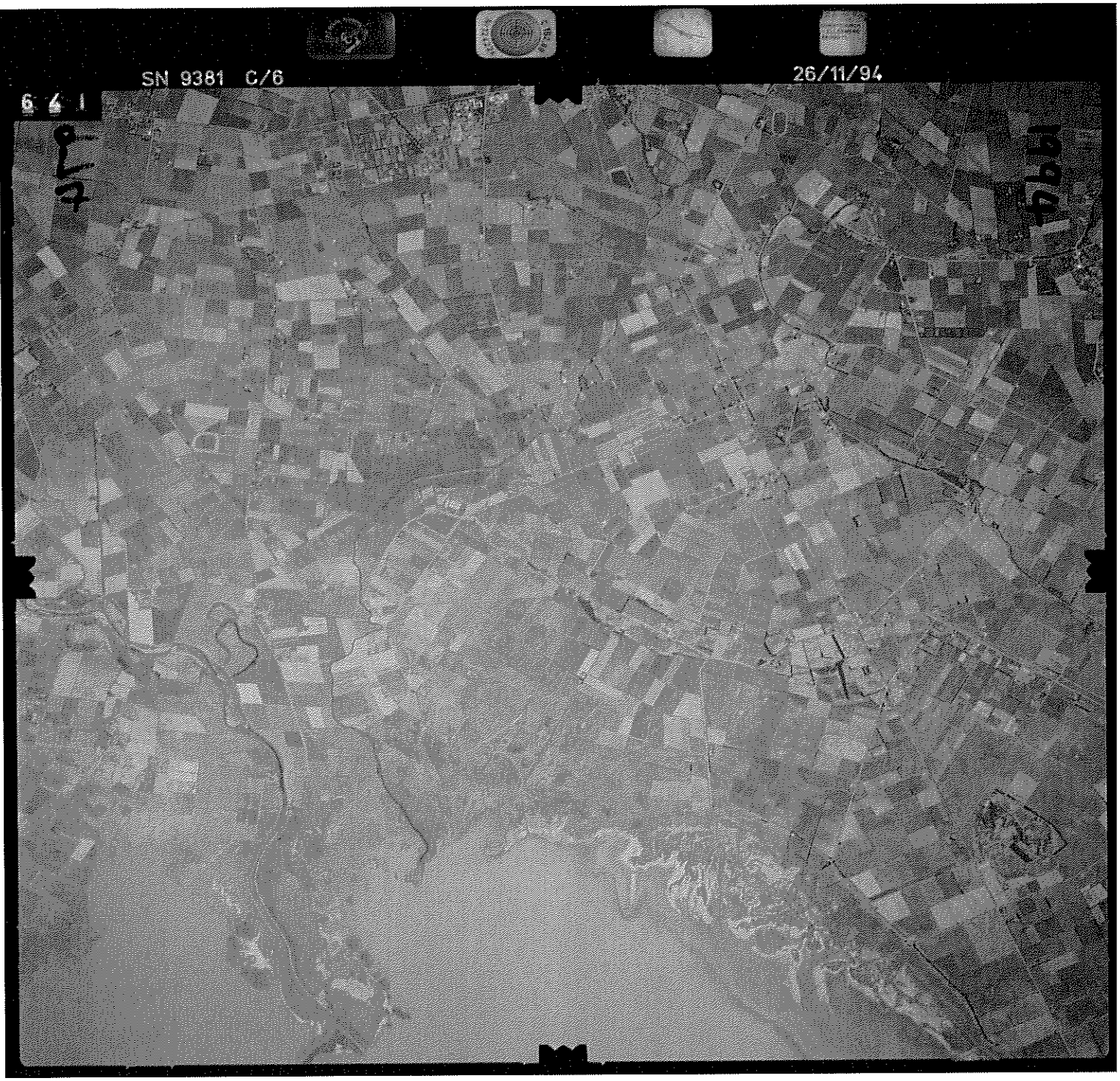
drawn	RZ
approved	RM
date	14.10.2020
scale	AS SHOWN
original size	A3

coffey
A TETRA TECH COMPANY

client:	ROLLESTON INDUSTRIAL DEVELOPMENTS LTD.
project:	1491 SPRINGS ROAD, LINCOLN, CHRISTCHURCH
title:	SITE PLAN
project no:	773-CHCGE280252
figure no:	01
rev:	A

MXD ref: SPRINGS_01_GIS002_1

Appendix A – Historical aerial photographs



canterbury maps

Canterbury Maps

2017

N

0 0.1 0.2 0.3 0.4 Kilometres

Scale 1:8,000 @A3

Map Created by Canterbury Maps on 15/10/2020 at 12:26 PM

Appendix B – Selected site photographs

Photograph 1: Potential farm dump / offal pit location showing general material and site cover.

Photograph 2: General site cover and land-use.

scale	drawn	AB	coffey	client:	Carter Group			
	approved	RM		project:	1491 Springs Road Preliminary Site Invsetigation			
	date	Oct-20		title:	Site photgraphs			
	scale	NTS		project no:	773-CHCGE280252	figure no:	1 of 3	rev:
	original size	A4						

Photograph 3: Known offal pit / farm dump within western section of the site.

Photograph 4: Raised above ground petrol tank. Minor staining observed.

scale	drawn	AB	coffey	client:	Carter Group			
	approved	RM		project:	1491 Springs Road Preliminary Site Invsetigation			
	date	Oct-20						
	scale	NTS		title:	Site photgraphs			
	original size	A4		project no:	773-CHCGE280252	figure no:	2 of 3	rev:

Photograph 5: General farm equipment and storage on hardfill.

Photograph 6: Farm vehicle and equipment storage on hardfill.

scale	drawn	AB	coffey	client:	Carter Group			
	approved	RM		project:	1491 Springs Road Preliminary Site Invsetigation			
	date	Oct-20		title:	Site photgraphs			
	scale	NTS		project no:	773-CHCGE280252	figure no:	3 of 3	rev:
	original size	A4						

This page has been left intentionally blank

Appendix D

Integrated Transport Assessment

novo group
Planning. Traffic. Development.

Integrated Transport Assessment

Prepared for

ROLLESTON INDUSTRIAL DEVELOPMENTS LTD

1491 Springs Road
Lincoln

October 2020

Integrated Transport Assessment
Prepared for

Rolleston Industrial Developments Ltd

1491 Springs Road
Lincoln

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

Document Date:	**29/10/2020**
Document Version/Status:	Revision B | FINAL
Project Reference:	021-028
Project Manager:	Jeremy Phillips, Director and Senior Planner
Prepared by:	Nick Fuller, Senior Transport Engineer
Reviewed by	Rhys Chesterman, Director and Traffic Engineer/Planner

Table of Contents

List of Figures and Tables

Appendices

Introduction

1. Rolleston Industrial Developments Ltd has commissioned Novo Group to prepare an Integrated Transport Assessment (ITA) for a Plan Change at 1491 Springs Road, south of Lincoln.

2. This report provides an assessment of the transport aspects of the proposed Plan Change. It also describes the transport environment in the vicinity of the site, 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, November 2010.

3. It is proposed to develop the site primarily for residential use, plus a small commercial zone is also proposed. It is anticipated that the site will accommodate up to 2,000 residential Lots. Primary vehicle access will be taken from Springs Road and it is proposed this will link through to Moirs Land and then Ellesmere Road. Secondary accesses will be provided to Collins Road, Liffey Springs Drive and potentially the internal road networks of the Te Whāriki and Verdeco Park subdivisions.

4. The site location (to the south of Lincoln) is illustrated in **Figure 1** and a copy of the proposed Outline Development Plan (ODP) is included in **Appendix 1**.

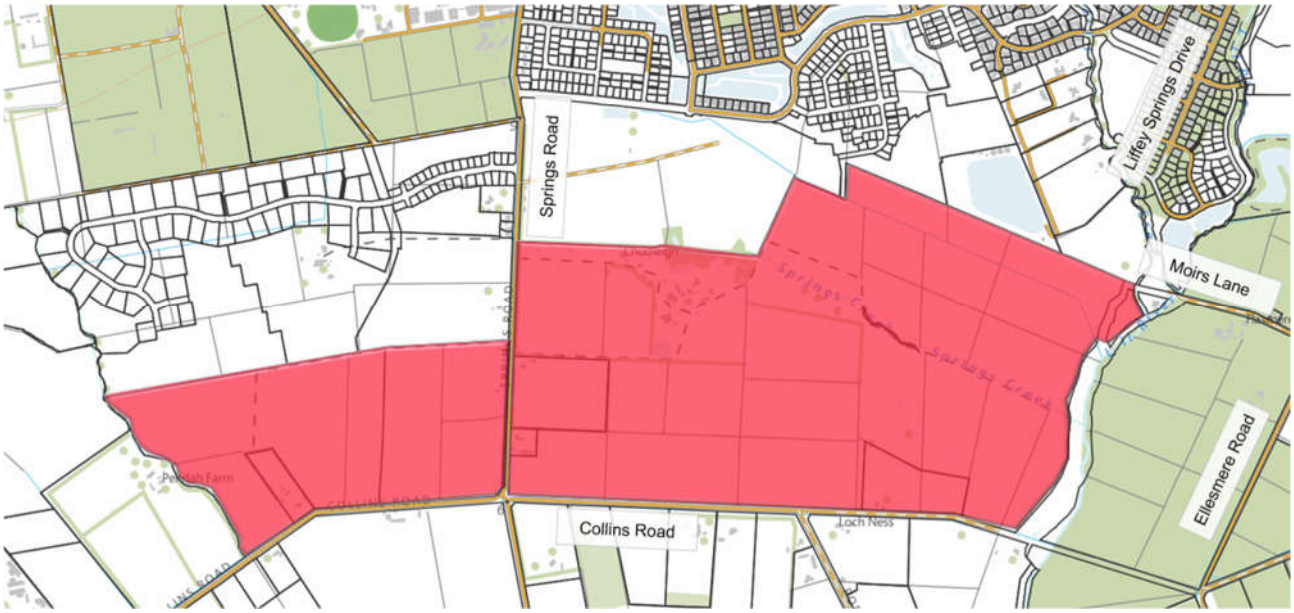


Figure 1: Site Location

Transport Environment

Road Links

Springs Road

5. **Table 1** sets out the transport details of Springs Road in the vicinity of the application site.

Table 1: Springs Road Details

Key Feature or Characteristic	Comment
Road Classification	Collector Road from Gerald Street to 800m north of Collins Road. Local Road south of this.
Cross-Section Description	6.2m sealed carriageway for the section outside the application site. The segments outside Verdeco Park and Te Whāriki are being upgraded to provide a 12.8m carriageway with footpaths on both sides. See **Figure 2** and **Figure 3** for images.
Traffic Volumes	1,531 vehicles per day[1].
Speed	60km/hr from south of the Verdeco Park access heading north. 100km/hr to the south of this.
Cycling Infrastructure	It is understood that the eastern footpath on Springs Road will be a shared path.
Pedestrian Infrastructure	Footpaths on both sides of the road where the carriageway has been upgraded. No footpaths in the rural sections of Springs Road.
Public Transport	None
Road Safety	One non-injury crash at the Springs Road / Anaru Road intersection where a driver u-turning on Springs Road hit a vehicle as they failed to check the road was clear.

Figure 2: Springs Road (Urbanised Area)

Figure 3: Springs Road (Rural Area)

[1] From the Mobile Road website.

Collins Road

6. **Table 2** sets out the transport details of Collins Road in the vicinity of the application site.

Table 2: Collins Road Details

Key Feature or Characteristic	Comment
Road Classification	Local Road.
Cross-Section Description	The section west of Springs Road has a 6m sealed carriageway. The section east of Springs Road has a 6.2m wide sealed carriageway for approximately 935m and then is a 4.2m wide metalled road for a further 540m before terminating.
Traffic Volumes	740 vehicles per day[2] west of Springs Road and 85 vehicles per day east of Springs Road.
Speed	100km/hr.
Cycling, Pedestrian and Public Transport Infrastructure	None
Road Safety	One non-injury crash at the intersection with Springs Road, where a drive lost control after negotiating the bend.

Figure 4: Collins Road West of Springs Road

Figure 5: Collins Road East of Springs Road

[2] From the Mobile Road website.

Ellesmere Road

7. **Table 3** sets out the transport details of Ellesmere Road in the vicinity of the application site.

Table 3: Ellesmere Road Details

Key Feature or Characteristic	Comment
Road Classification	Local Road south of Edward Street and Arterial Road north of Edward Street.
Cross-Section Description	The section south of Edward Street has a 6m sealed carriageway and grass berms beyond this.
Traffic Volumes	1,968 vehicles per day[3] south of Edward Street and 81 to 110 vehicles per hour in the peak hours.
Speed	80km/hr.
Cycling, Pedestrian and Public Transport Infrastructure	None
Road Safety	No crashes have been reported in the most recent five-year period available.

Moirs Lane

8. **Table 4** sets out the transport details of Moirs Lane in the vicinity of the application site.

Table 4: Moirs Lane Details

Key Feature or Characteristic	Comment
Road Classification	Local Road.
Cross-Section Description	This road is sealed for a length of approximately 50m from the stop-controlled intersection with Ellesmere Road. The carriageway is approximately 6.4m wide. This is then a 3.7m wide metalled track to the west of this.
Traffic Volumes	Estimated a 40 vehicles per day and four vehicles per hour based on this road currently serving four residential properties.
Speed	100km/hr.
Cycling, Pedestrian and Public Transport Infrastructure	Provides a cycle connection to the Little River Cycle Route, which crosses Ellesmere Road at the intersection with Moirs Lane.
Road Safety	No crashes have been reported in the most recent five-year period available.

[3] From the Mobile Road website.

Key Intersections

Springs Road / Ellesmere Junction Road / Gerald Street Roundabout

9. This intersection is a four-arm roundabout, as illustrated in **Figure 6**. Traffic counts were undertaken at this intersection from 07:00 to 09:00 and 16:00 to 18:00 on Thursday 15th October 2020. The peak hour traffic volumes are contained on the traffic diagrams in **Appendix 2**.

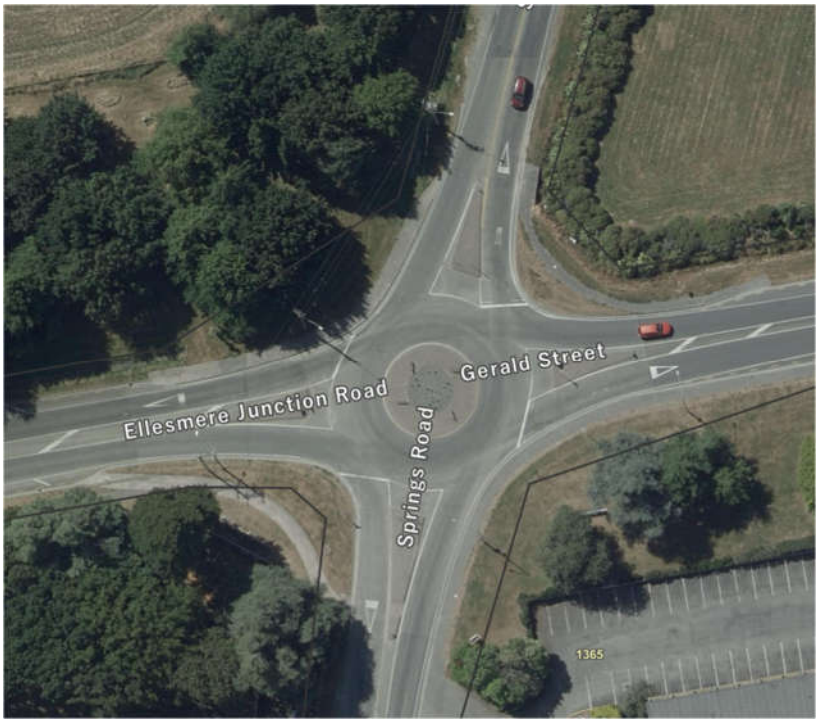


Figure 6: Springs Road / Ellesmere Junction Road / Gerald Street Roundabout

10. A SIDRA model has been created of this intersection to identify the existing traffic capacity. The results of this intersection model are included in **Appendix 3**. As a broad summary, the model results indicate that:

    i. The intersection operates satisfactorily in the AM peak hour, with an overall Level of Service of B[4]. Similarly, the worst Level of Service for any turning movement is C. The degrees of saturation are also considered to be within acceptable limits[5]; and

    ii. The intersection operates satisfactorily in the PM peak hour, again with an overall Level of Service of B. Similarly, the worst Level of Service for any turning movement is C. The degrees of saturation are also considered to be within acceptable limits.

11. The Selwyn District Council Long Term Plan commits funding to the upgrading of this intersection to traffic signals between 2018 to 2028. However, we understand that funding is being reviewed by the Council and this signalisation project may be pushed further into the future.

[4] Where Level of Service A is considered excellent, E is considered to be at capacity and F is over-capacity.
[5] A practical limit for degree of saturation on non-signalised intersections is considered to 0.85, as large queues and delays can occur above this value.

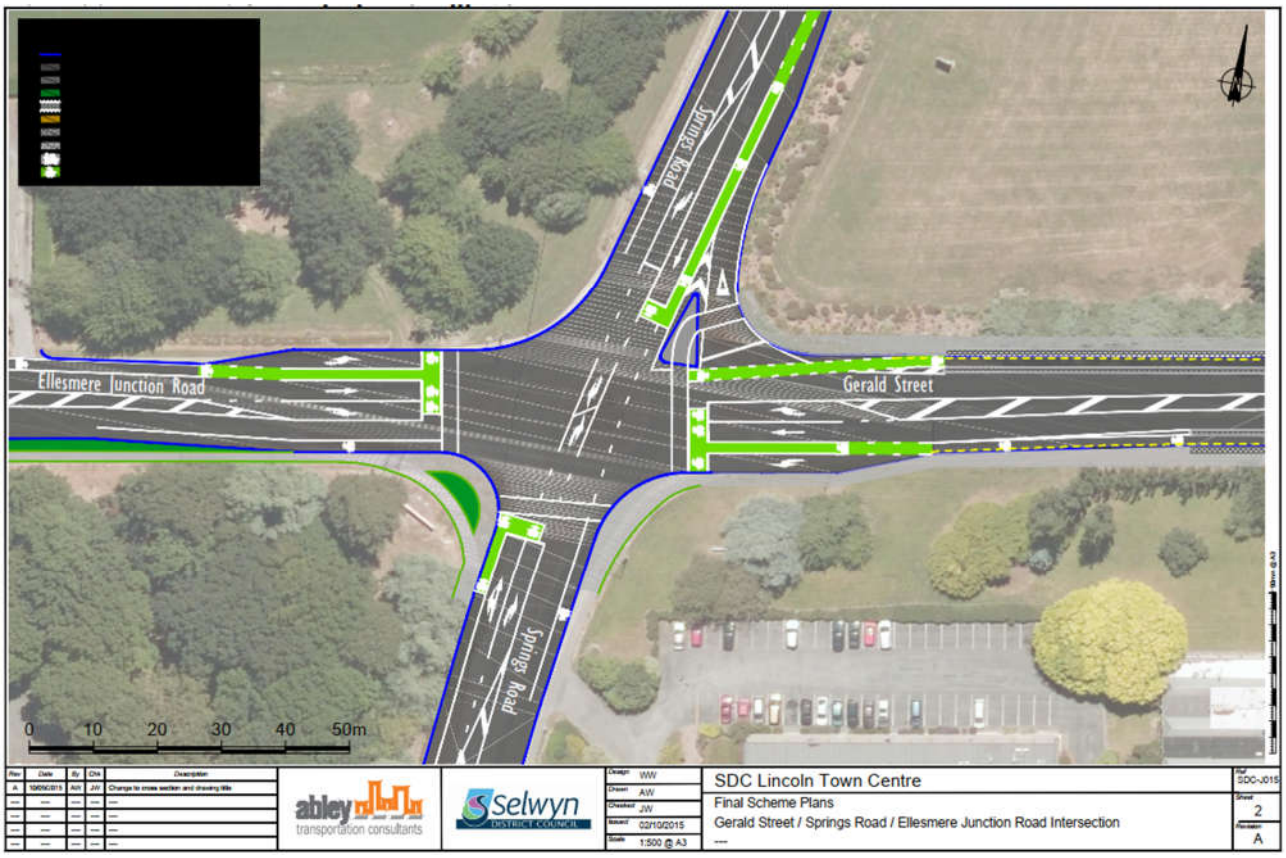


Figure 7: Springs Road / Ellesmere Junction Road / Gerald Street Intersection – Council Upgrade

12. The NZ Transport Agency Crash Analysis System (CAS) has been reviewed to identify crashes that have been reported within 100m of the Springs Road / Ellesmere Junction Road / Gerald Street roundabout in the most recent five-year period available. **Figure 8** is the collision diagram at this intersection.

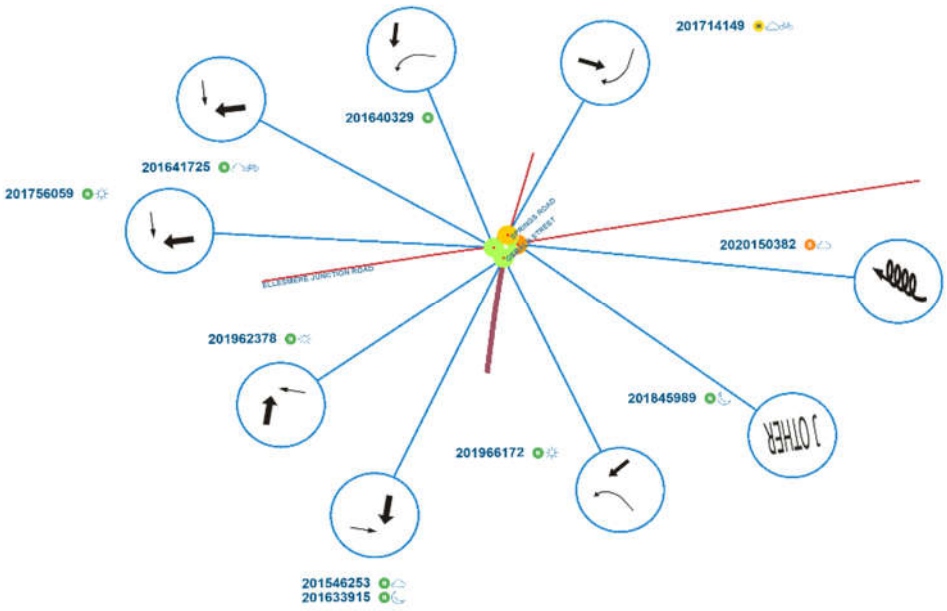


Figure 8: Springs Road / Ellesmere Junction Road / Gerald Street Roundabout Collision Diagram

13. Ten crashes were reported at this intersection, including one severe injury crash, one minor injury crash and eight non-injury crashes. These crashes are summarised as follows:

    i. A serious injury crash where a driver evading police lost control and hit a power pole;

    ii. A minor injury crash and non-injury crash where a southbound driver on Springs Road entered the roundabout and hit a cyclist that was circulating;

    iii. Three non-injury crashes where a southbound vehicle (on Springs Road) failed to give-way to circulating traffic (alcohol was a contributing factor in one of these crashes);

    iv. A non-injury crash where a westbound vehicle (on Gerald Street) failed to give-way to circulating traffic and crashed; and

    v. Three non-injury crashes where a northbound vehicle (on Springs Road) failed to give-way to circulating traffic.

Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Intersection

14. This is a four arm priority controlled intersection, with the northern and southern arms both being stop-controlled (both Ellesmere Road approaches), as illustrated in **Figure 9**.

Figure 9: Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Intersection

15. Traffic counts were undertaken at this intersection from 07:00 to 09:00 and 16:00 to 18:00 on Tuesday 20th October 2020. The peak hour traffic volumes are contained on the traffic diagrams in **Appendix 4**. It is noted that the dominant traffic flows at the intersection are the left turn from Edward Street to Ellesmere Road north and vice versa. This indicates that Ellesmere Road is being used as a route to / from Christchurch by residents of Lincoln.

16. A SIDRA model has been created of this intersection to identify the existing traffic capacity. The results of this intersection model are included in **Appendix 5**. As a broad summary, the model results indicate that:

    i. The intersection operates satisfactorily in the AM peak hour. The worst Level of Service for any turning movement is B. The degrees of saturation are also considered to be within acceptable limits; and

    ii. The intersection operates satisfactorily in the PM peak hour. Again, the worst Level of Service for any turning movement is B. The degrees of saturation are also considered to be within acceptable limits.

17. The Selwyn District Council Long Term Plan includes upgrading this intersection to a roundabout between 2018 to 2028.

18. The NZTA CAS database has been reviewed to identify crashes that have been reported within 100m of the Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection within the most recent five-year period available. This indicated two non-injury crashes, as per the following collision diagram.

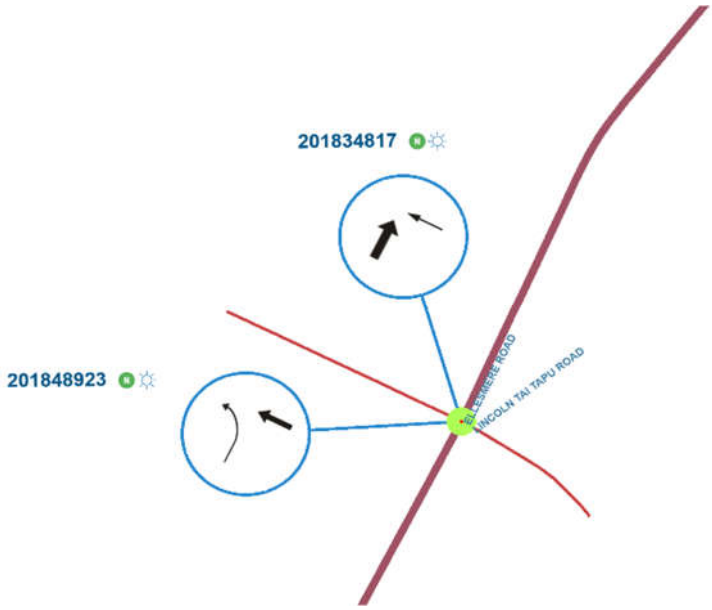


Figure 10: Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Collision Diagram

19. The above crashes both occurred when northbound vehicles on Ellesmere Road failed to give-way to westbound traffic on Lincoln Tai Tapu Road.

Adjacent Subdivisions

Verdeco Park

20. The Verdeco Park subdivision is located on the western side of Springs Road to the north of the application site, as illustrated in **Figure 11**.

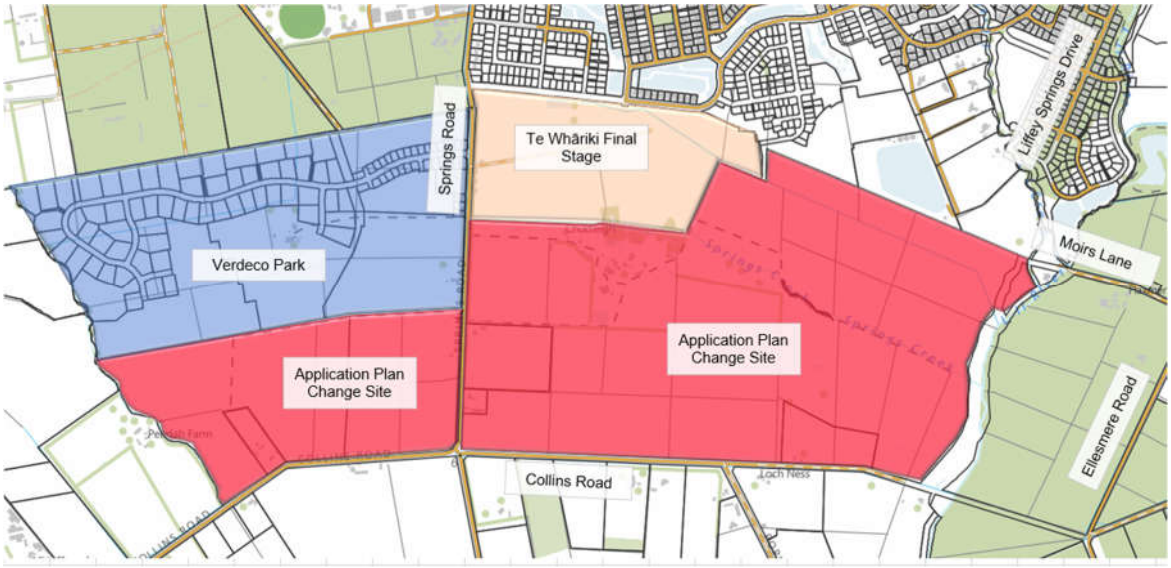


Figure 11: Adjacent Subdivisions

21. This subdivision is understood to comprise 225 sections, of which approximately 22 appeared to be constructed and occupied at the time of writing this report. The ODP for this site includes links for a potential bypass that connects to Ellesmere Junction Road via Weedons Road. The potential bypass route is consistent with that sought in the Lincoln Structure Plan[6] (see **Figure 12**) and is highlighted in **Figure 13**[7].

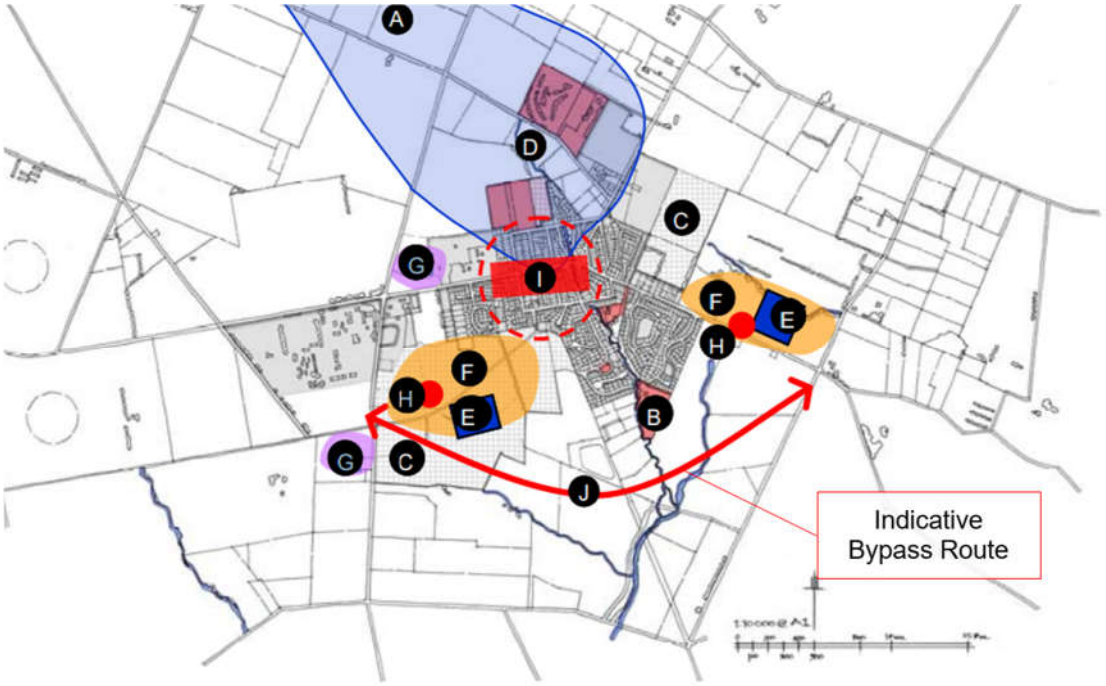


Figure 12: Extract of Lincoln Structure Plan

[6] *Lincoln Structure Plan* by Selwyn District Council dated May 2008.
[7] Extract from Outline Development Plan Area 5 in Township Appendix E37 of the Operative Selwyn District Plan.

Figure 13: Verdeco Park ODP & Bypass Route

Te Whāriki

22. It is understood that the Te Whāriki subdivision will be in the order of 1,200 residential Lots when complete, although it is currently approximately 80% complete. This subdivision has access to Springs Road and Gerald Street via Vernon Drive and West Belt. Southfield Drive also links to Edward Street opposite Eastfield Drive.

23. The ODP for this site also includes a potential bypass route that would continue the segment from Verdeco Park. This is illustrated in **Figure 14**[8]. However, that route stops at the eastern boundary of the subdivision and is unable to complete the bypass route.

[8] Extract from Outline Development Plan Area 1 in Township Appendix E37 of the Operative Selwyn District Plan.

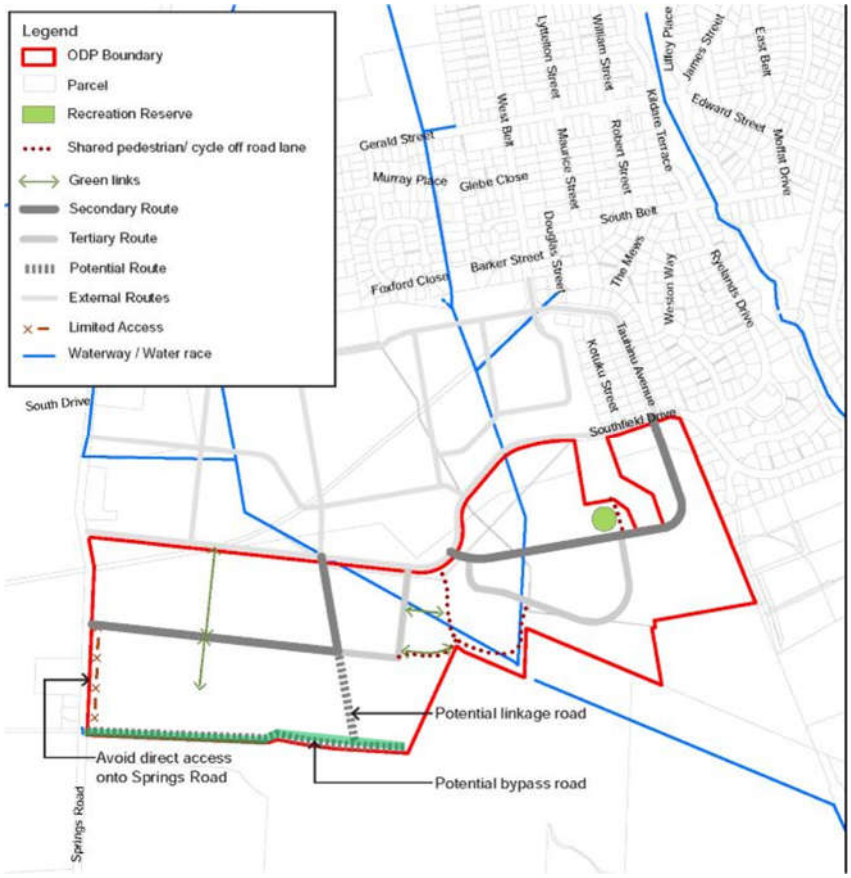


Figure 14: Te Whāriki ODP & Bypass Route

The Proposal

24. The proposed Plan Change would enable up to 2,000 residential lots and a small commercial zone to be established at the application site. A copy of the ODP is included in **Figure 15** and included in more detail in **Appendix 1**.

25. The following sets out the transport details of the proposed Plan Change.

26. 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.

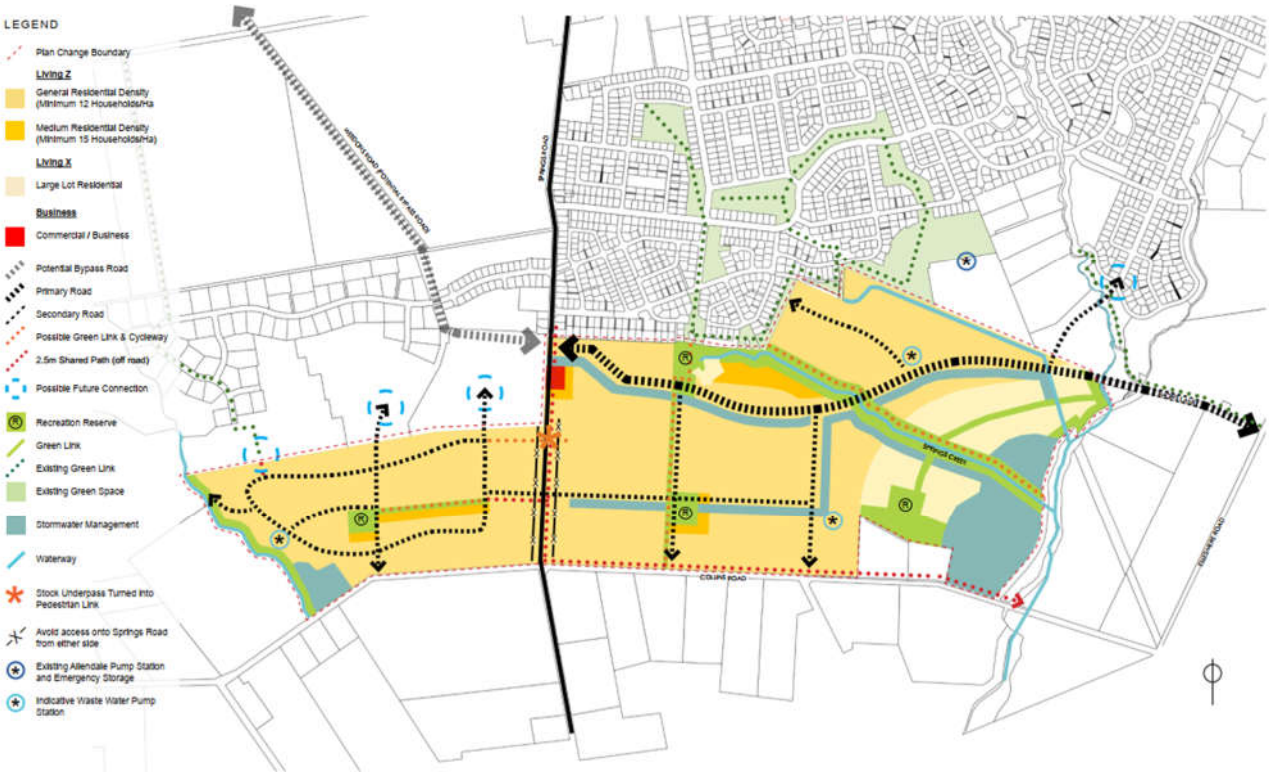


Figure 15: Proposed ODP Layout

Site Layout

Access Intersections

27. The proposed ODP enables the connection of the proposed Lincoln bypass through the site, linking to Ellesmere Road. It is noted that the subdivision layout anticipated for the Te Whāriki subdivision does not include this link, so the Plan Change would contribute to the provision of the bypass in a manner that might not otherwise be achieved.

28. The two Plan Change intersections with Springs Road are anticipated to be roundabouts. These will be designed at a later stage when it is understood whether the potential bypass would be completed and when the traffic volumes associated with this are known. This potential bypass intersection is closer than 151m from proposed Te Whāriki Stage 4 intersection, with approximately 100m spacing from centre to centre in a 60km/hr zone.

29. The Moirs Lane / Ellesmere Road intersection will also require upgrading. These roads are proposed to be upgraded and the intersection will need to tie in with the new cross-sections, with Ellesmere Road continuing to have the priority in the short-term. However, the predominant traffic volumes will be to / from Moirs Lane, so there would be value in realigning the priorities as part of completing the bypass route.

30. The three intersections with Collins Road are proposed to be priority-controlled T-intersections. The need for a right turn bay or other intersection treatments will be determined at subdivision stage, although there is sufficient space to accommodate upgrades in these locations.

31. The 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, or on the outside of bend (in the case of the western Collins Road intersection).

32. No direct access is proposed to Springs Road, as is consistent with the other subdivisions in this area. Direct access is proposed to Collins Road to assist with the subdivision integrating with the existing area.

Potential Access Links

33. Potential traffic access links are indicated to Verdeco Park, Te Whāriki and Liffey Springs Road on the ODP. These links are intended to assist with permeability and connectivity fo the subdivision. That said, provision of these links is outside of the control of the Plan Change as they all rely on third party land.

Road Standards

34. 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 bypass route would be constructed as a Collector Road, with the remainder of roads identified on the ODP being constructed as either Local Major or Local Intermediate roads.

Pedestrian & Cycle Links

35. The existing 2.5m shared path on the eastern side of Springs Road will be continued to Collins Road. This will then extend east along Collins Road to the boundary of the subdivision.

36. Greenlink connections are provided within Outline Development Plan area. These also include links to the Greenlinks in Verdeco Park and Te Whāriki to provide a connected and continuous facility.

Off-Site Transport Improvements

Springs Road / Ellesmere Junction Road / Gerald Street Intersection

37. As will be described later in this report, it is proposed to provide a further of the planned and funded improvements to the Springs Road / Ellesmere Junction Road / Gerald Street Intersection to better accommodate the predicted traffic generated this Plan Change, as well as the existing volumes on the network. The form of upgrade is anticipated to be dependent on whether the bypass route is constructed. The form of upgrade will be discussed in greater detail at paragraph 70.

Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Intersection

38. The Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection is not anticipated to require upgrading as a result of this Plan Change. However, there would be benefits in undertaking this upgrade and development contributions would be able to bring forward the Council's roundabout proposal.

Springs Road

39. It is proposed to upgrade Springs Road along the Plan Change boundary to provide a 60km/hr Collector Road consistent with that being provided by the existing subdivisions.

Collins Road

40. It is proposed to upgrade Collins Road along the Plan Change boundary to the District Plan standard for a 60km/hr Local Road.

Moirs Lane

41. Moirs Lane will be upgraded to a 50km/hr Collector Road consistent with the requirements of the requirements of the District Plan where sufficient width is available. It is noted that the road corridor of Moirs Lane varies between approximately 18m (toward the western end) and 13.5m (at the intersection with Ellesmere Road. This means compromises in cross-section will be required.

42. Given the above, the minimum proposed will be a 7.0m carriageway with minimum 1.5m sealed shoulders on both sides. The northern side of the road will need to incorporate the Little River Rail Trail as an off-road facility.

Ellesmere Road

43. Ellesmere Road is proposed to remain an 80km/hr rural road with shoulders. No footpath or cycle facilities are proposed as these users are anticipated to use alternate routes. The exception to this is the provision of a safe crossing facility for the existing Little River Rail Trail.

44. The proposed cross-section for this road is discussed further at paragraph 81.

Traffic Generation & Distribution

Traffic Generation

45. The traffic generation of residential activities is typically based on an 85th percentile rate of 0.9 vehicles per dwelling in the peak hours and 8.2 vehicles per dwelling per day[9]. However, it is considered that the location of the Plan Change site may lead to spreading of traffic generation, with some vehicles leaving early to commute to Rolleston and Christchurch, whilst other leave later having dropped children at school in Lincoln.

46. The TRICS database has been reviewed to identify the traffic generation of villages in the UK. This is considered to be a reasonable proxy for Lincoln given there are local facilities provided, but the majority of employment will be further afield. The TRICS data is contained in **Appendix 6**. This indicates traffic generation rates of between 0.53 and 0.55 vehicles per dwelling per hour in the peaks and 4.88 vehicles per dwelling per day.

47. **Table 5** sets out the assumed traffic generation rates of residential activity in Lincoln, which is considered to be a balance between the two data sources. This assumes a rate of 0.7 vehicles per dwelling per hour, to acknowledge that the traffic generation may not be as low as the UK sourced data.

[9] Based on Outer Suburban dwellings in the NZTA Research Report 453 – *Trips and Parking Related to Land Use*.

Table 5: Assumed Residential Traffic Generation Rates

Time Period	Arrivals	Departures	Total
AM Peak Hour	0.175	0.525	0.7
PM Peak Hour	0.441	0.259	0.7
Daily	3.5	3.5	7.0

48. Furthermore, it has been assumed that traffic associated with the commercial area would not generate noticeable volumes to the external transport network. The intention of these areas is that they would be internal only, attracting pass-by traffic on the way to / from work. These facilities are also intended to reduce the distance to small scale shopping opportunities (such as to a dairy) to encourage walking and cycling, rather than driving further for the same facilities.

49. The following tables set out the predicted traffic generation associated with the Plan Change site, as well as Verdeco Park and the remainder of Te Whāriki. This uses the traffic generation rates set out in **Table 5**.

Table 6: Plan Change Traffic Generation – 2,000 Lots

Time Period	Arrivals	Departures	Total
AM Peak Hour	350	1,050	1,400
PM Peak Hour	882	518	1,400
Daily	7,000	7,000	14,000

Table 7: Verdeco Park Traffic Generation – 203 Lots

Time Period	Arrivals	Departures	Total
AM Peak Hour	36	107	142
PM Peak Hour	90	53	142
Daily	711	711	1,421

Table 8: Te Whāriki Traffic Generation – 240 Lots

Time Period	Arrivals	Departures	Total
AM Peak Hour	42	126	168
PM Peak Hour	106	62	168
Daily	840	840	1,680

Distribution

50. The Distribution of traffic to the wider transport network has been based on Census data for Journey to Work of people living in Lincoln. This also assumes that vehicles would use predominantly Shands Road to access the Christchurch Southern Motorway, as this route avoids Prebbleton and has good access to the State highway interchange.

51. **Table 9** sets out the distribution of traffic on the wider road network (on the basis that it all leaves Lincoln). This is based on assumptions regarding the quickest route to get to the various locations based on the surrounding road network

Table 9: Wider Area Distribution

Location	Percentage
Shands Road (to / from north)	43%
Springs Road (to / from north)	19%
Ellesmere Junction Road (to / from west)	11%
Ellesmere Road (to / from north and east)	26%
Collins Road (to / from south and west)	1%
Total	***100%***

52. The traffic from Verdeco Park and Te Whāriki has been added to the key intersections as included in **Appendix 2** (Springs Road / Ellesmere Junction Road / Gerald Street Roundabout) and **Appendix 4** (Ellesmere Road / Edward Street / Lincoln Tai Tapu Road). This has then been added to the existing traffic volumes to create future baseline traffic volumes. These are the volumes that will be used to determine the baseline operation of these intersections (prior to accounting for the proposed Plan Change) in the following sections.

53. The traffic generation from the proposed Plan Change has also been added to the key intersections, as included in **Appendix 2** and **Appendix 4**. These are the volumes that will be used to determine the intersection operation with the proposed Plan Change in place in the following sections.

Assessment of Effects

54. 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.

55. The above matters are assessed in turn in the following sections.

Parking & Loading

56. 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

Site Accesses

57. The engineering details of the proposed access arrangements are yet to be determined, although it is considered there will be sufficient space to accommodate satisfactory intersections. The intersections will be designed to comply with relevant design standards, including sight line requirements. These will also be subject to road safety audit requirements to confirm they are anticipated to operate safely.

58. The passing volumes on Springs Road and Collins Road are considered to be sufficiently low that the access intersections can be designed that will accommodate the predicted traffic volumes.

59. The only anticipated non-compliance for the access arrangements is with regard to the proposed northern Springs Road access, which will be approximately 100m from the proposed southern intersection to Te Whāriki. That southern Te Whāriki intersection will primarily accommodate traffic coming to / from the north of the proposed subdivision, so these volumes are unlikely to interact with the proposed Plan Change intersection.

60. Overall, it is considered that satisfactory intersections to accommodate access can be designed and constructed.

Internal Access Roads

61. 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.

62. 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.

63. The above is considered to be sufficient to confirm that the internal transport network will be safe and efficient.

Wider Effects

Springs Road / Ellesmere Junction Road / Gerald Street Roundabout

Existing Intersection Arrangement

64. The base traffic model of the Springs Road / Ellesmere Junction Road / Gerald Street roundabout has been updated with the Baseline traffic volumes, which account for the yet to be completed Verdeco Park and Te Whāriki subdivisions. The results of this model are included in **Appendix 7** and these indicate that:

    i. The intersection operates satisfactorily in the AM peak hour, with an overall Level of Service of B. The worst Level of Service for any turning movement is C. However, the degree of saturation for the Springs Road northern approach is at 0.86, which is over the practical capacity threshold of 0.85 and indicates that this approach is likely to incur significant delays and queuing with small changes to the traffic volumes; and

    ii. The intersection operates satisfactorily in the PM peak hour, with an overall Level of Service of B. The worst Level of Service for any turning movement is D, which occurs on the Springs Road northern approach. However, the degree of saturation for the Springs Road northern approach is at 0.879, which is again over the practical capacity threshold of 0.85.

65. The above indicates that the existing intersection is effectively at capacity (or slightly over-capacity) with the completion of the existing subdivisions on Springs Road.

66. The Plan Change traffic has been added to the roundabout model and these results are included in **Appendix 8**. These results indicate that:

    i. The intersection is over-capacity in the AM peak hour, with an overall Level of Service of F. The worst Levels of Service are on the Springs Road north and south approaches. The degree of saturation for the Springs Road north and south approaches at 1.296 and 1.393 respectively, meaning these approaches are unable to accommodate the predicted traffic volumes and extensive queueing and delays are predicted; and

    ii. The intersection is over-capacity in the PM peak hour, with an overall Level of Service of F. The worst Levels of Service are on the Springs Road north and south approaches, as well as Ellesmere Junction Road. The degree of saturation for these approaches is between 1.131 and 1.522, meaning these approaches are again unable to accommodate the predicted traffic volumes and extensive queueing and delays are predicted.

67. Given the above, it is apparent that the existing roundabout cannot accommodate the predicted traffic volumes and an intersection upgrade will be required.

Council Intersection Arrangement

68. The Council's proposed signalised intersection arrangement has been modelled, using the traffic volumes that include the proposed Plan Change traffic. This is to determine whether the currently planned and funded intersection could accommodate the Plan Change traffic. The results of this model are included in **Appendix 9**, which indicate:

    i. The intersection is over-capacity in the AM peak hour, with an overall Level of Service of F. The worst Levels of Service are on the Springs Road north, Gerald Street and Ellesmere Junction Road

approaches. The degree of saturation for the for all approaches is between 1.194 and 1.590, meaning these approaches are unable to accommodate the predicted traffic volumes and extensive queueing and delays are predicted; and

ii. The intersection is over-capacity in the PM peak hour, with an overall Level of Service of F. The worst Levels of Service are on the Springs Road north, Gerald Street and Ellesmere Junction Road approaches. The degree of saturation for the for these approaches is between 1.460 and 1.502, meaning these approaches are unable to accommodate the predicted traffic volumes and extensive queueing and delays are predicted.

69. Given the above results, it is apparent that further improvements to this proposed intersection upgrade would be required. That said, the final form of that upgrade is likely to be dependent on whether the Lincoln bypass is constructed, as this will reduce the traffic through the Springs Road / Ellesmere Junction Road / Gerald Street intersection. It is noted that the proposed Plan Change would contribute a significant element to that bypass in so far as to provides the connection from Springs Road through to Ellesmere Road.

Potential Intersection Arrangement

70. **Figure 16** is a concept arrangement to understand whether an intersection upgrade could be constructed that would lead to the Springs Road / Ellesmere Junction Road / Gerald Street intersection operating satisfactorily.

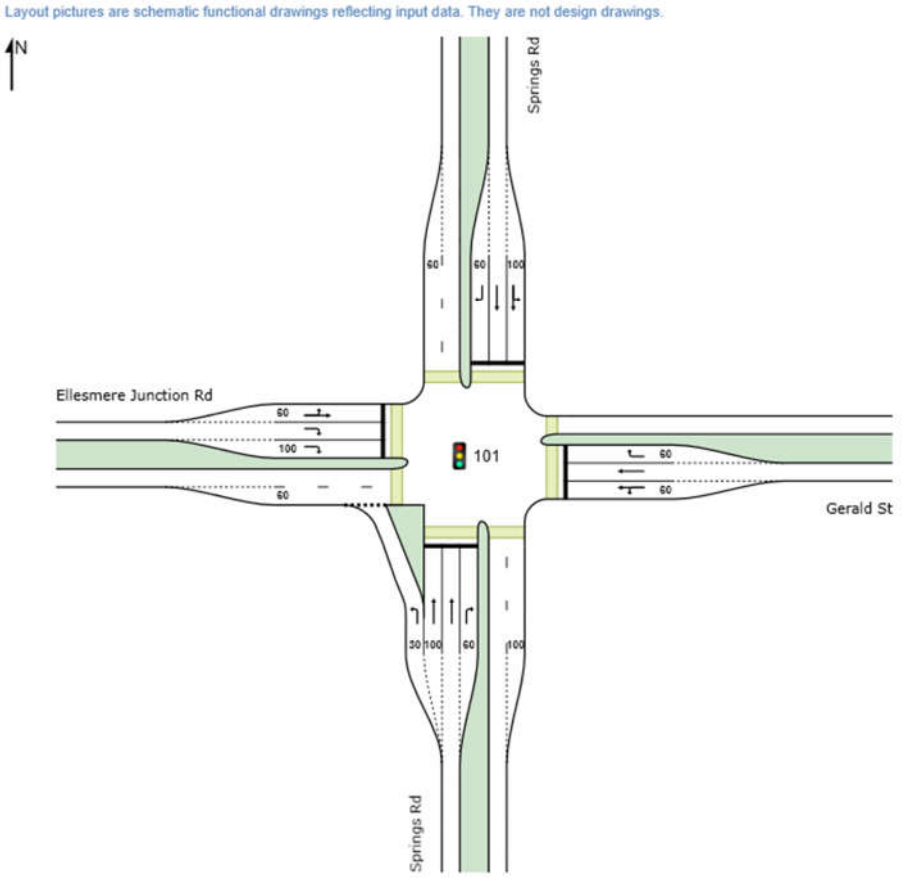


Figure 16: Springs Rd / Ellesmere Junction Rd / Gerald St – Concept Traffic Signals

71. It should be noted that the above intersection arrangement is conceptual only and the proposed arrangement would extend beyond the existing road reserve, as does the currently planned intersection upgrade for this intersection. However, this has been used as the basis of intersection modelling to understand whether a solution to the traffic capacity constraint at this location could be developed.

72. Traffic modelling results of the above intersection arrangement with the Plan Change traffic added to the network are included in **Appendix 10**. These indicate:

    i. The intersection operates satisfactorily in the AM peak hour, with an overall Level of Service of D. The worst Level of Service for any turning movement is E, which occurs on the right turns from Springs Road and Gerald Street. The degrees of saturation are less than 0.9, which is considered to be practical limit for traffic signal intersections; and

    ii. The intersection operates satisfactorily in the PM peak hour, with an overall Level of Service of D. The worst Level of Service for any turning movement is E, which occurs on the right turns from Springs Road and Gerald Street. The degrees of saturation are again less than 0.9.

73. The above confirms that a traffic signal intersection could be constructed at this location that would have sufficient capacity to accommodate the predicted traffic volumes from this intersection. The form, timing and contribution to the construction of the upgrade will need to be agreed with the Council, in conjunction with other stakeholders. It is anticipated that this upgrade would be required from early occupation of this Plan Change given the roundabout is predicted to be slightly over-capacity upon completion of the existing subdivisions.

74. There remains the possibility that a lesser intersection upgrade is required should the bypass route be completed. Again, this is a matter for further discussion with Council regarding timeframes. However, Plan Changes to date have contemplated and provided for a bypass (particularly the Verdeco Park Plan Change). This proposed Plan Change would construct the link between Springs Road and Ellesmere Road, which would contribute a significant portion of the bypass route.

Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Intersection

75. The base traffic model of the Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection has been updated with the Baseline traffic volumes, which account for the yet to be completed Verdeco Park and Te Whāriki subdivisions. The results of this model are included in **Appendix 11** and these indicate that:

    i. The intersection operates satisfactorily in the AM peak hour. The worst Level of Service for any turning movement is B. The degrees of saturation for all approaches is less than 0.85 and therefore there are no capacity concerns regarding this intersection in this time period; and

    ii. The intersection operates satisfactorily in the PM peak hour. The worst Level of Service for any turning movement is B. The degrees of saturation for all approaches is less than 0.85 and therefore there are no capacity concerns regarding this intersection in this time period.

76. The above indicates that the existing intersection is predicted to operate satisfactorily with the completion of the existing subdivisions on Springs Road.

77. The Plan Change traffic has been added to the roundabout model and these results are included in **Appendix 12**. These results indicate that:

i. The intersection operates satisfactorily in the AM peak hour. The worst Level of Service for any turning movement is C. The degrees of saturation for all approaches is less than 0.85 and therefore there are no capacity concerns regarding this intersection in this time period; and

ii. The intersection operates satisfactorily in the PM peak hour. The worst Level of Service for any turning movement is D. The degrees of saturation for all approaches is less than 0.85 and therefore there are no capacity concerns regarding this intersection in this time period. That said, the Ellesmere Road north approach is predicted to be at a degree of saturation of 0.843, which suggests the Plan Change would effectively take this intersection to its limit of capacity.

Potential Intersection Arrangement

78. Given the above results, it is apparent that an intersection upgrade is not required at this location as a result of this Plan Change. That said, it is understood that Council has a plan to install a roundabout at this location. This roundabout would benefit the capacity of the intersection with the Plan Change in place (noting the above results) as well as provide a safer intersection. The primary movement from the Plan Change would be through movements on the minor arms, which are typically the least safe movements at cross-roads.

79. We do not have a design for the proposed roundabout, although the following has been assumed for the purposes of confirming that a roundabout could be constructed in this location.

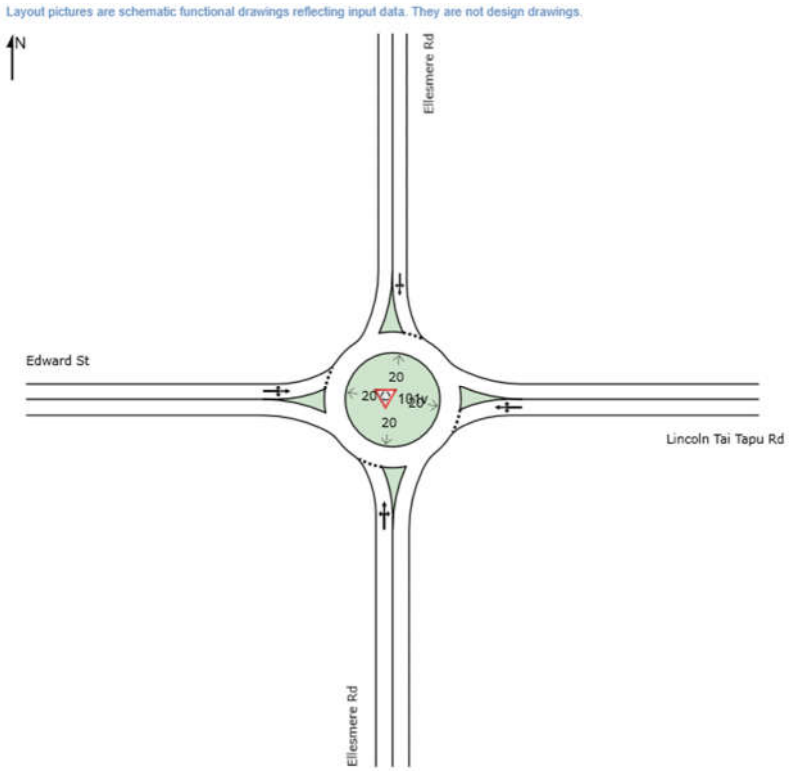


Figure 17: Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd – Roundabout Concept

80. Traffic capacity results for the above roundabout with the Plan Change traffic added to the road network are included in **Appendix 13**. These indicate that the proposed roundabout could comfortably accommodate the predicted traffic volumes.

Ellesmere Road

81. Ellesmere Road currently accommodates a traffic volume of approximately 2,000 vehicles per day. This road has a sealed carriageway of approximately 6m plus grass berms at present.

82. The provision of a connection through the Plan Change site from Springs Road to Ellesmere Road will increase the traffic volumes on this route. The traffic distribution assumed that 26% of traffic from Verdeco Park would use Ellesmere Road, as would 26% of traffic from the Plan Change site. These two subdivisions would therefore increase traffic volumes on Ellesmere Road by approximately 370 vehicles per day and 3,600 vehicles per day respectively. These volumes would be further increased with the completion of the potential bypass route. This leads to a potential traffic volume of in the order of 6,000 vehicles per day.

83. The cross-section of this road will need to be upgraded to accommodate this increase in traffic. That said, the road will still be largely rural in nature and it is not proposed to provide dedicated pedestrian or cycle facilities. Austroads *Guide to Road Design Part 3 – Geometric Design* recommends the following cross-section for rural roads that accommodate greater than 3,000 vehicles per day:

    i. Traffic lanes: 7.0m (i.e. two 3.5m traffic lanes); and

    ii. Total Shoulder of 2.5m on both sides, including 1.5m minimum sealed shoulders.

84. It is envisaged that Ellesmere Road would be upgraded to meet this standard between Edward Street and Moirs Lane.

Accessibility

85. The proposed site will include pedestrian and cycle links within the Plan Change area and linkages to off-site facilities. This includes links to the Te Whāriki subdivision, which means the existing commercial centre on Vernon Drive will be approximately 1.6km from the centre of the Plan Change site. This equates to a walk of approximately 20 minutes or a six-minute bike ride. These are considered to be comfortable distances to walk / cycle.

86. The Plan Change will also provide a small local commercial area that is intended to provide for everyday shopping and further reduce the need to travel by car for local trips.

87. 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

88. The Plan Change proposed would enable the development of up to 2,000 residential Lots plus a small commercial zone to be established at the application site. These activities are predicted to generate in the order of 1,400 vehicle movements per hour in the peak hours and 14,000 vehicle movements per day.

89. Primary access to the Plan Change site would be via two roundabouts on Springs Road. The northern roundabout has the potential to form part of a Lincoln bypass route, with the Plan Change road layout providing a connection from Springs Road to Ellesmere Road (via Moirs Lane). The remainder of the

bypass route has been accounted for in the Verdeco Park subdivision. The site would also have accesses to Collins Road.

90. Road cross-section upgrades are proposed as described in detail earlier in this report so as to accommodate the predicted traffic volumes from the Plan Change site.

91. The Ellesmere Junction Road / Springs Road / Gerald Street roundabout has been identified as being at capacity with the completion of the current subdivisions in Lincoln. The inclusion of traffic associated with this Plan Change would lead that intersection to being over-capacity and an upgrade will be required. Council has already planned and funded a traffic signal-controlled intersection at this location and a potential revised layout has been identified that would accommodate the Plan Change traffic. There is potential that a lesser upgrade would be required if the Lincoln bypass were to be completed, with the proposed Plan Change including internal roading that is intended to facilitate this bypass. As such, the final form of the intersection arrangement needs to be agreed with Council.

92. The traffic capacity of the Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection has been assessed. This intersection can operate satisfactorily with the proposed Plan Change traffic added to the network. That said, the Council has a proposal to upgrade this intersection to a roundabout and this would reduce the traffic safety effects of the proposed Plan Change at this location.

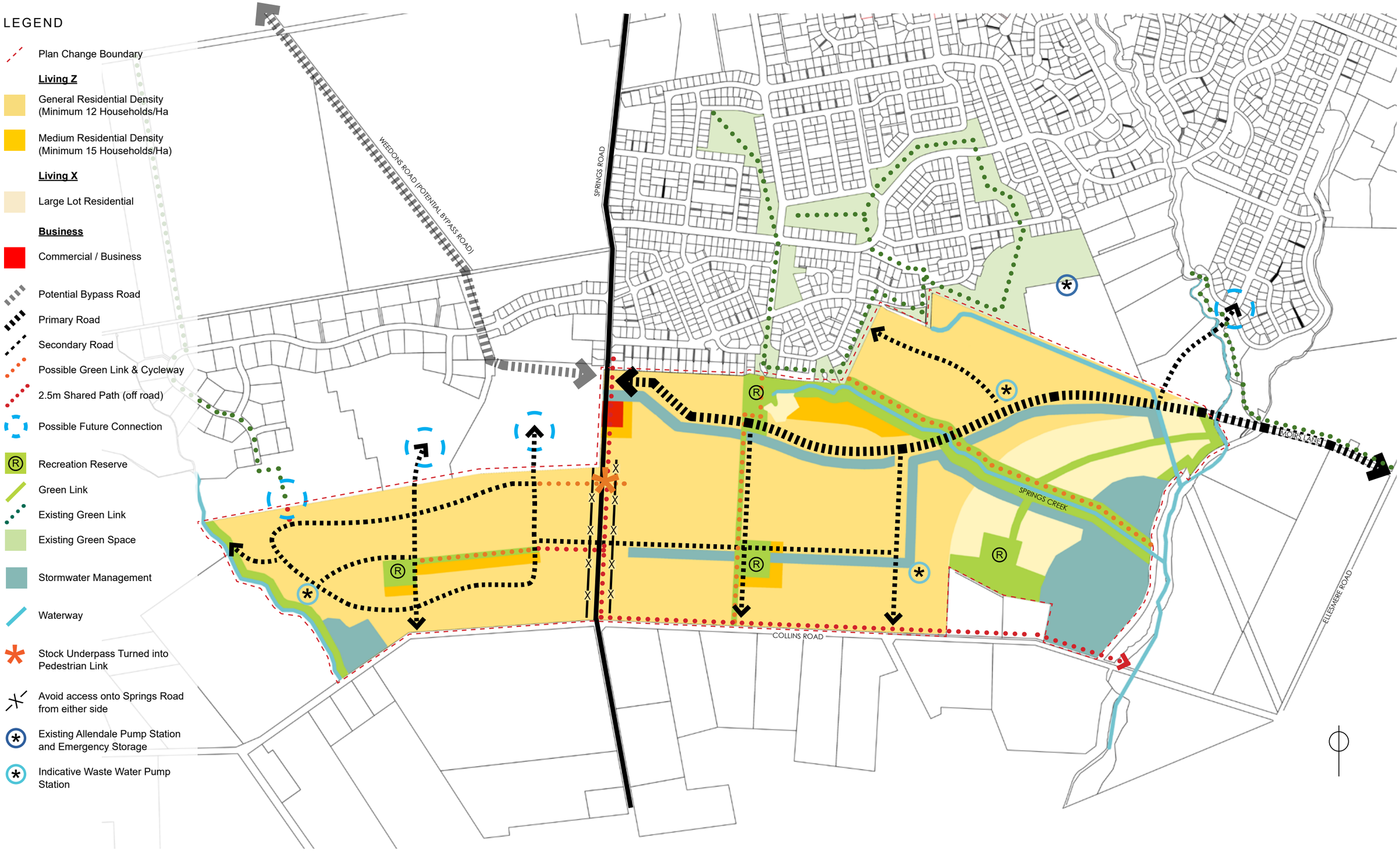
Conclusion

93. Overall, it is considered that the transport effects of the proposed Plan Change will be acceptable on the surrounding transport network subject to undertaking the off-site improvements outlined in this report.

Appendix 1

Outline Development Plan

OUTLINE DEVELOPMENT PLAN (ODP)



LANDUSE AND DENSITY

LEGEND

Plan Change Boundary

Living Z

General Residential Density
(Minimum 12 Households/Ha

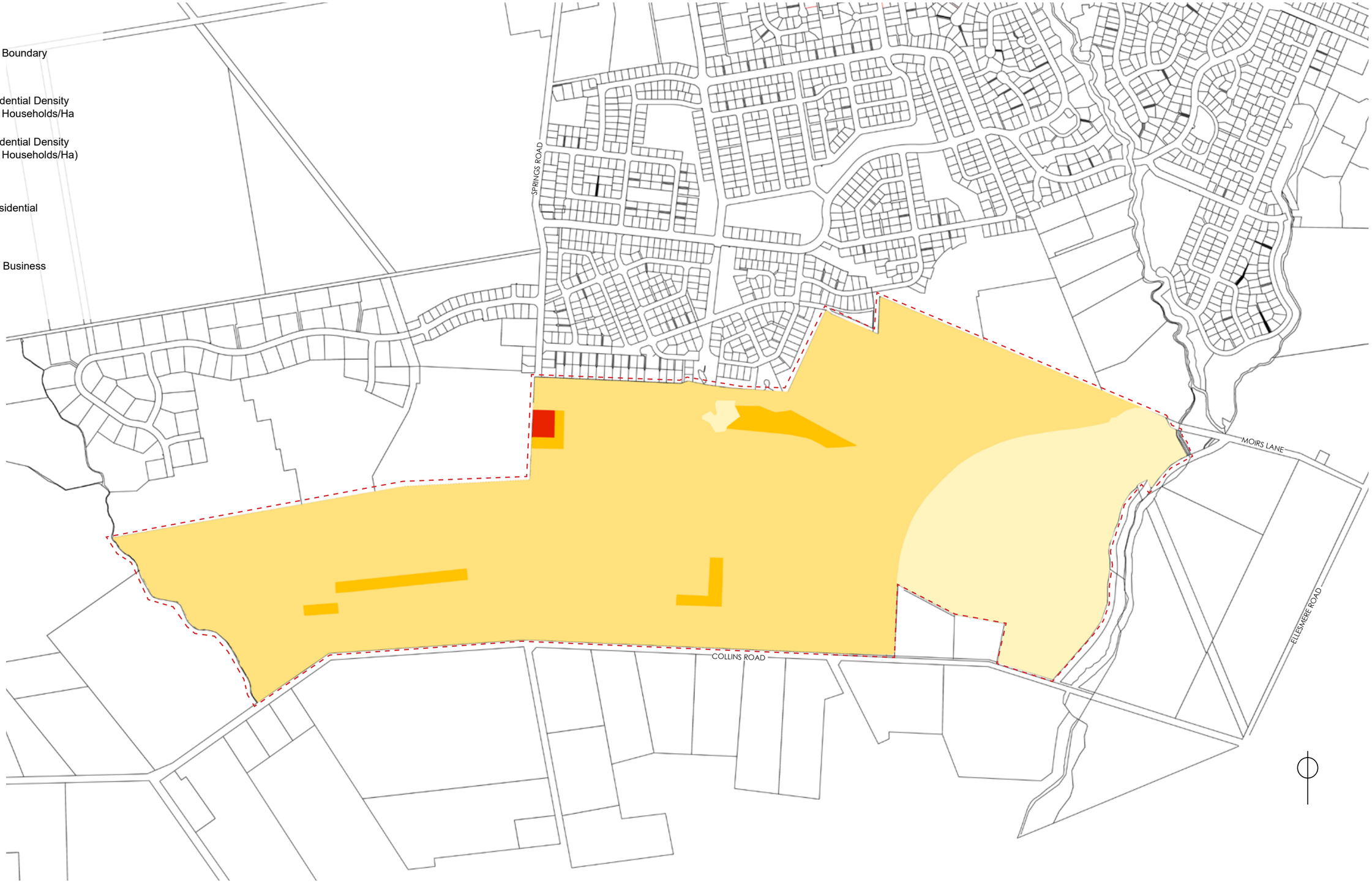
Medium Residential Density
(Minimum 15 Households/Ha)

Living X

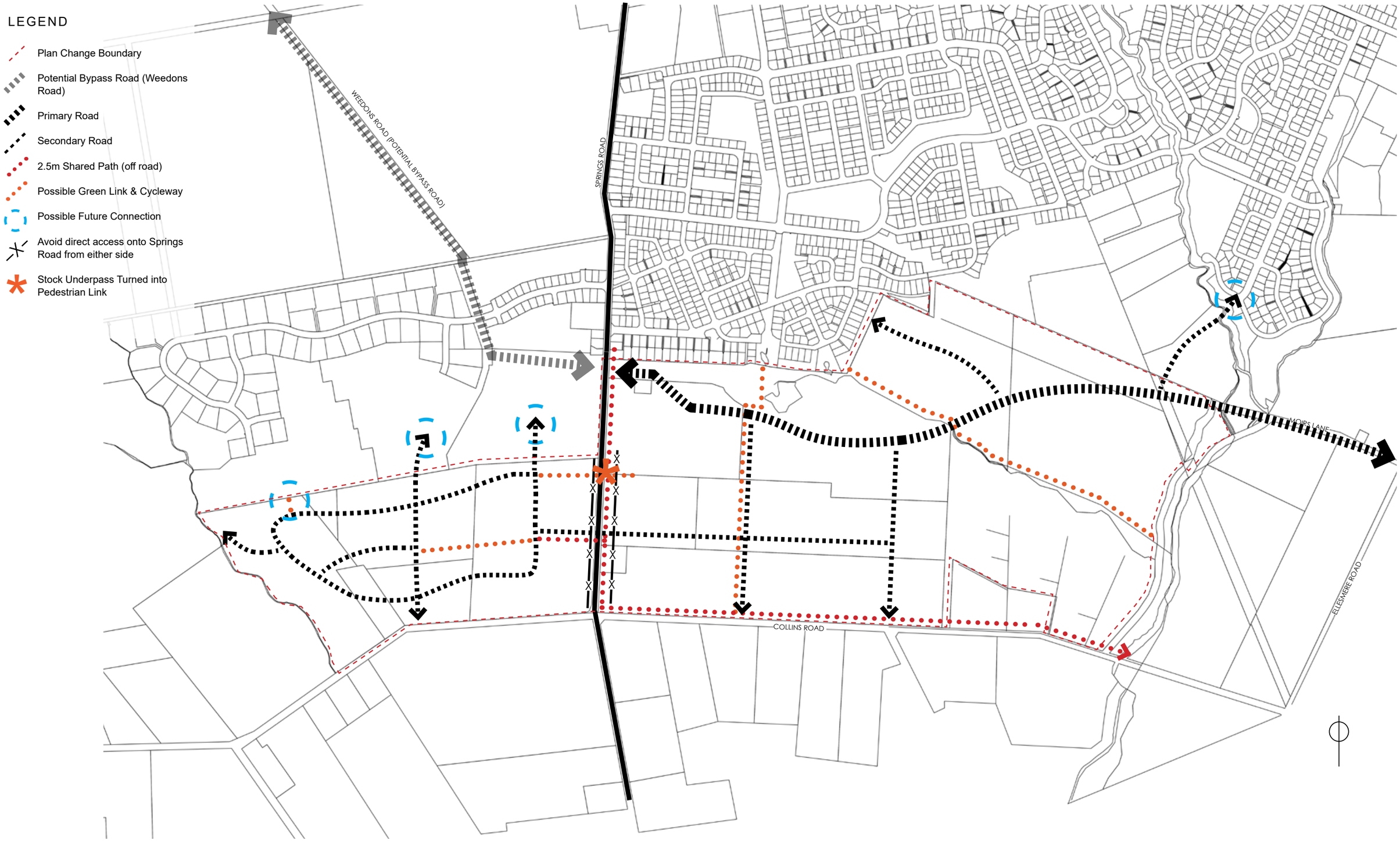
Large Lot Residential

Business

Commercial / Business



MOVEMENT AND CONNECTIVITY



GREEN / OPEN SPACE NETWORK

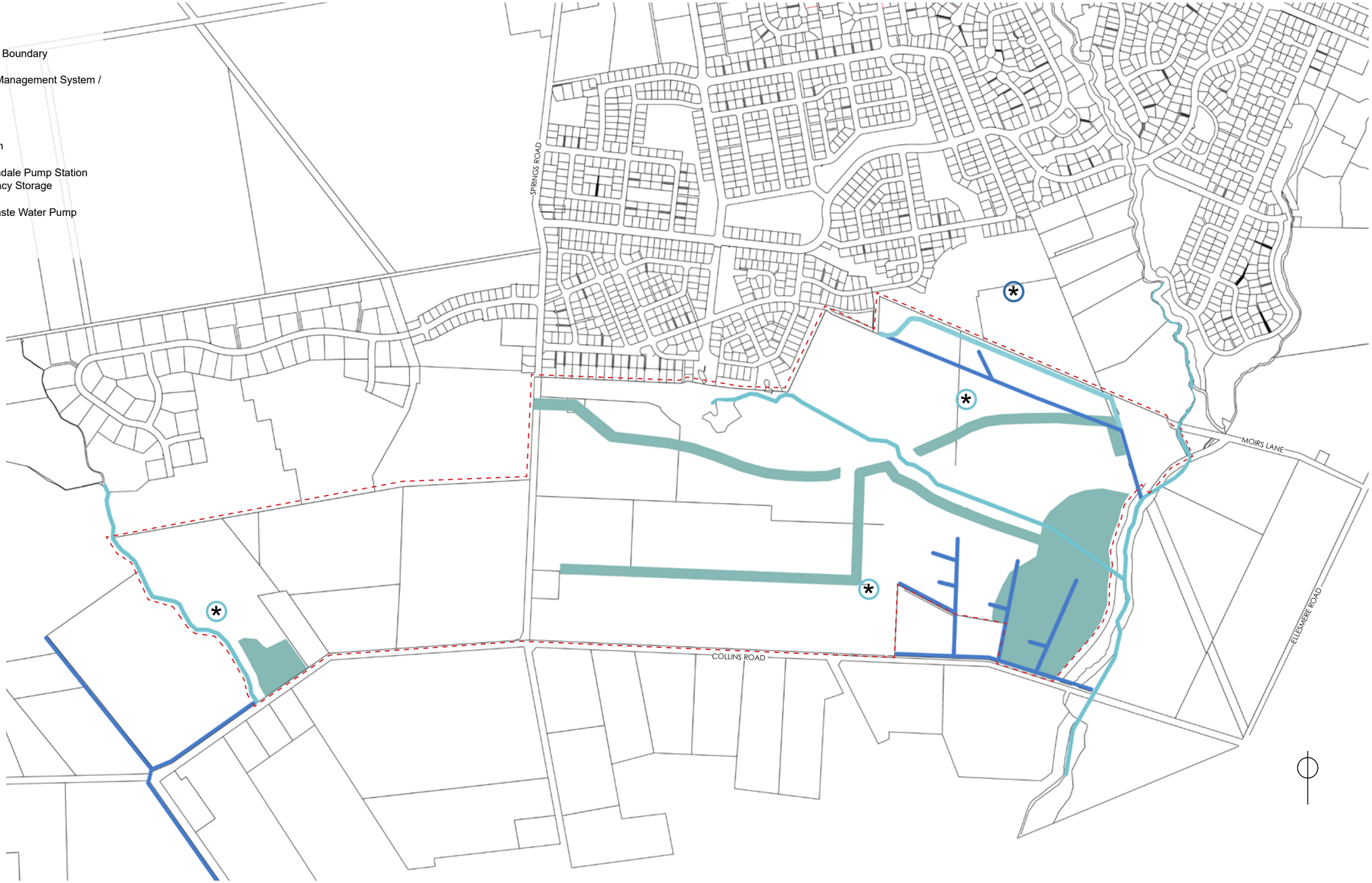
LEGEND

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

BLUE NETWORK

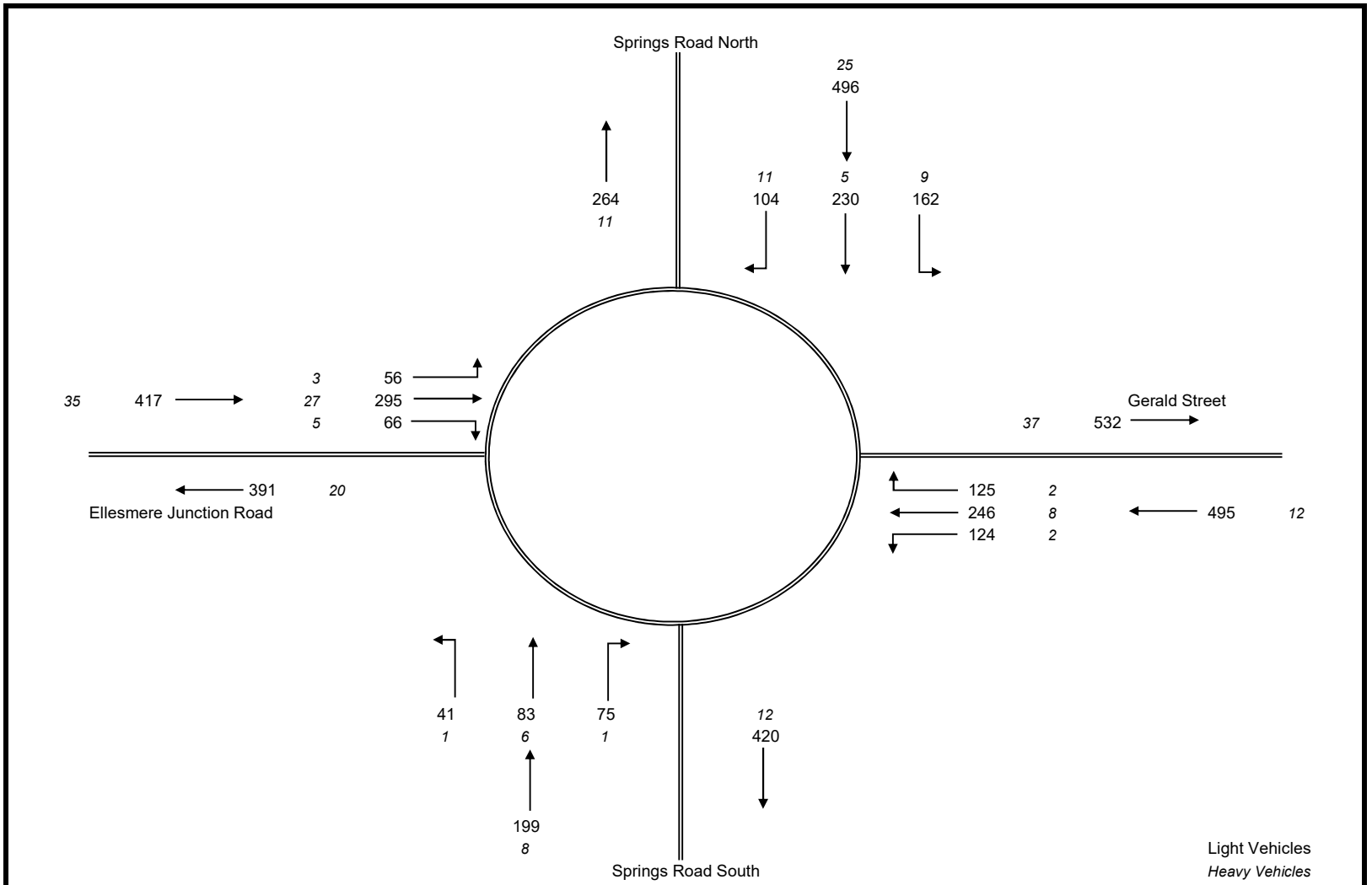
LEGEND

- Plan Change Boundary
- Stormwater Management System / Areas
- Waterway
- Existing Drain
- Existing Allendale Pump Station and Emergency Storage
- Indicative Waste Water Pump Station



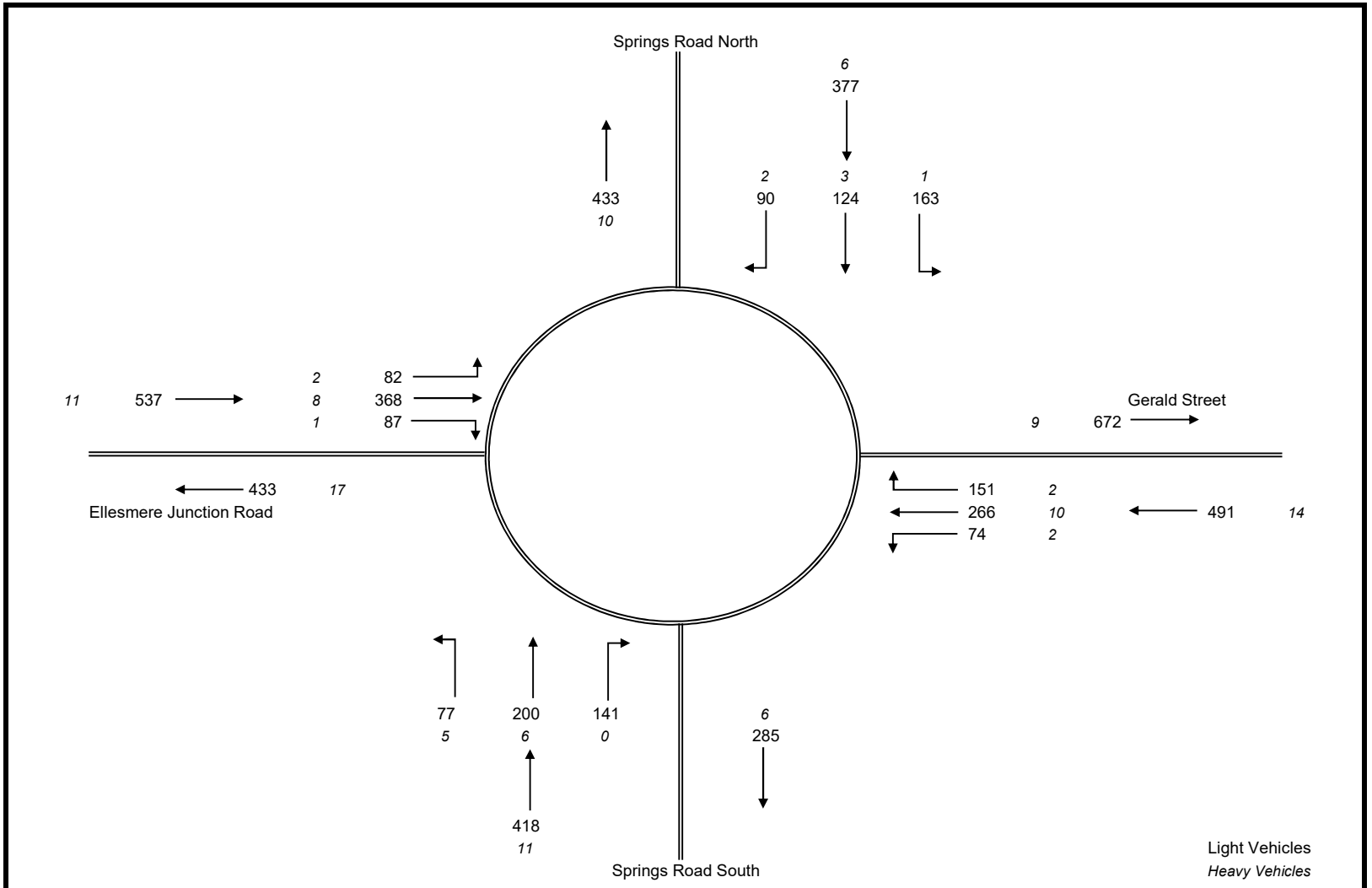
Appendix 2

Springs Rd / Ellesmere Junction Rd / Gerald St Traffic Volumes



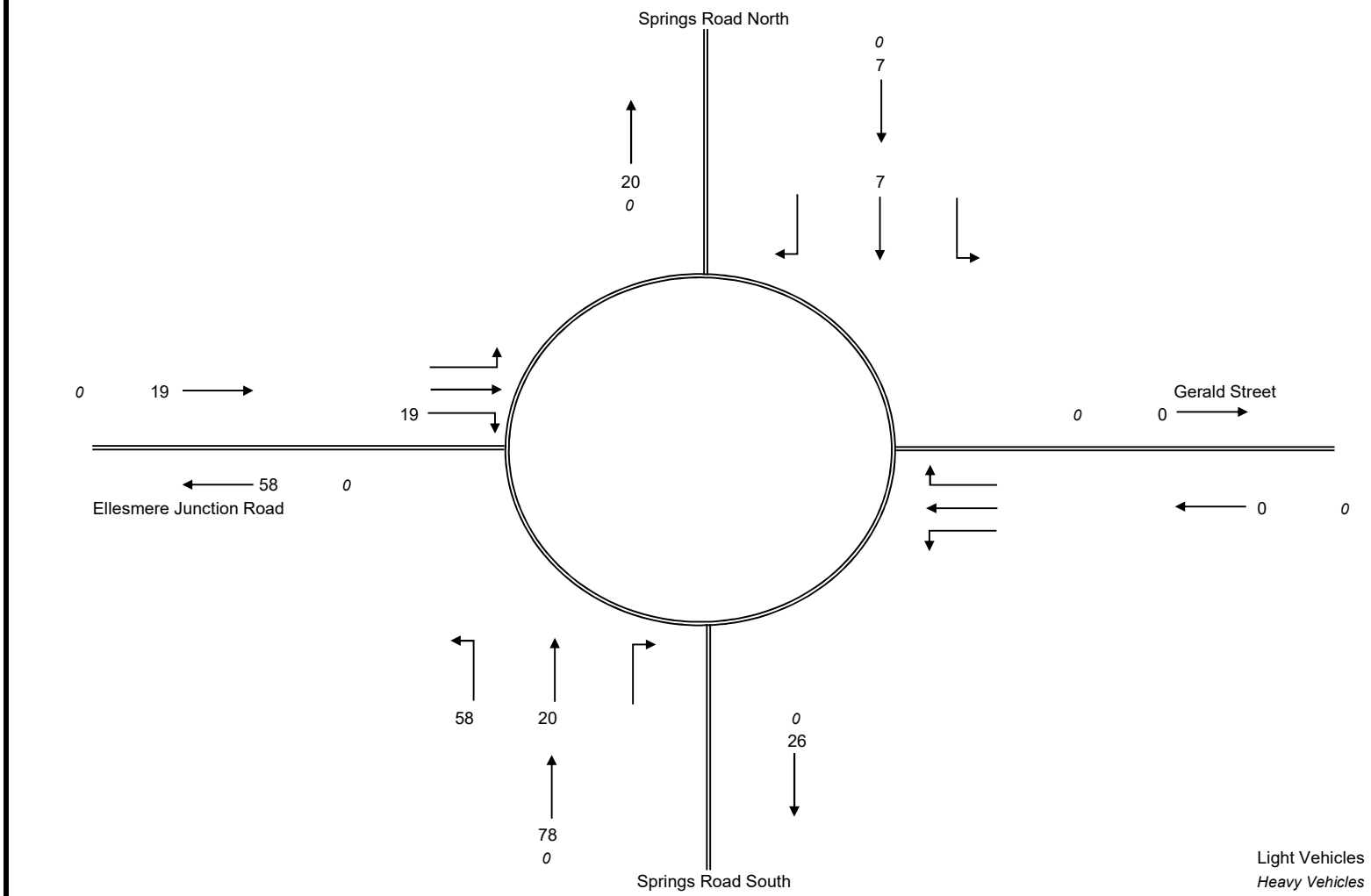
novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
2020 Peak Hour Surveyed Traffic Volumes - AM Peak



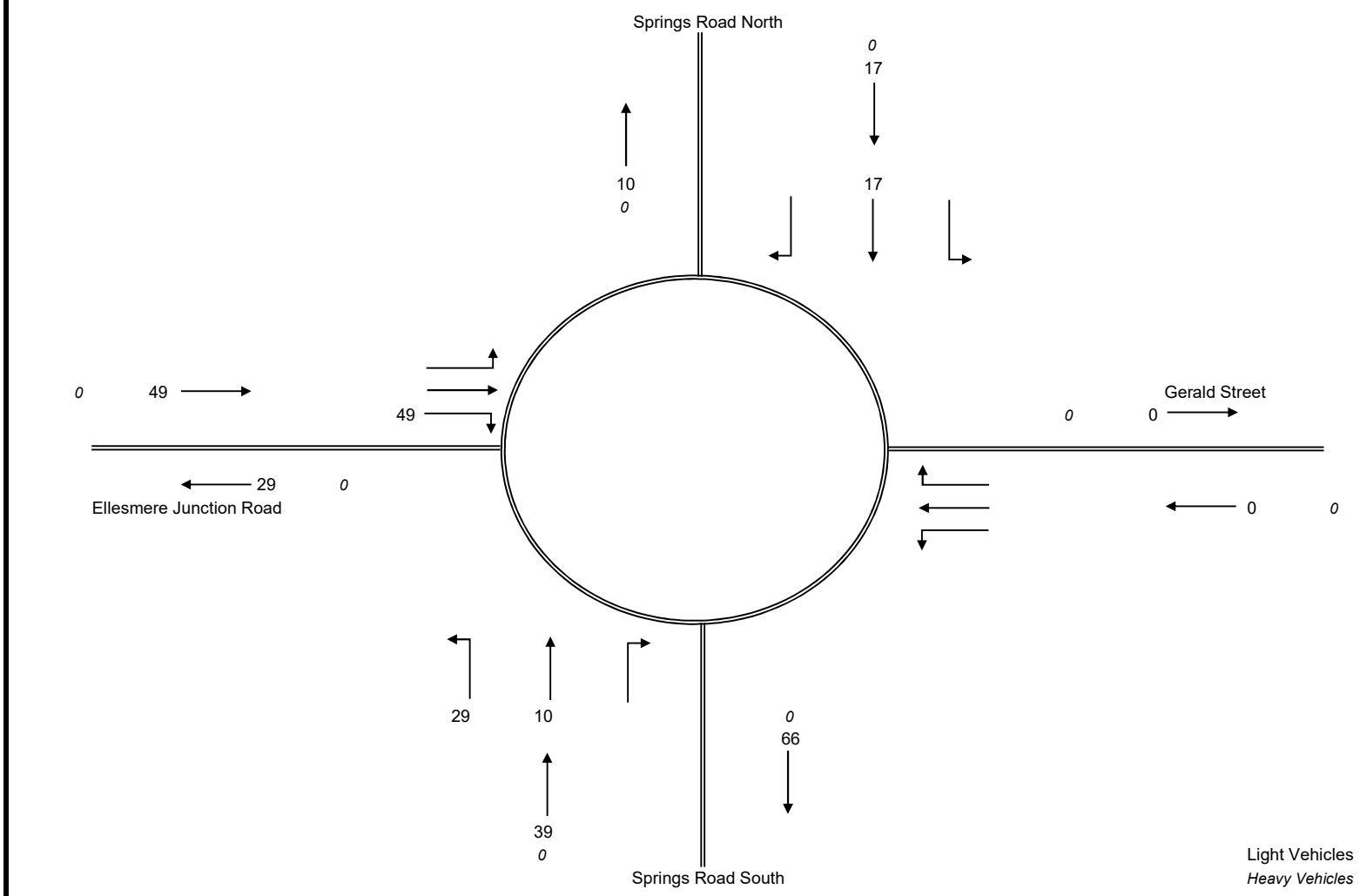
novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
2020 Peak Hour Surveyed Traffic Volumes - PM Peak



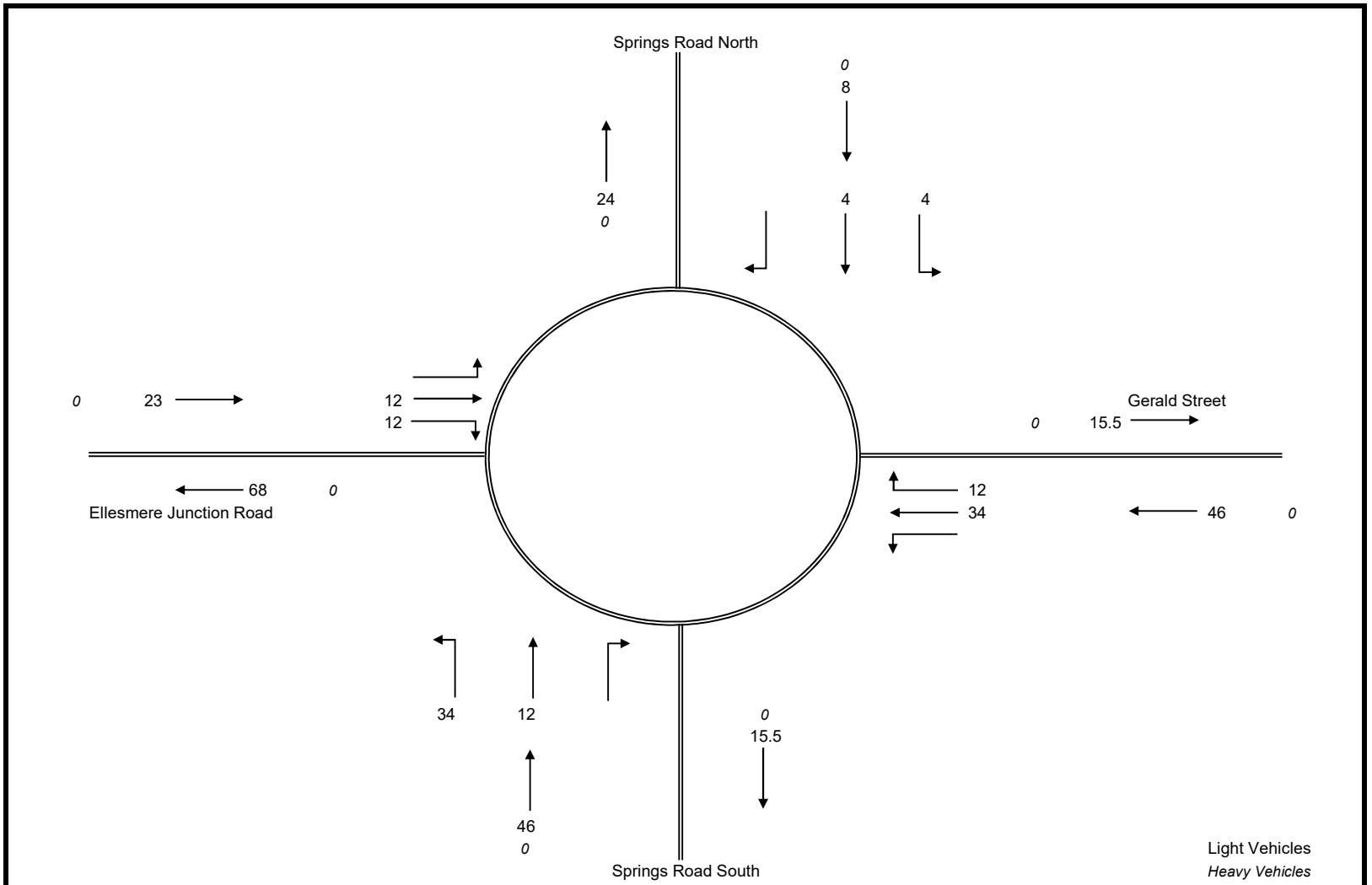
novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Verdeco Park Additional Traffic Volumes - AM Peak



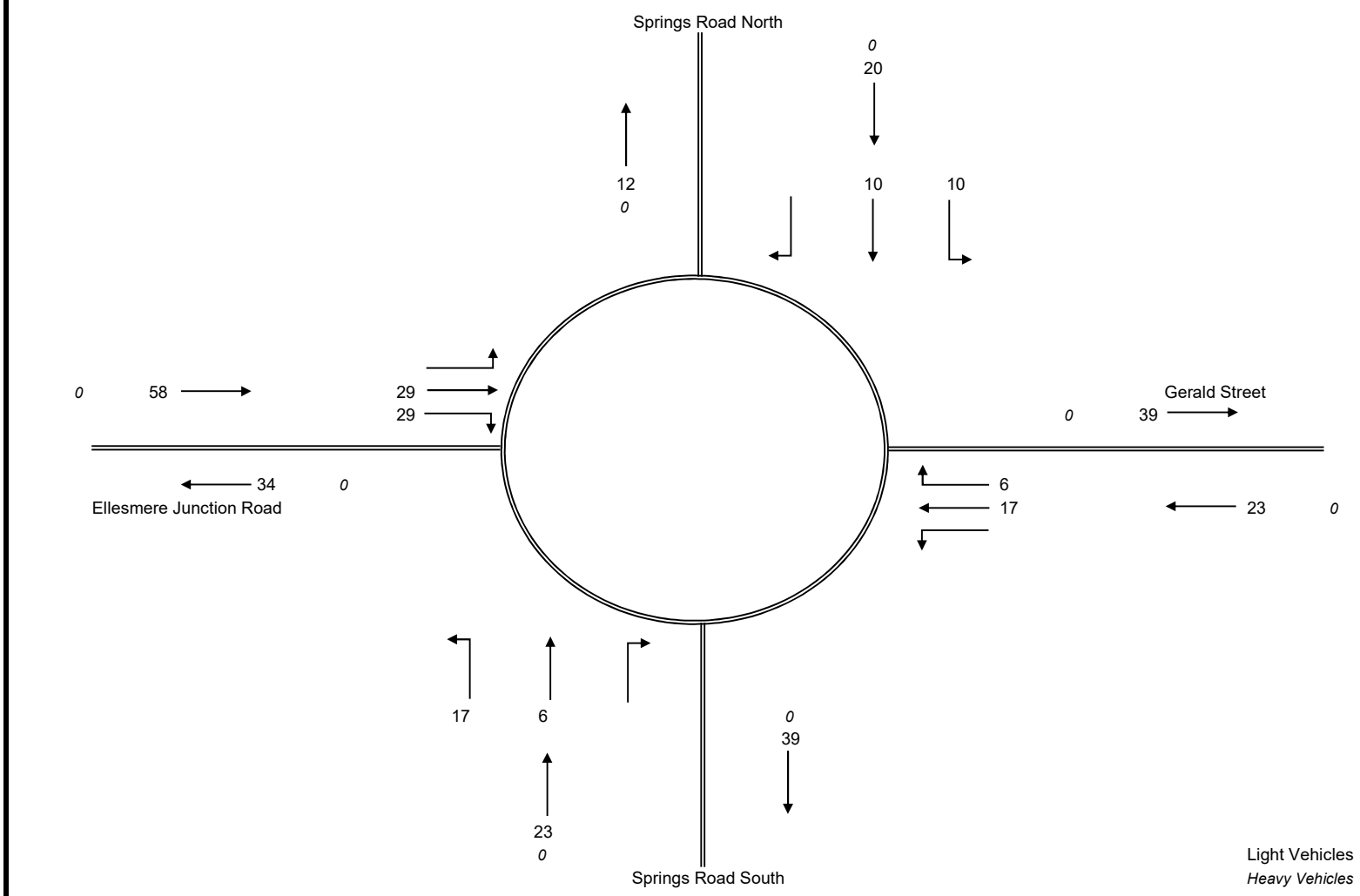
novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Verdeco Park Additional Traffic Volumes - PM Peak



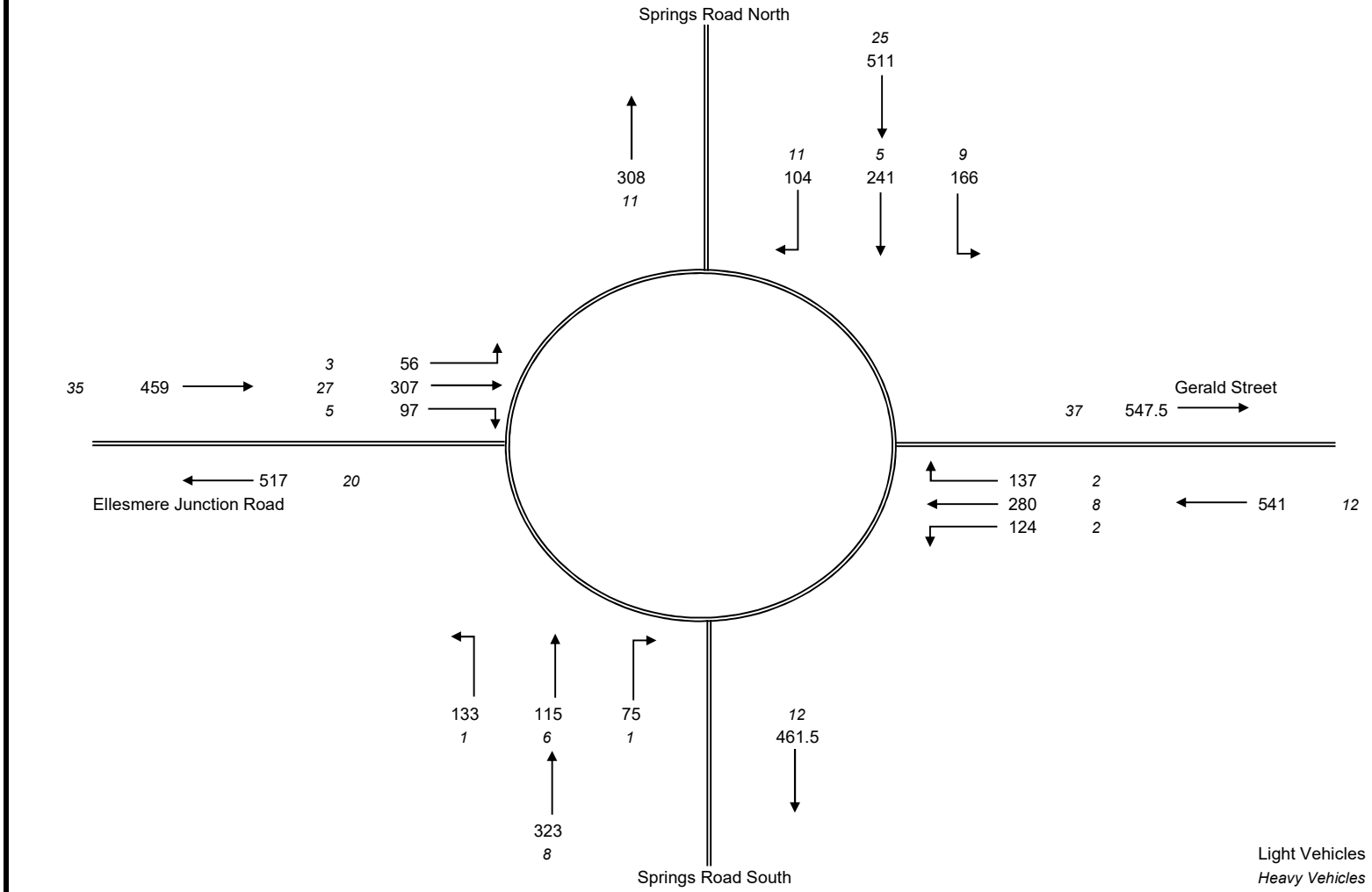
novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Te Whariki Additional Traffic Volumes - AM Peak



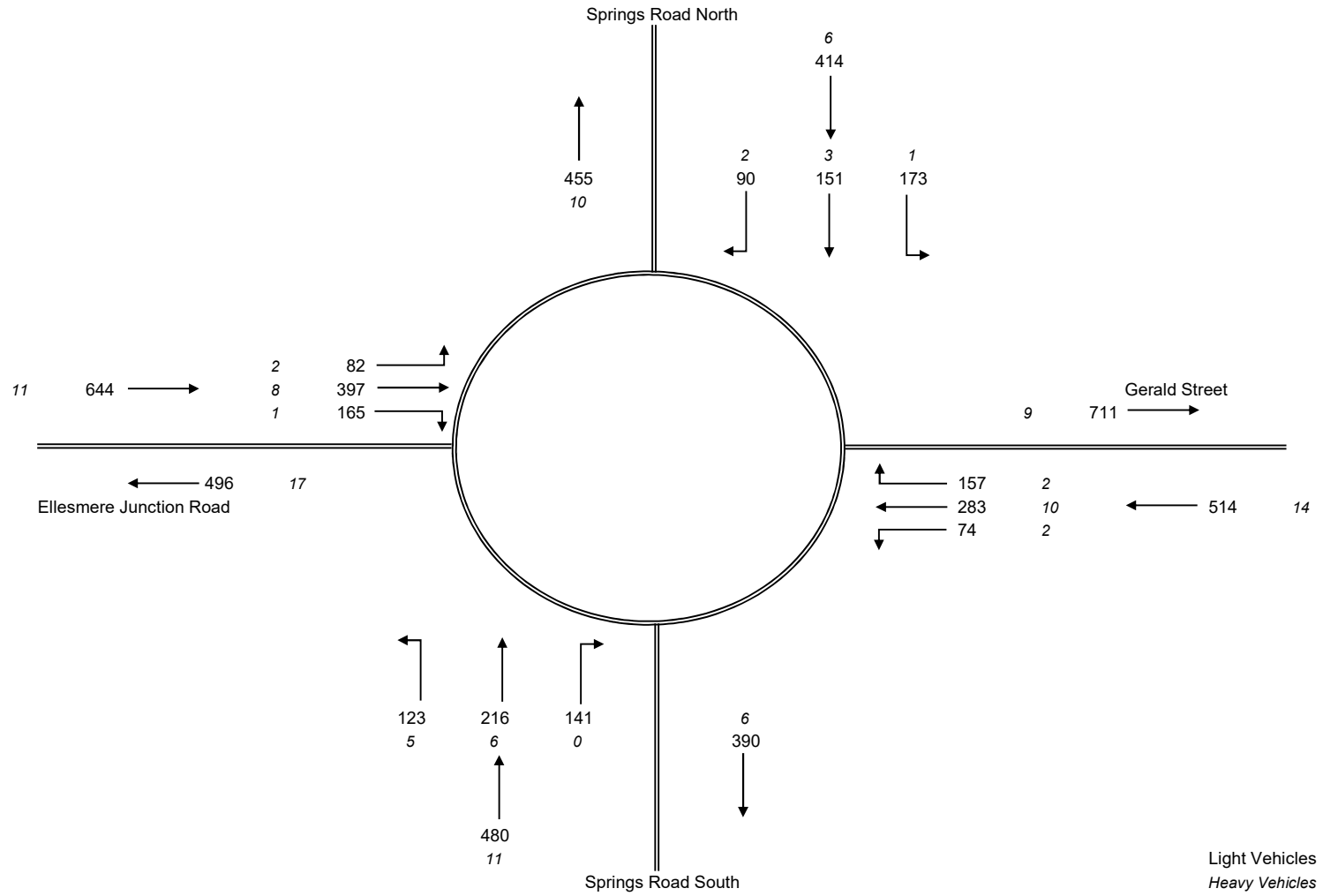
novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Te Whariki Additional Traffic Volumes - PM Peak



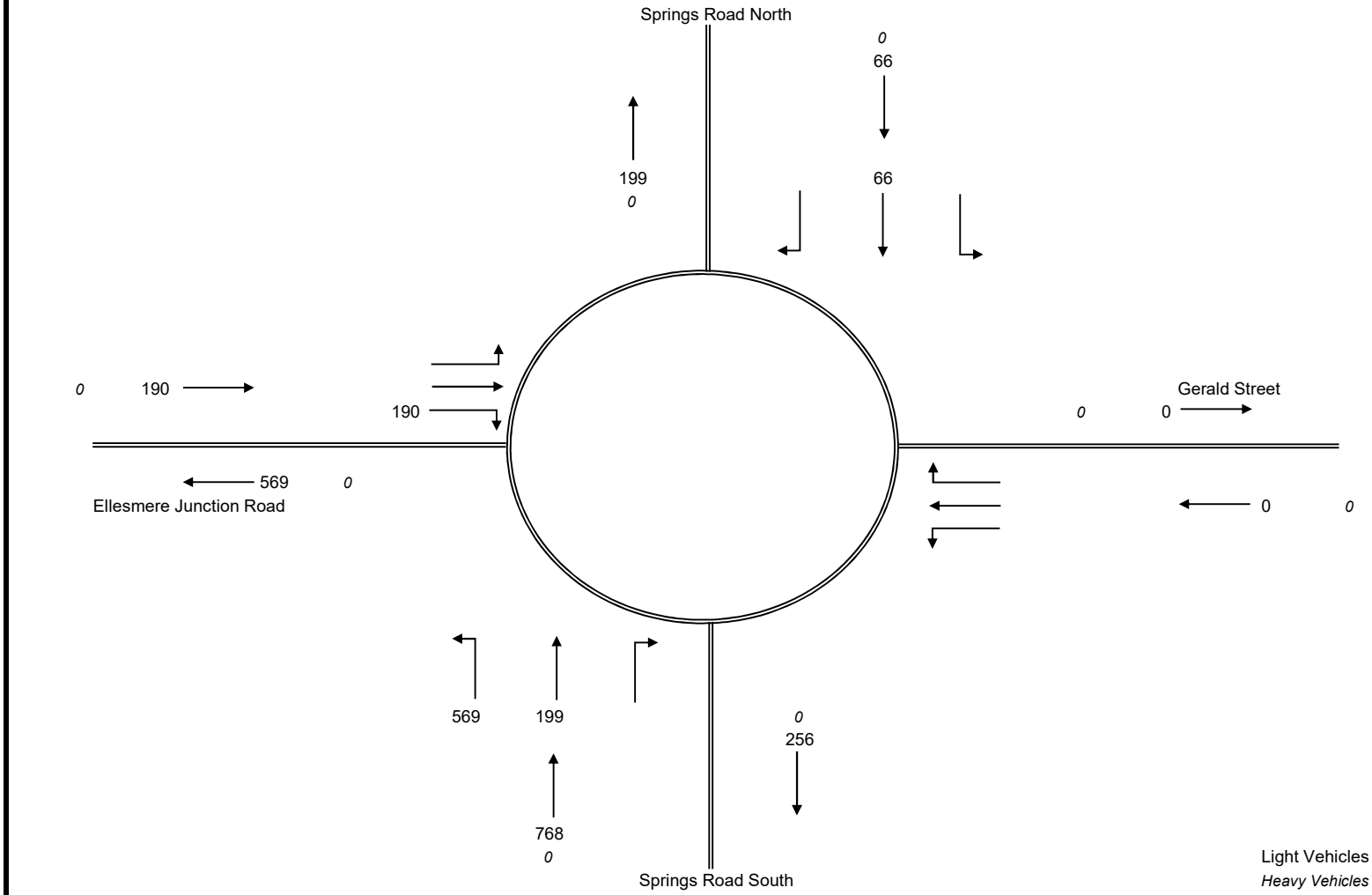
novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Base plus Additional Subdivision Traffic Volumes - AM Peak



novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Base plus Additional Subdivision Traffic Volumes - PM Peak

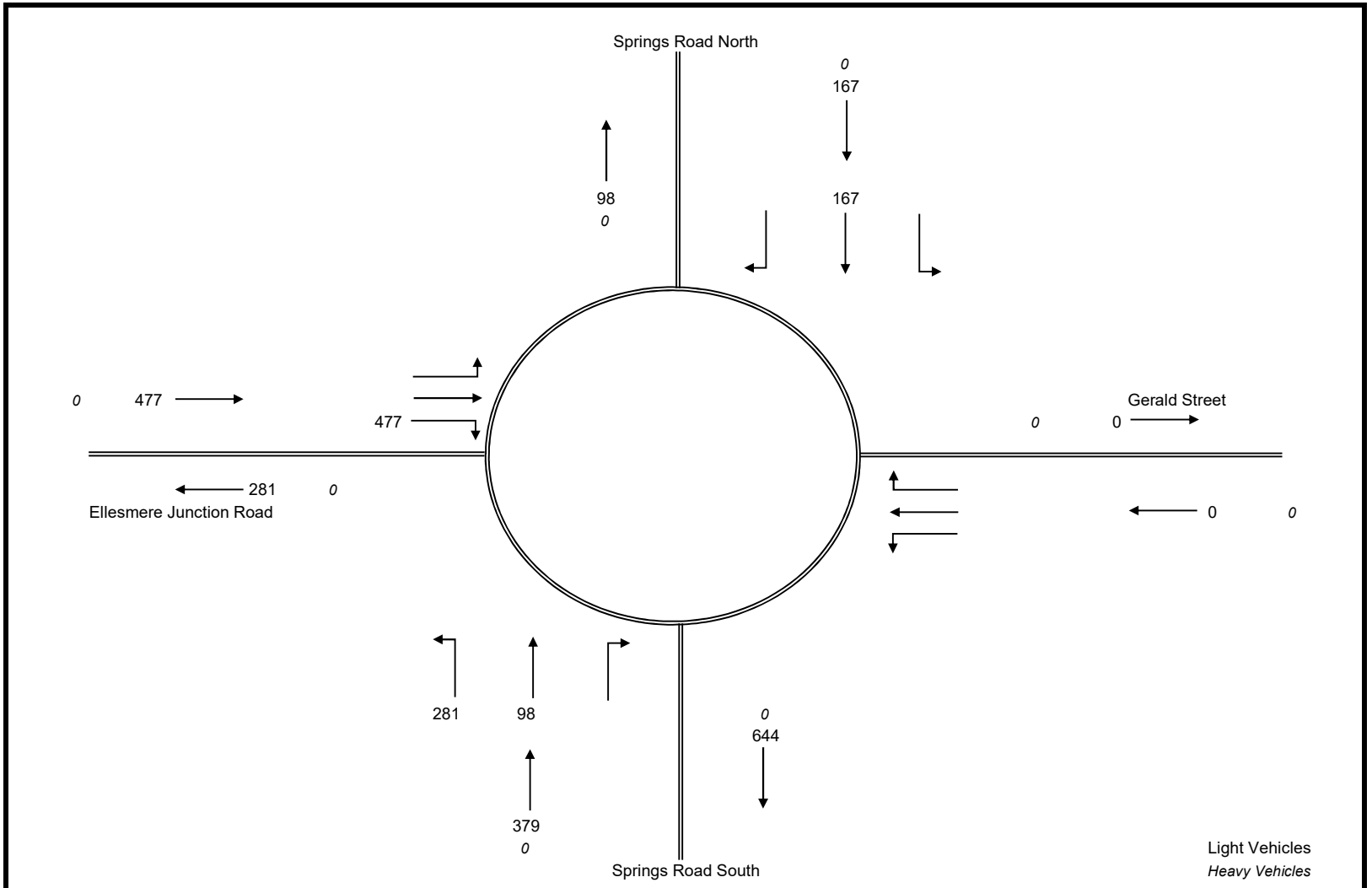


Planning. Traffic. Development.

021-028: Lincoln South Plan Change

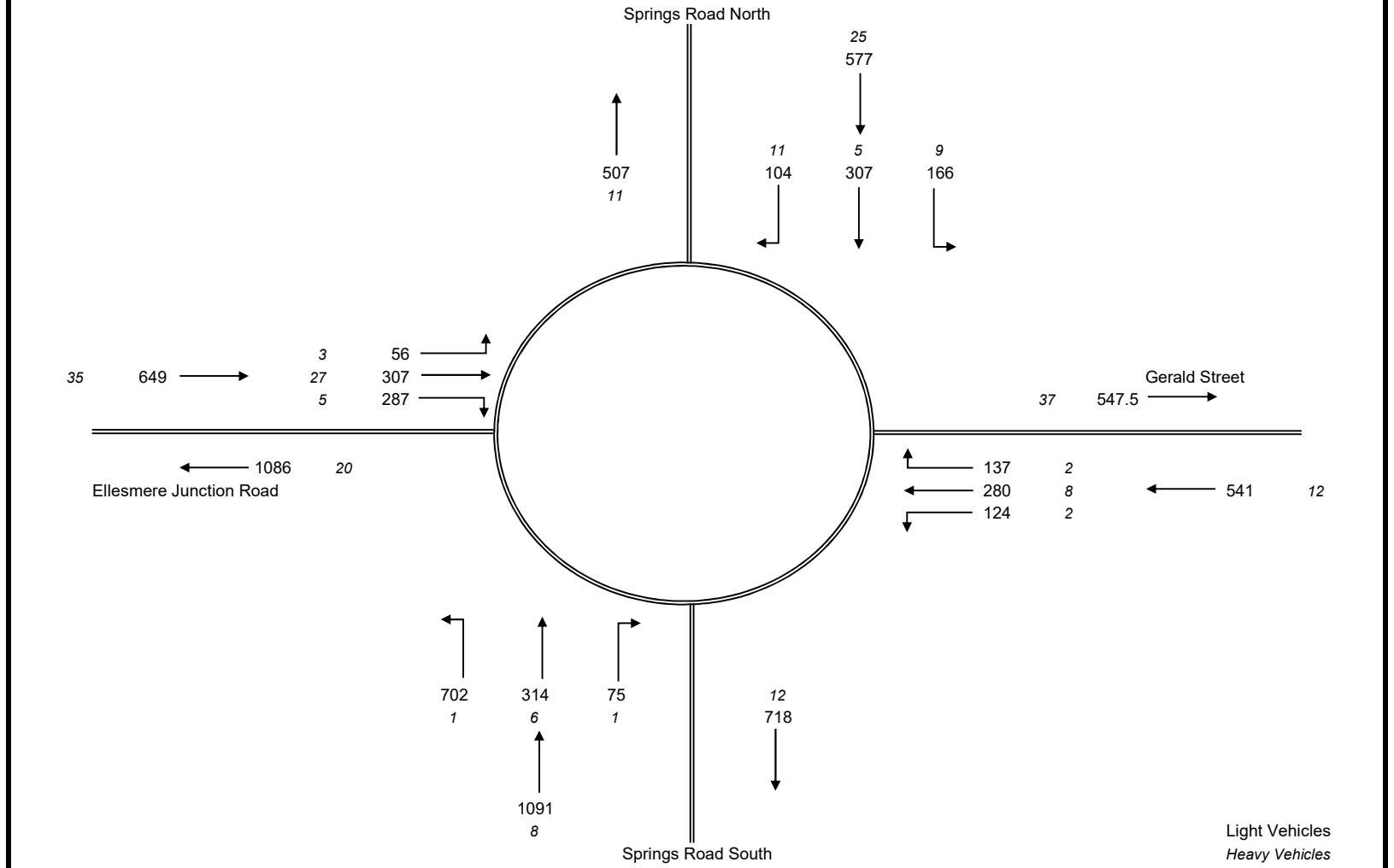
Ellesmere Junction Rd / Springs Rd / Gerald St

Lincoln South Traffic Volumes - AM Peak



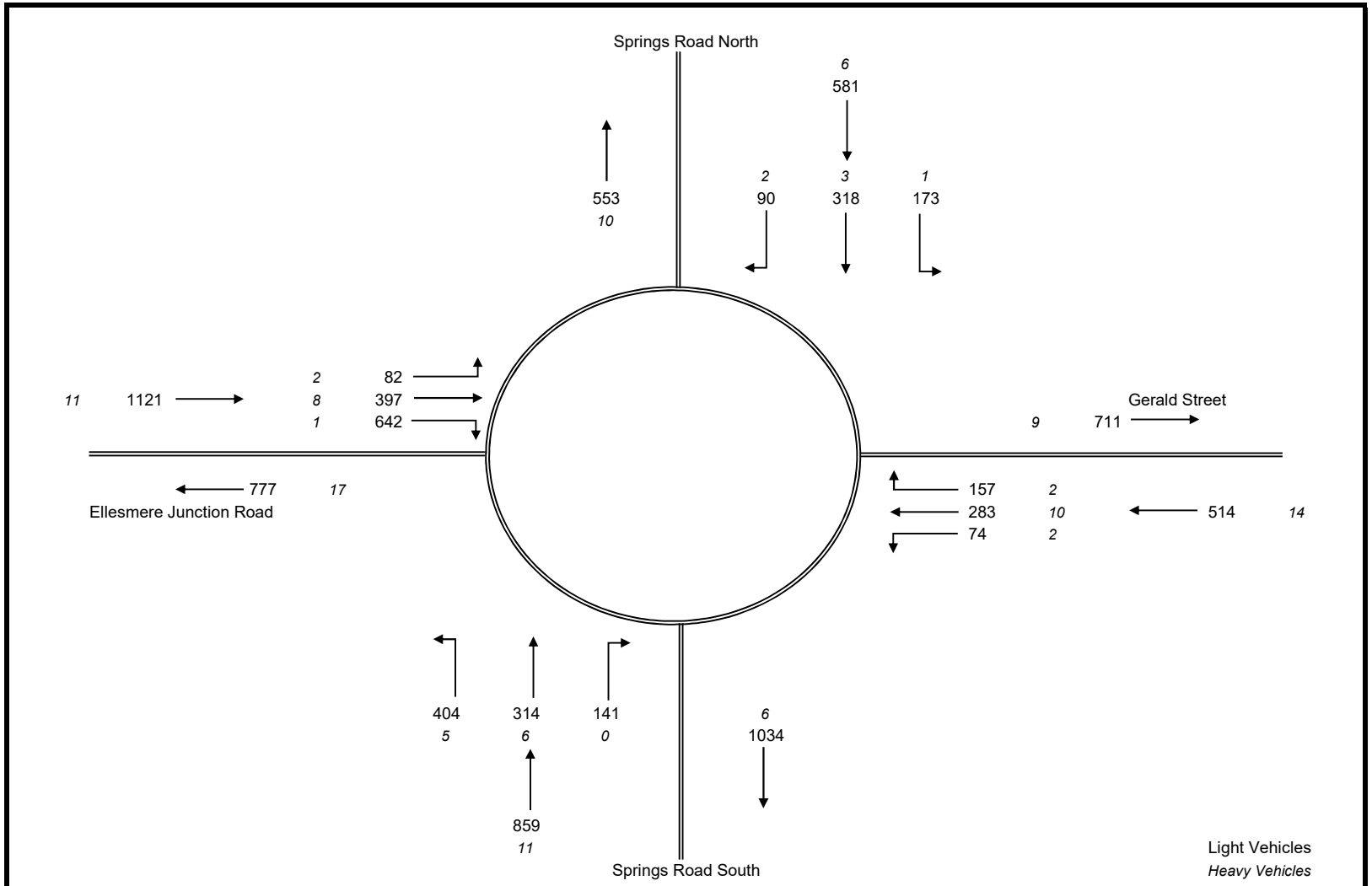
novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Lincoln South Traffic Volumes - PM Peak



novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Base plus Lincoln South Traffic Volumes - AM Peak



novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Base plus Lincoln South Traffic Volumes - PM Peak

Appendix 3

Springs Rd / Ellesmere Junction Rd / Gerald St Operation - Existing

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM Base (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Springs Rd														
1	L2	42	1	44	2.4	0.261	7.0	LOS A	1.5	10.5	0.63	0.75	0.63	51.2
2	T1	89	6	94	6.7	0.261	7.3	LOS A	1.5	10.5	0.63	0.75	0.63	52.2
3	R2	76	1	80	1.3	0.261	10.9	LOS B	1.5	10.5	0.63	0.75	0.63	52.1
Approach		207	8	218	3.9	0.261	8.6	LOS A	1.5	10.5	0.63	0.75	0.63	52.0
East: Gerald St														
4	L2	126	2	133	1.6	0.577	8.2	LOS A	5.2	36.9	0.80	0.85	0.89	50.9
5	T1	254	8	267	3.1	0.577	8.5	LOS A	5.2	36.9	0.80	0.85	0.89	51.8
6	R2	127	2	134	1.6	0.577	12.2	LOS B	5.2	36.9	0.80	0.85	0.89	51.6
Approach		507	12	534	2.4	0.577	9.3	LOS A	5.2	36.9	0.80	0.85	0.89	51.5
North: Springs Rd														
7	L2	171	9	180	5.3	0.789	18.0	LOS B	10.9	79.6	0.99	1.21	1.54	44.9
8	T1	235	5	247	2.1	0.789	18.0	LOS B	10.9	79.6	0.99	1.21	1.54	45.8
9	R2	115	11	121	9.6	0.789	22.3	LOS C	10.9	79.6	0.99	1.21	1.54	45.4
Approach		521	25	548	4.8	0.789	18.9	LOS B	10.9	79.6	0.99	1.21	1.54	45.5
West: Ellesmere Junction Rd														
10	L2	59	3	62	5.1	0.468	6.5	LOS A	3.2	24.2	0.62	0.68	0.62	51.8
11	T1	322	27	339	8.4	0.468	6.8	LOS A	3.2	24.2	0.62	0.68	0.62	52.7
12	R2	71	5	75	7.0	0.468	10.6	LOS B	3.2	24.2	0.62	0.68	0.62	52.5
Approach		452	35	476	7.7	0.468	7.4	LOS A	3.2	24.2	0.62	0.68	0.62	52.6
All Vehicles		1687	80	1776	4.7	0.789	11.7	LOS B	10.9	79.6	0.79	0.90	0.98	49.8

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.

Organisation: NOVO GROUP LIMITED | Licence: PLUS / 1PC | Processed: Sunday, 18 October 2020 10:42:52 am
Project: S:\Novo Projects\020-100 Favourites\021 Carter Group\021028 1491 Springs Road\04 Transport\Traffic Model\021-028 - Lincoln South Rev A.sip9

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM Base (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

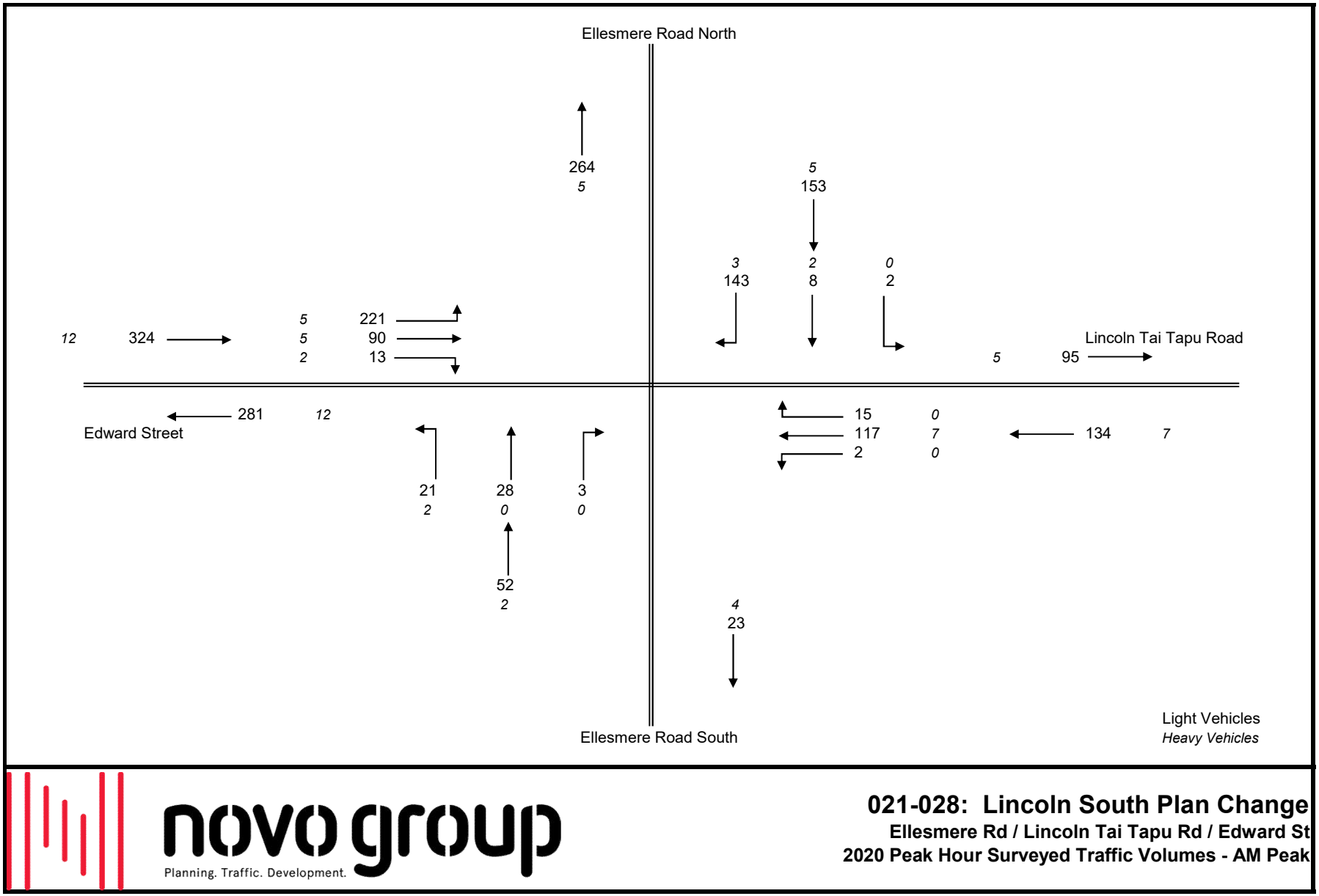
Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h]	INPUT VOLUMES HV] veh/h	DEMAND FLOWS [Total veh/h]	DEMAND FLOWS HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	95% BACK OF QUEUE Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Springs Rd														
1	L2	82	5	86	6.1	0.543	9.1	LOS A	4.2	29.9	0.76	0.89	0.87	50.1
2	T1	206	6	217	2.9	0.543	9.1	LOS A	4.2	29.9	0.76	0.89	0.87	51.3
3	R2	141	0	148	0.0	0.543	12.8	LOS B	4.2	29.9	0.76	0.89	0.87	51.1
Approach		429	11	452	2.6	0.543	10.3	LOS B	4.2	29.9	0.76	0.89	0.87	51.0
East: Gerald St														
4	L2	76	2	80	2.6	0.503	6.3	LOS A	3.7	26.3	0.64	0.69	0.64	51.6
5	T1	276	10	291	3.6	0.503	6.5	LOS A	3.7	26.3	0.64	0.69	0.64	52.6
6	R2	153	2	161	1.3	0.503	10.3	LOS B	3.7	26.3	0.64	0.69	0.64	52.4
Approach		505	14	532	2.8	0.503	7.6	LOS A	3.7	26.3	0.64	0.69	0.64	52.4
North: Springs Rd														
7	L2	164	1	173	0.6	0.675	15.8	LOS B	7.0	49.9	0.95	1.13	1.33	46.1
8	T1	127	3	134	2.4	0.675	16.2	LOS B	7.0	49.9	0.95	1.13	1.33	47.0
9	R2	92	2	97	2.2	0.675	20.0	LOS C	7.0	49.9	0.95	1.13	1.33	46.7
Approach		383	6	403	1.6	0.675	17.0	LOS B	7.0	49.9	0.95	1.13	1.33	46.5
West: Ellesmere Junction Rd														
10	L2	84	2	88	2.4	0.680	11.8	LOS B	7.6	53.8	0.90	1.00	1.17	48.8
11	T1	376	8	396	2.1	0.680	12.0	LOS B	7.6	53.8	0.90	1.00	1.17	49.7
12	R2	88	1	93	1.1	0.680	15.8	LOS B	7.6	53.8	0.90	1.00	1.17	49.5
Approach		548	11	577	2.0	0.680	12.6	LOS B	7.6	53.8	0.90	1.00	1.17	49.6
All Vehicles		1865	42	1963	2.3	0.680	11.6	LOS B	7.6	53.8	0.81	0.92	0.99	49.9

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.

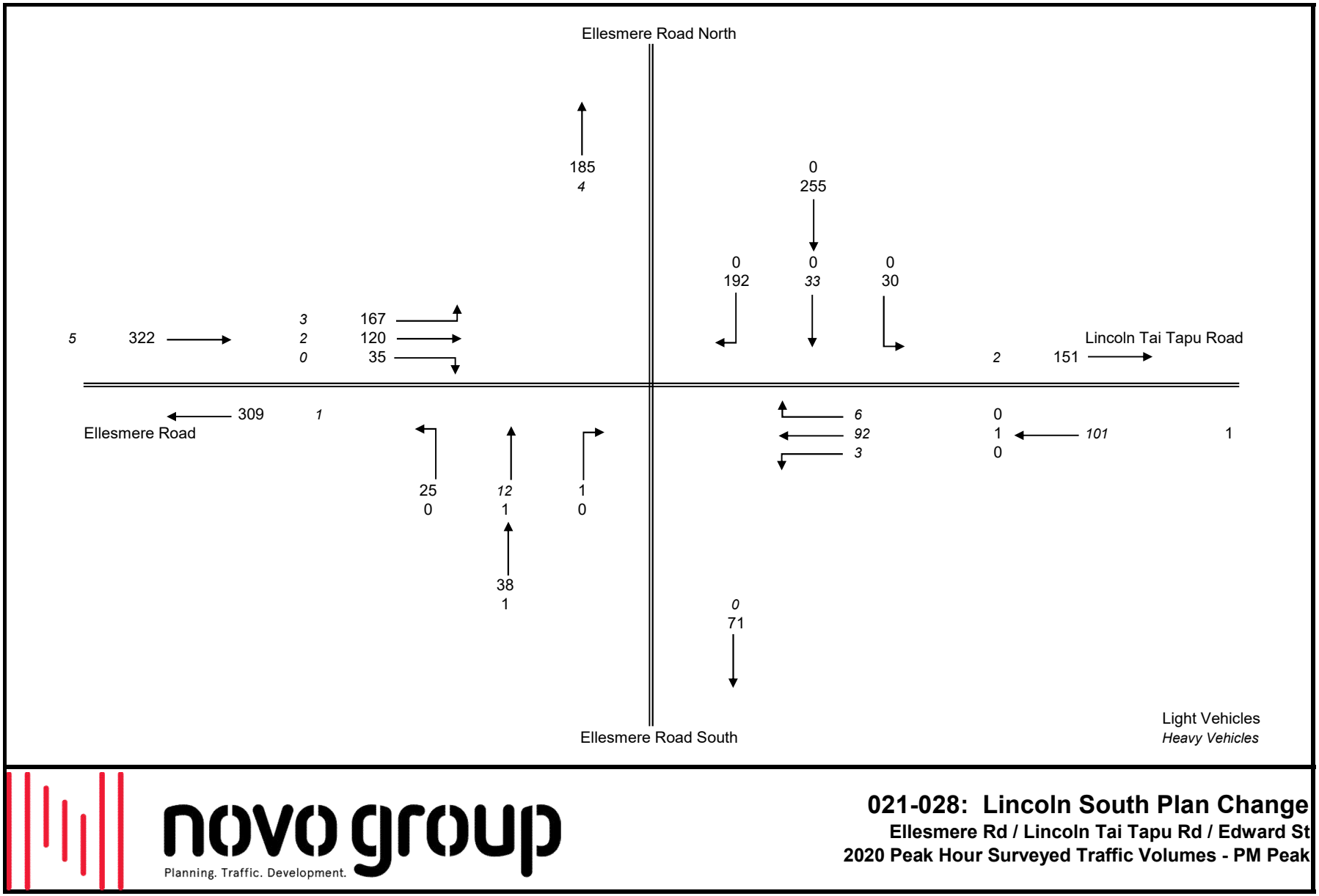
Appendix 4

Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Traffic Volumes



novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St
2020 Peak Hour Surveyed Traffic Volumes - AM Peak

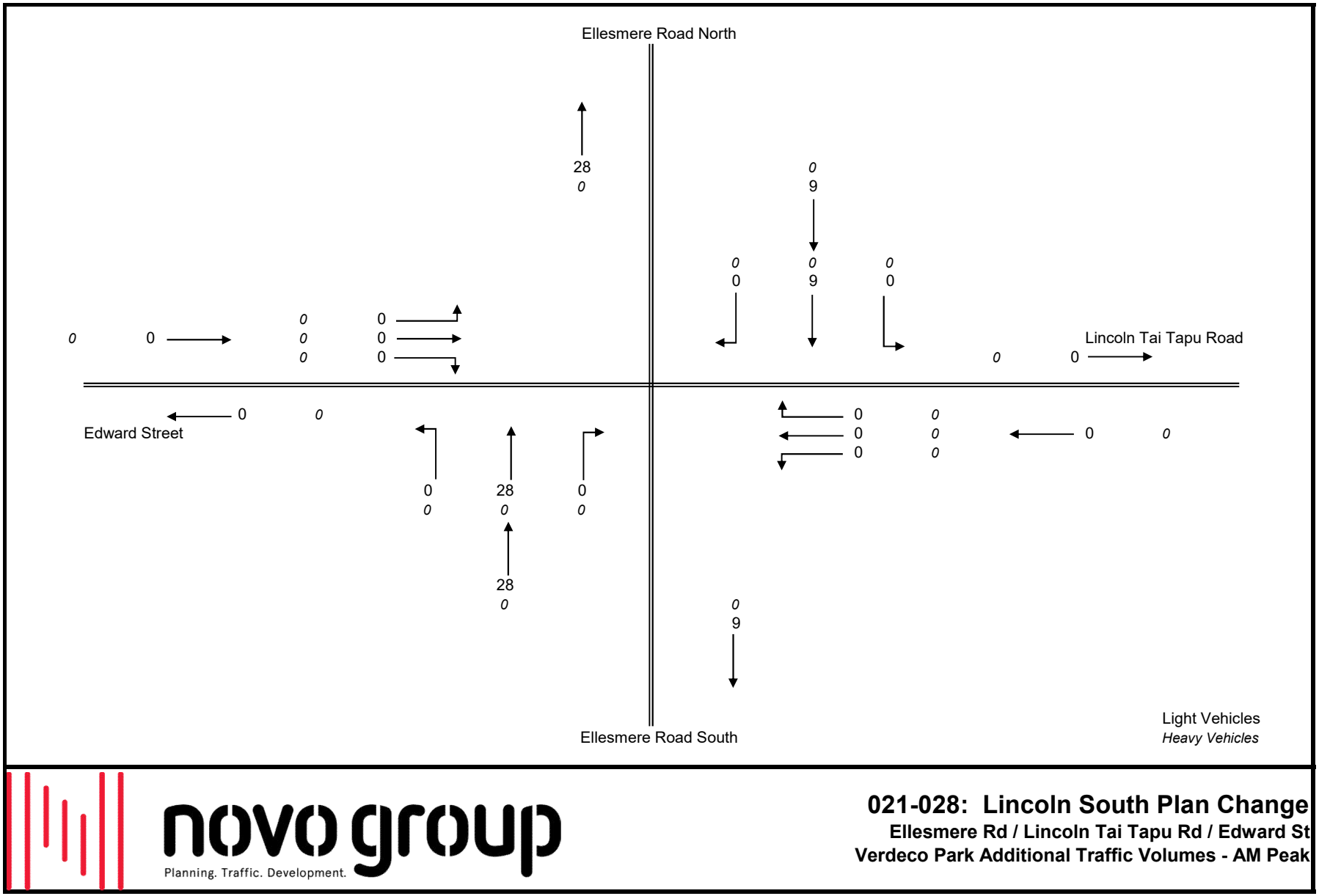


Planning. Traffic. Development.

021-028: Lincoln South Plan Change

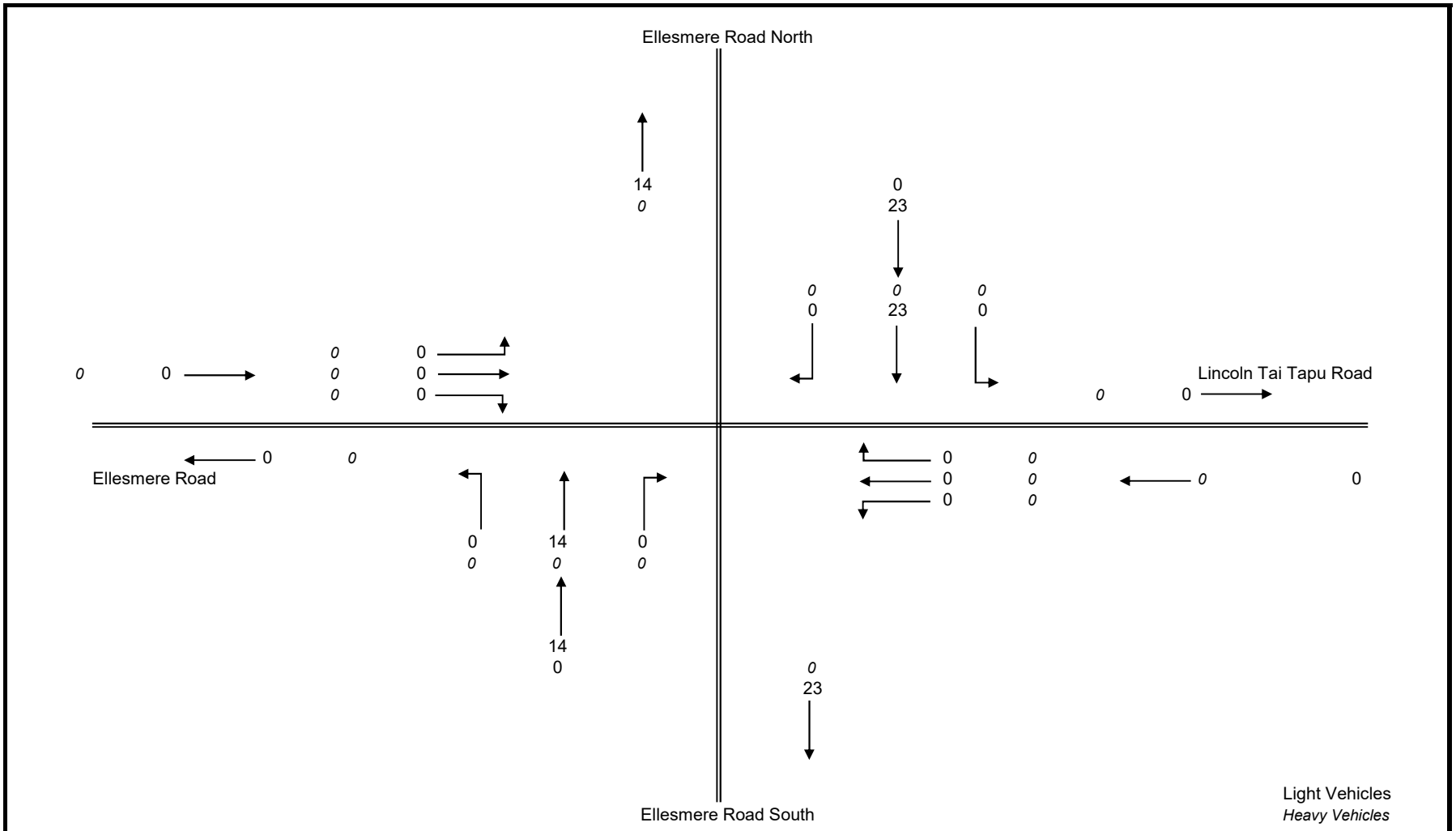
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

2020 Peak Hour Surveyed Traffic Volumes - PM Peak



novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St
Verdeco Park Additional Traffic Volumes - AM Peak

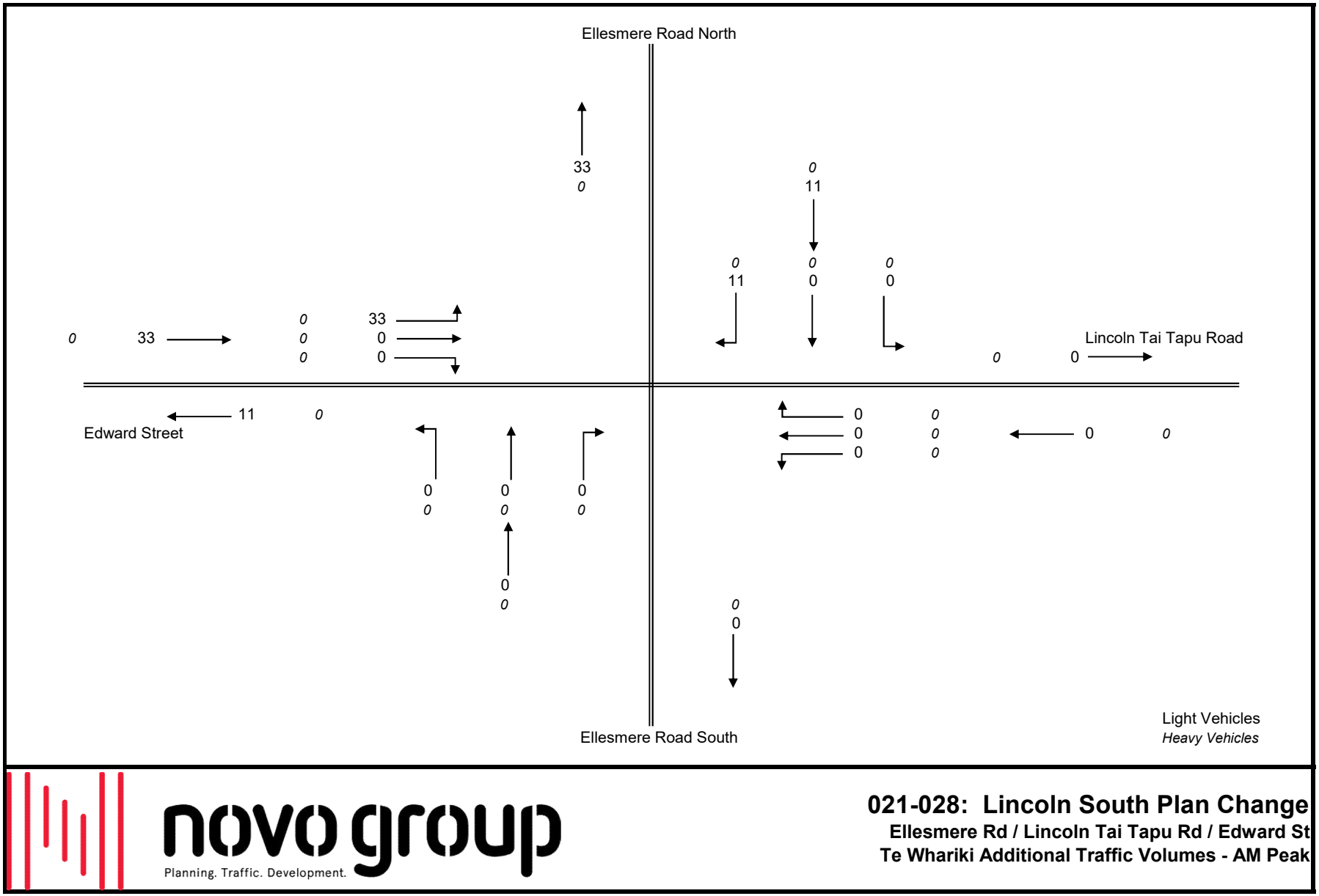


novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change

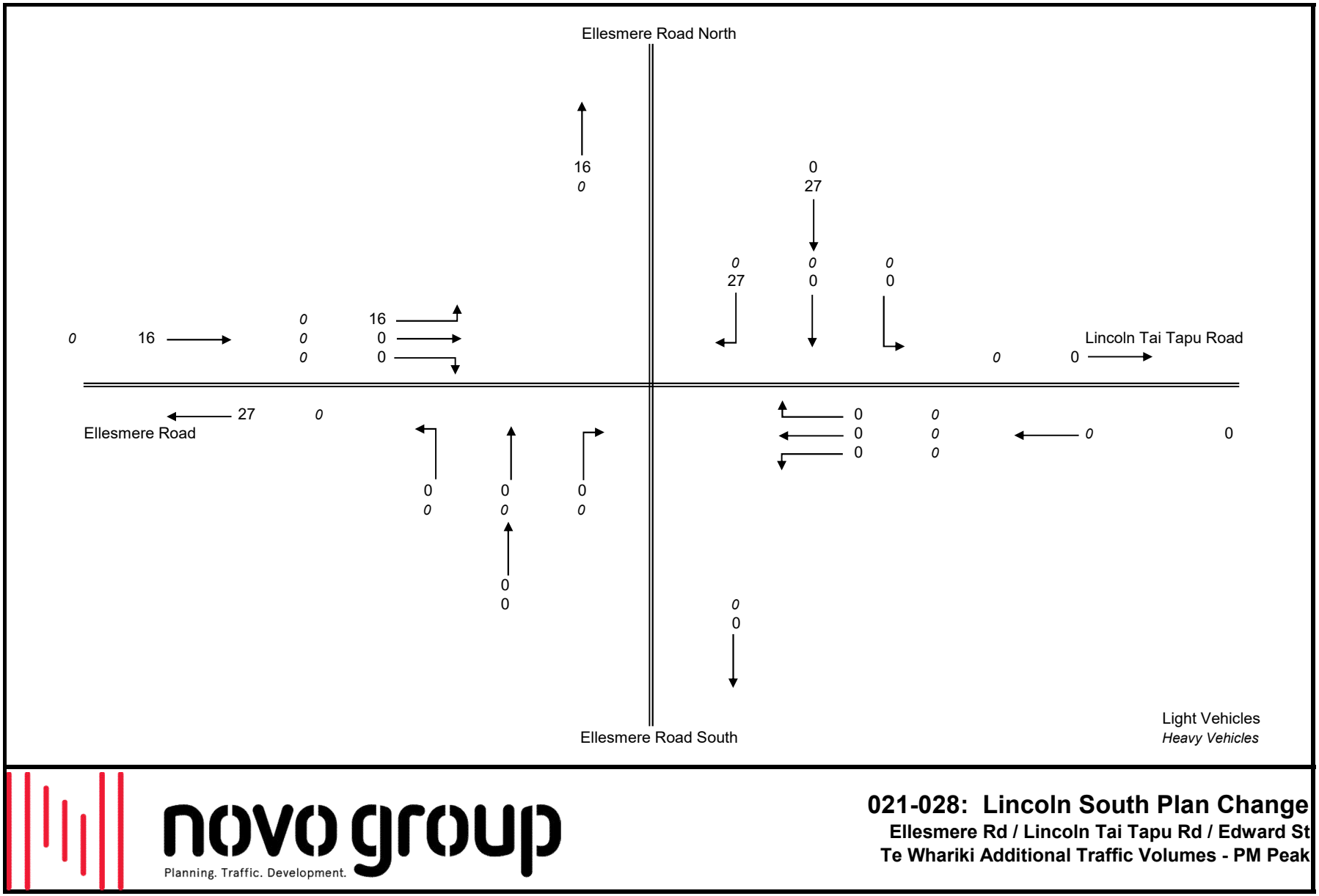
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

Verdeco Park Additional Traffic Volumes - PM Peak



novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St
Te Whariki Additional Traffic Volumes - AM Peak

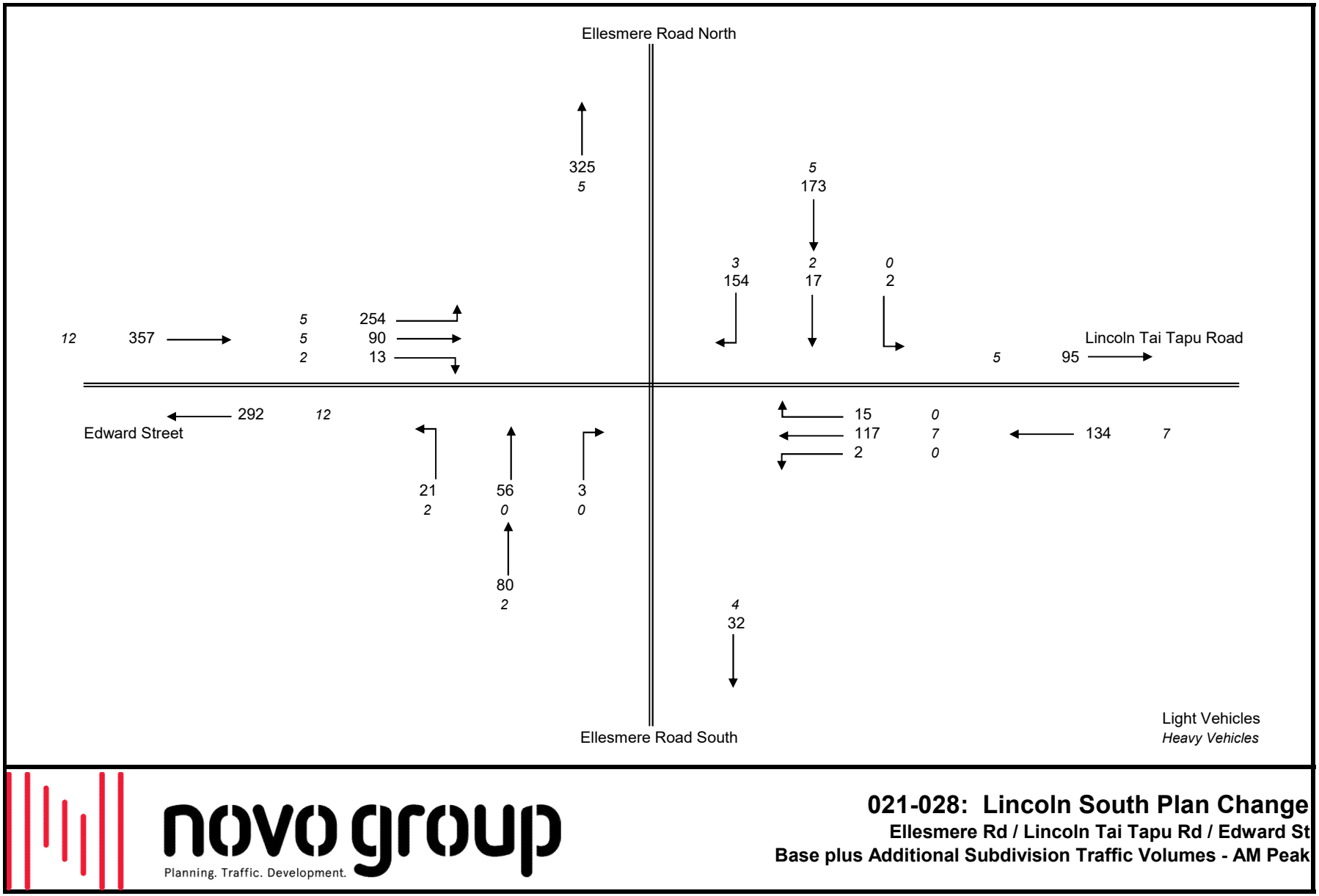


Planning. Traffic. Development.

021-028: Lincoln South Plan Change

Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

Te Whariki Additional Traffic Volumes - PM Peak

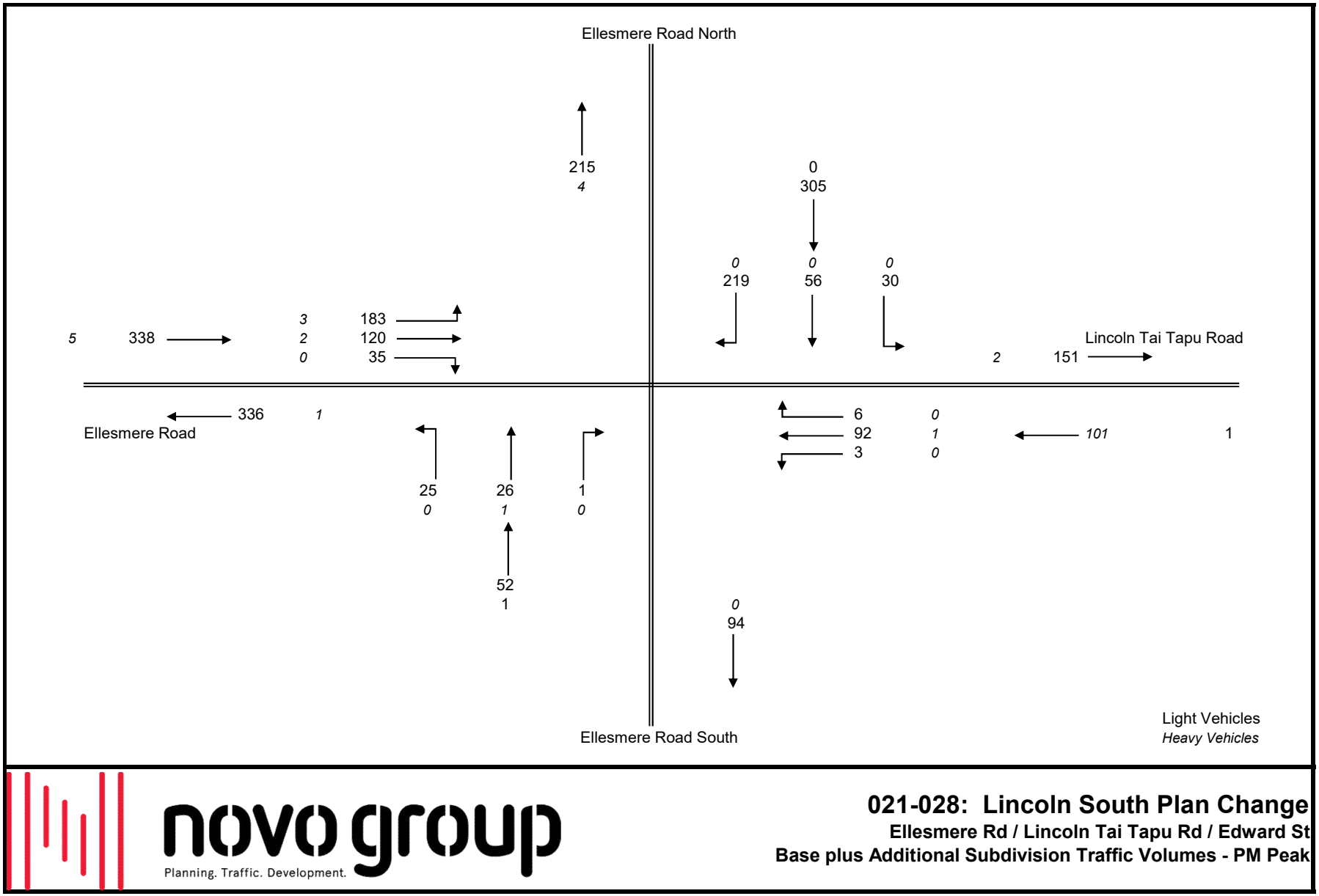


novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change

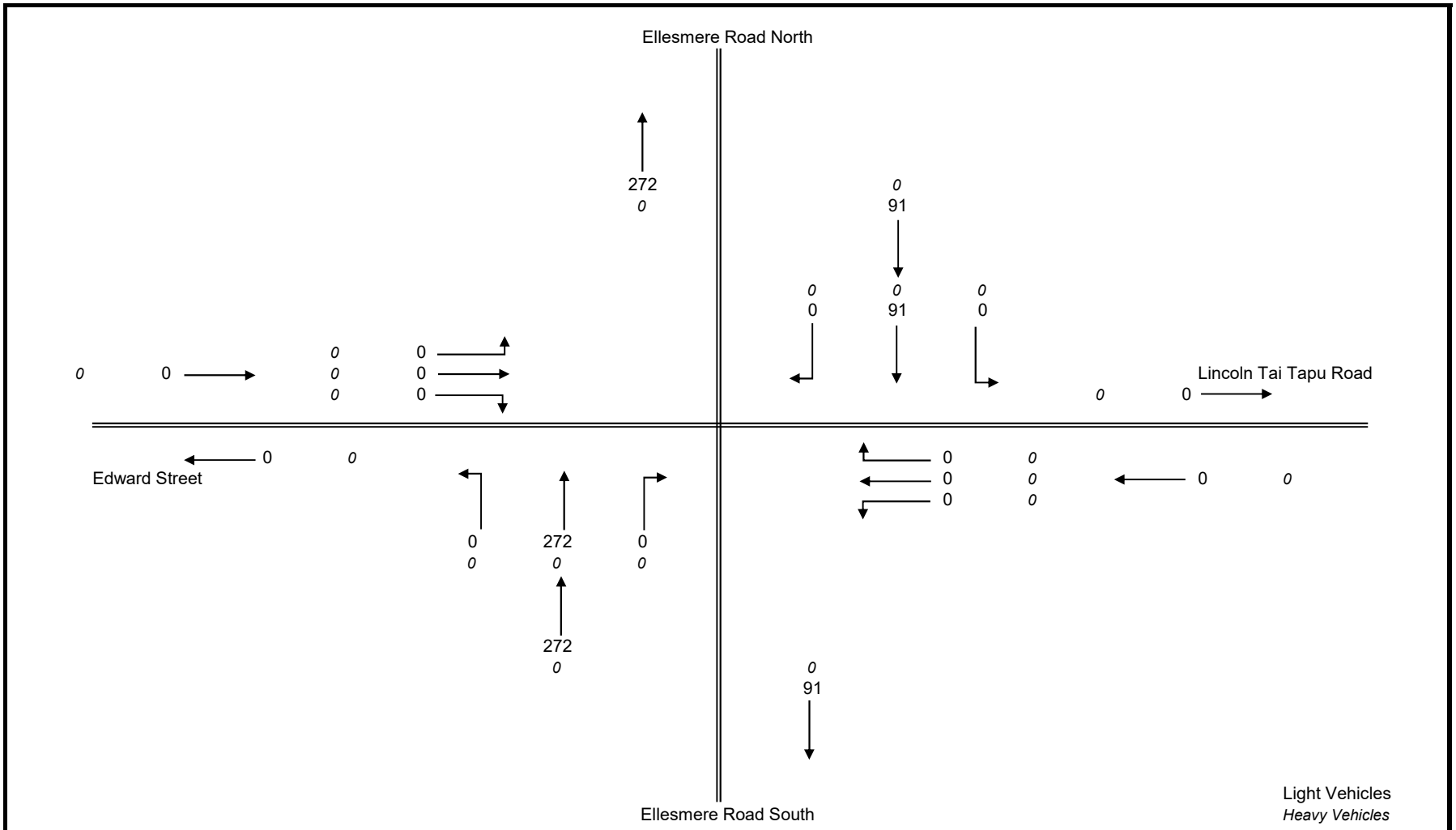
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

Base plus Additional Subdivision Traffic Volumes - AM Peak



novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St
Base plus Additional Subdivision Traffic Volumes - PM Peak

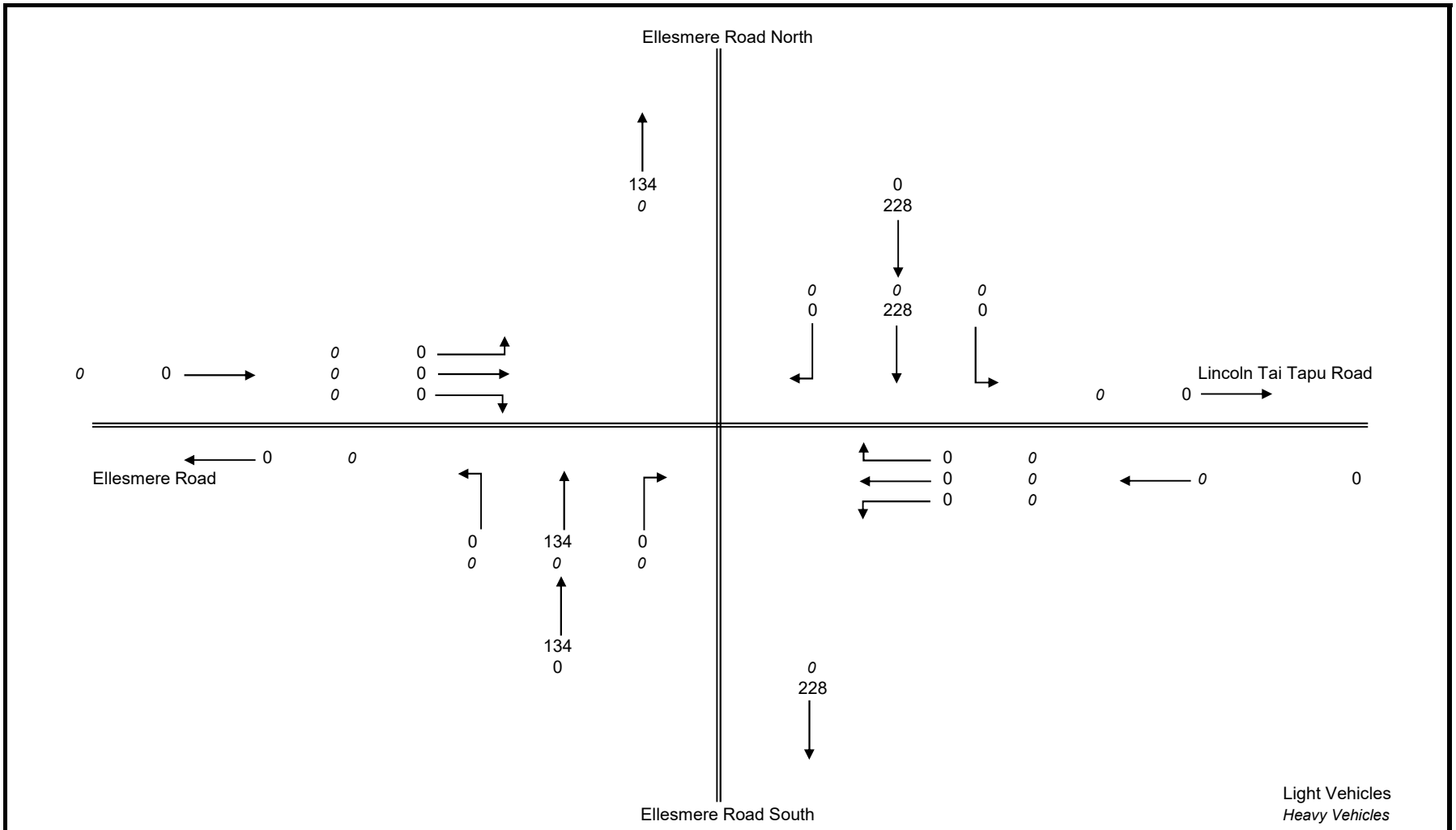


novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change

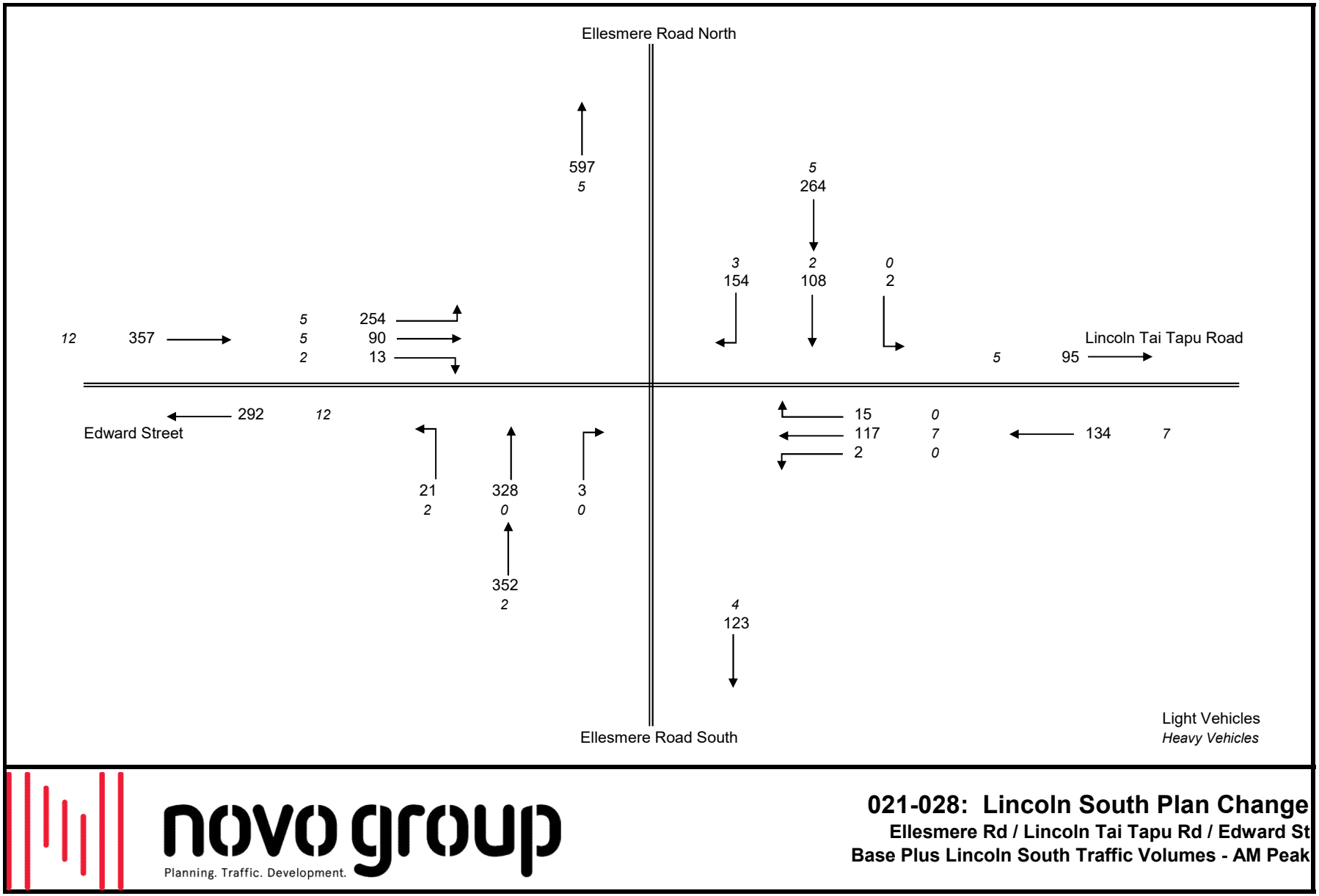
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

Lincoln South Traffic Volumes - AM Peak



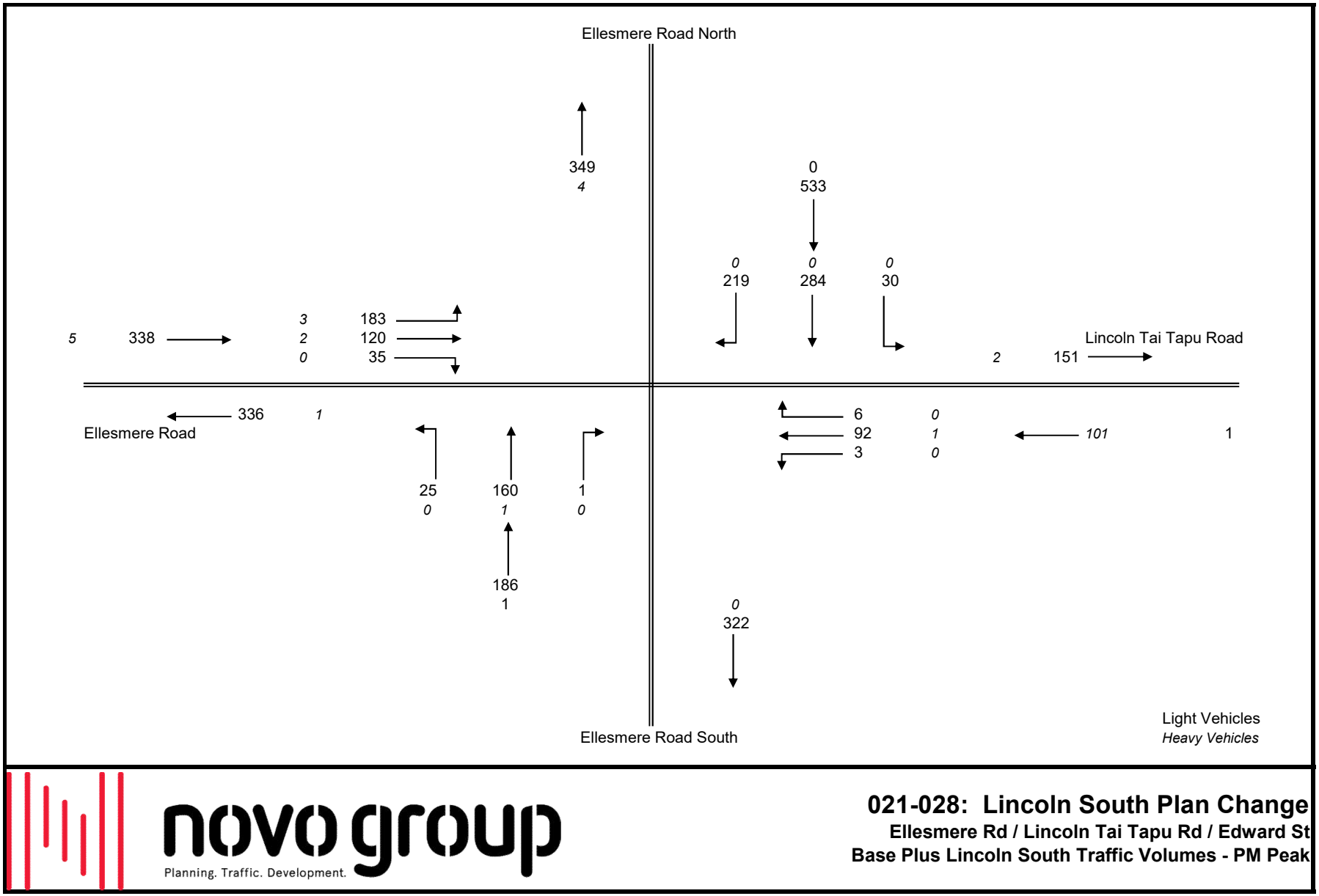
novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St
Lincoln South Traffic Volumes - PM Peak



novo group
Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St
Base Plus Lincoln South Traffic Volumes - AM Peak



Planning. Traffic. Development.

021-028: Lincoln South Plan Change

Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

Base Plus Lincoln South Traffic Volumes - PM Peak

Appendix 5

Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Operation – Existing

MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 AM Base (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h]	INPUT VOLUMES [HV] veh/h	DEMAND FLOWS [Total veh/h]	DEMAND FLOWS [HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	95% BACK OF QUEUE [Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Ellesmere Rd														
1	L2	23	2	24	8.7	0.069	9.8	LOS A	0.2	1.8	0.32	0.94	0.32	59.5
2	T1	28	0	29	0.0	0.069	11.6	LOS B	0.2	1.8	0.32	0.94	0.32	61.8
3	R2	3	0	3	0.0	0.069	10.0	LOS B	0.2	1.8	0.32	0.94	0.32	61.7
Approach		54	2	57	3.7	0.069	10.8	LOS B	0.2	1.8	0.32	0.94	0.32	60.8
East: Lincoln Tai Tapu Rd														
4	L2	2	0	2	0.0	0.082	8.1	LOS A	0.1	1.0	0.11	0.08	0.11	72.6
5	T1	124	7	131	5.6	0.082	0.2	LOS A	0.1	1.0	0.11	0.08	0.11	77.6
6	R2	15	0	16	0.0	0.082	7.8	LOS A	0.1	1.0	0.11	0.08	0.11	72.0
Approach		141	7	148	5.0	0.082	1.1	NA	0.1	1.0	0.11	0.08	0.11	76.9
North: Ellesmere Rd														
7	L2	2	0	2	0.0	0.273	9.5	LOS A	1.1	7.8	0.52	1.00	0.55	60.7
8	T1	10	2	11	20.0	0.273	12.9	LOS B	1.1	7.8	0.52	1.00	0.55	55.1
9	R2	146	3	154	2.1	0.273	12.3	LOS B	1.1	7.8	0.52	1.00	0.55	59.7
Approach		158	5	166	3.2	0.273	12.3	LOS B	1.1	7.8	0.52	1.00	0.55	59.4
West: Edward St														
10	L2	226	5	238	2.2	0.194	7.0	LOS A	0.2	1.3	0.04	0.44	0.04	66.7
11	T1	95	5	100	5.3	0.194	0.1	LOS A	0.2	1.3	0.04	0.44	0.04	71.9
12	R2	15	2	16	13.3	0.194	7.5	LOS A	0.2	1.3	0.04	0.44	0.04	62.4
Approach		336	12	354	3.6	0.194	5.1	NA	0.2	1.3	0.04	0.44	0.04	67.9
All Vehicles		689	26	725	3.8	0.273	6.4	NA	1.1	7.8	0.19	0.54	0.20	66.7

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.

MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 PM Base (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Ellesmere Rd														
1	L2	25	0	26	0.0	0.042	9.2	LOS A	0.2	1.1	0.22	0.93	0.22	62.6
2	T1	13	1	14	7.7	0.042	11.8	LOS B	0.2	1.1	0.22	0.93	0.22	59.9
3	R2	1	0	1	0.0	0.042	10.4	LOS B	0.2	1.1	0.22	0.93	0.22	62.1
Approach		39	1	41	2.6	0.042	10.1	LOS B	0.2	1.1	0.22	0.93	0.22	61.6
East: Lincoln Tai Tapu Rd														
4	L2	3	0	3	0.0	0.057	7.8	LOS A	0.1	0.4	0.07	0.06	0.07	73.3
5	T1	93	1	98	1.1	0.057	8.1	LOS A	0.1	0.4	0.07	0.06	0.07	76.4
6	R2	6	0	6	0.0	0.057	7.6	LOS A	0.1	0.4	0.07	0.06	0.07	72.6
Approach		102	1	107	1.0	0.057	0.8	NA	0.1	0.4	0.07	0.06	0.07	77.9
North: Ellesmere Rd														
7	L2	30	0	32	0.0	0.383	10.1	LOS B	2.0	13.7	0.49	1.00	0.59	60.8
8	T1	33	0	35	0.0	0.383	11.7	LOS B	2.0	13.7	0.49	1.00	0.59	60.5
9	R2	192	0	202	0.0	0.383	12.5	LOS B	2.0	13.7	0.49	1.00	0.59	60.3
Approach		255	0	268	0.0	0.383	12.1	LOS B	2.0	13.7	0.49	1.00	0.59	60.4
West: Edward St														
10	L2	170	3	179	1.8	0.186	7.1	LOS A	0.3	2.4	0.07	0.38	0.07	67.5
11	T1	122	2	128	1.6	0.186	0.1	LOS A	0.3	2.4	0.07	0.38	0.07	72.6
12	R2	35	0	37	0.0	0.186	7.0	LOS A	0.3	2.4	0.07	0.38	0.07	67.7
Approach		327	5	344	1.5	0.186	4.5	NA	0.3	2.4	0.07	0.38	0.07	69.4
All Vehicles		723	7	761	1.0	0.383	6.9	NA	2.0	13.7	0.23	0.58	0.26	66.5

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.

Appendix 6

TRICS Residential Trip Rates

Calculation Reference: AUDIT-191301-201024-1030

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : A - HOUSES PRIVATELY OWNED
TOTAL VEHICLES

Selected regions and areas:

02	SOUTH EAST		
	IW	ISLE OF WIGHT	1 days
	KC	KENT	2 days
	WS	WEST SUSSEX	1 days
03	SOUTH WEST		
	SM	SOMERSET	2 days
04	EAST ANGLIA		
	CA	CAMBRIDGESHIRE	1 days
	SF	SUFFOLK	1 days
05	EAST MIDLANDS		
	LE	LEICESTERSHIRE	1 days
09	NORTH		
	TW	TYNE & WEAR	1 days
12	CONNAUGHT		
	CS	SLIGO	2 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: No of Dwellings
Actual Range: 8 to 207 (units:)
Range Selected by User: 0 to 5000 (units:)

Parking Spaces Range: All Surveys Included

Parking Spaces per Dwelling Range: All Surveys Included

Bedrooms per Dwelling Range: All Surveys Included

Percentage of dwellings privately owned: All Surveys Included

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/12 to 19/11/19

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Tuesday	4 days
Thursday	4 days
Friday	4 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	12 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Neighbourhood Centre (PPS6 Local Centre)	11
Free Standing (PPS6 Out of Town)	1

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Village	11
Out of Town	1

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

C3	12 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 500m Range:

All Surveys Included

Population within 1 mile:

1,000 or Less	3 days
1,001 to 5,000	6 days
5,001 to 10,000	2 days
10,001 to 15,000	1 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

5,000 or Less	2 days
25,001 to 50,000	3 days
50,001 to 75,000	3 days
75,001 to 100,000	2 days
125,001 to 250,000	1 days
250,001 to 500,000	1 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0	1 days
1.1 to 1.5	7 days
1.6 to 2.0	4 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No	12 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present	12 days

This data displays the number of selected surveys with PTAL Ratings.

LIST OF SITES relevant to selection parameters

1 CA-03-A-06 MIXED HOUSES CAMBRIDGESHIRE
CRAFT'S WAY
NEAR CAMBRIDGE
BAR HILL
Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 207
Survey date: FRIDAY *22/06/18* *Survey Type: MANUAL*

2 CS-03-A-03 MIXED HOUSES SLIGO
TOP ROAD
STRANDHILL
STRANDHILL
Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 30
Survey date: THURSDAY *27/10/16* *Survey Type: MANUAL*

3 CS-03-A-04 DETACHED & SEMI-DETACHED SLIGO
R292
STRANDHILL

Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 63
Survey date: THURSDAY *27/10/16* *Survey Type: MANUAL*

4 IW-03-A-01 DETACHED HOUSES ISLE OF WIGHT
MEDHAM FARM LANE
NEAR COWES
MEDHAM
Free Standing (PPS6 Out of Town)
Out of Town
Total No of Dwellings: 72
Survey date: TUESDAY *25/06/19* *Survey Type: MANUAL*

5 KC-03-A-05 DETACHED & SEMI-DETACHED KENT
ROCHESTER ROAD
NEAR CHATHAM
BURHAM
Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 8
Survey date: FRIDAY *22/09/17* *Survey Type: MANUAL*

6 KC-03-A-08 MIXED HOUSES KENT
MAIDSTONE ROAD
CHARING

Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 159
Survey date: TUESDAY *22/05/18* *Survey Type: MANUAL*

7 LE-03-A-02 DETACHED & OTHERS LEICESTERSHIRE
MELBOURNE ROAD
IBSTOCK

Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 85
Survey date: THURSDAY *28/06/18* *Survey Type: MANUAL*

8 SF-03-A-06 DETACHED & SEMI-DETACHED SUFFOLK
BURY ROAD
KENTFORD

Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 38
Survey date: FRIDAY *22/09/17* *Survey Type: MANUAL*

LIST OF SITES relevant to selection parameters (Cont.)

9	SM-03-A-02	MIXED HOUSES		SOMERSET
	HYDE LANE			
	NEAR TAUNTON			
	CREECH SAINT MICHAEL			
	Neighbourhood Centre (PPS6 Local Centre)			
	Village			
	Total No of Dwellings:		42	
	Survey date: TUESDAY		*25/09/18*	*Survey Type: MANUAL*
10	SM-03-A-03	MIXED HOUSES		SOMERSET
	HYDE LANE			
	NEAR TAUNTON			
	CREECH ST MICHAEL			
	Neighbourhood Centre (PPS6 Local Centre)			
	Village			
	Total No of Dwellings:		41	
	Survey date: TUESDAY		*25/09/18*	*Survey Type: MANUAL*
11	TW-03-A-03	MIXED HOUSES		TYNE & WEAR
	STATION ROAD			
	NEAR NEWCASTLE			
	BACKWORTH			
	Neighbourhood Centre (PPS6 Local Centre)			
	Village			
	Total No of Dwellings:		33	
	Survey date: FRIDAY		*13/11/15*	*Survey Type: MANUAL*
12	WS-03-A-07	BUNGALOWS		WEST SUSSEX
	EMMS LANE			
	NEAR HORSHAM			
	BROOKS GREEN			
	Neighbourhood Centre (PPS6 Local Centre)			
	Village			
	Total No of Dwellings:		57	
	Survey date: THURSDAY		*19/10/17*	*Survey Type: MANUAL*

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED
TOTAL VEHICLES
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	12	70	0.065	12	70	0.250	12	70	0.315
08:00 - 09:00	12	70	0.165	12	70	0.383	12	70	0.548
09:00 - 10:00	12	70	0.163	12	70	0.226	12	70	0.389
10:00 - 11:00	12	70	0.145	12	70	0.172	12	70	0.317
11:00 - 12:00	12	70	0.153	12	70	0.193	12	70	0.346
12:00 - 13:00	12	70	0.187	12	70	0.198	12	70	0.385
13:00 - 14:00	12	70	0.186	12	70	0.176	12	70	0.362
14:00 - 15:00	12	70	0.208	12	70	0.190	12	70	0.398
15:00 - 16:00	12	70	0.216	12	70	0.189	12	70	0.405
16:00 - 17:00	12	70	0.284	12	70	0.183	12	70	0.467
17:00 - 18:00	12	70	0.362	12	70	0.168	12	70	0.530
18:00 - 19:00	12	70	0.260	12	70	0.153	12	70	0.413
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			2.394			2.481			4.875

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	8 - 207 (units:)
Survey date date range:	01/01/12 - 19/11/19
Number of weekdays (Monday-Friday):	12
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

Appendix 7

Springs Rd / Ellesmere Junction Rd / Gerald St Operation - Baseline

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM Base + Subdivisions (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Springs Rd														
1	L2	114	1	120	0.9	0.411	7.7	LOS A	2.6	18.8	0.73	0.82	0.74	51.2
2	T1	121	6	127	5.0	0.411	8.0	LOS A	2.6	18.8	0.73	0.82	0.74	52.2
3	R2	76	1	80	1.3	0.411	11.7	LOS B	2.6	18.8	0.73	0.82	0.74	52.0
Approach		311	8	327	2.6	0.411	8.8	LOS A	2.6	18.8	0.73	0.82	0.74	51.8
East: Gerald St														
4	L2	126	2	133	1.6	0.652	9.8	LOS A	6.7	48.0	0.87	0.94	1.05	49.9
5	T1	288	8	303	2.8	0.652	10.1	LOS B	6.7	48.0	0.87	0.94	1.05	50.9
6	R2	139	2	146	1.4	0.652	13.6	LOS B	6.7	48.0	0.87	0.94	1.05	50.7
Approach		553	12	582	2.2	0.652	10.9	LOS B	6.7	48.0	0.87	0.94	1.05	50.6
North: Springs Rd														
7	L2	175	9	184	5.1	0.860	24.4	LOS C	14.6	106.5	1.00	1.36	1.89	41.7
8	T1	246	5	259	2.0	0.860	24.5	LOS C	14.6	106.5	1.00	1.36	1.89	42.4
9	R2	115	11	121	9.6	0.860	28.8	LOS C	14.6	106.5	1.00	1.36	1.89	42.1
Approach		536	25	564	4.7	0.860	25.4	LOS C	14.6	106.5	1.00	1.36	1.89	42.1
West: Ellesmere Junction Rd														
10	L2	59	3	62	5.1	0.534	7.4	LOS A	4.2	31.0	0.70	0.75	0.73	51.3
11	T1	334	27	352	8.1	0.534	7.7	LOS A	4.2	31.0	0.70	0.75	0.73	52.2
12	R2	102	5	107	4.9	0.534	11.4	LOS B	4.2	31.0	0.70	0.75	0.73	52.0
Approach		495	35	521	7.1	0.534	8.4	LOS A	4.2	31.0	0.70	0.75	0.73	52.1
All Vehicles		1895	80	1995	4.2	0.860	14.0	LOS B	14.6	106.5	0.84	0.99	1.15	48.4

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.

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM Base + Subdivisions (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h]	INPUT VOLUMES [HV] veh/h	DEMAND FLOWS [Total veh/h]	DEMAND FLOWS [HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	95% BACK OF QUEUE [Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Springs Rd														
1	L2	128	5	135	3.9	0.645	10.7	LOS B	6.0	43.1	0.85	0.99	1.07	49.1
2	T1	222	6	234	2.7	0.645	10.9	LOS B	6.0	43.1	0.85	0.99	1.07	50.2
3	R2	141	0	148	0.0	0.645	14.5	LOS B	6.0	43.1	0.85	0.99	1.07	50.0
Approach		491	11	517	2.2	0.645	11.9	LOS B	6.0	43.1	0.85	0.99	1.07	49.8
East: Gerald St														
4	L2	76	2	80	2.6	0.578	8.1	LOS A	5.0	35.6	0.76	0.83	0.84	50.8
5	T1	293	10	308	3.4	0.578	8.3	LOS A	5.0	35.6	0.76	0.83	0.84	51.8
6	R2	159	2	167	1.3	0.578	12.1	LOS B	5.0	35.6	0.76	0.83	0.84	51.6
Approach		528	14	556	2.7	0.578	9.4	LOS A	5.0	35.6	0.76	0.83	0.84	51.6
North: Springs Rd														
7	L2	174	1	183	0.6	0.879	34.8	LOS C	14.6	103.2	1.00	1.44	2.18	37.3
8	T1	154	3	162	1.9	0.879	35.1	LOS D	14.6	103.2	1.00	1.44	2.18	37.9
9	R2	92	2	97	2.2	0.879	39.0	LOS D	14.6	103.2	1.00	1.44	2.18	37.7
Approach		420	6	442	1.4	0.879	35.8	LOS D	14.6	103.2	1.00	1.44	2.18	37.6
West: Ellesmere Junction Rd														
10	L2	84	2	88	2.4	0.835	18.3	LOS B	13.9	98.9	1.00	1.24	1.66	44.8
11	T1	405	8	426	2.0	0.835	18.5	LOS B	13.9	98.9	1.00	1.24	1.66	45.6
12	R2	166	1	175	0.6	0.835	22.2	LOS C	13.9	98.9	1.00	1.24	1.66	45.4
Approach		655	11	689	1.7	0.835	19.4	LOS B	13.9	98.9	1.00	1.24	1.66	45.4
All Vehicles		2094	42	2204	2.0	0.879	18.4	LOS B	14.6	103.2	0.90	1.12	1.42	45.9

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.

Appendix 8

Springs Rd / Ellesmere Junction Rd / Gerald St Operation – With Subdivision

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM Base + Plan Change (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Springs Rd														
1	L2	703	1	740	0.1	1.393	366.5	LOS F	223.1	1571.3	1.00	7.14	15.72	8.5
2	T1	320	6	337	1.9	1.393	366.8	LOS F	223.1	1571.3	1.00	7.14	15.72	8.5
3	R2	76	1	80	1.3	1.393	370.5	LOS F	223.1	1571.3	1.00	7.14	15.72	8.5
Approach		1099	8	1157	0.7	1.393	366.9	LOS F	223.1	1571.3	1.00	7.14	15.72	8.5
East: Gerald St														
4	L2	126	2	133	1.6	0.744	14.8	LOS B	9.1	64.9	0.96	1.15	1.41	46.8
5	T1	288	8	303	2.8	0.744	15.1	LOS B	9.1	64.9	0.96	1.15	1.41	47.6
6	R2	139	2	146	1.4	0.744	16.8	LOS B	9.1	64.9	0.96	1.15	1.41	47.4
Approach		553	12	582	2.2	0.744	16.0	LOS B	9.1	64.9	0.96	1.15	1.41	47.3
North: Springs Rd														
7	L2	175	9	184	5.1	1.296	292.5	LOS F	107.8	781.2	1.00	4.58	10.44	10.3
8	T1	312	5	328	1.6	1.296	292.5	LOS F	107.8	781.2	1.00	4.58	10.44	10.3
9	R2	115	11	121	9.6	1.296	296.9	LOS F	107.8	781.2	1.00	4.58	10.44	10.3
Approach		602	25	634	4.2	1.296	293.3	LOS F	107.8	781.2	1.00	4.58	10.44	10.3
West: Ellesmere Junction Rd														
10	L2	59	3	62	5.1	0.814	14.7	LOS B	12.7	92.7	0.99	1.11	1.45	46.4
11	T1	334	27	352	8.1	0.814	15.0	LOS B	12.7	92.7	0.99	1.11	1.45	47.1
12	R2	292	5	307	1.7	0.814	16.6	LOS B	12.7	92.7	0.99	1.11	1.45	47.1
Approach		685	35	721	5.1	0.814	16.5	LOS B	12.7	92.7	0.99	1.11	1.45	47.1
All Vehicles		2939	80	3094	2.7	1.393	204.1	LOS F	223.1	1571.3	0.99	4.08	8.62	13.8

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.

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM Base + Plan Change (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Springs Rd														
1	L2	409	5	431	1.2	1.131	138.6	LOS F	88.2	624.0	1.00	3.73	7.55	18.1
2	T1	320	6	337	1.9	1.131	138.8	LOS F	88.2	624.0	1.00	3.73	7.55	18.3
3	R2	141	0	148	0.0	1.131	142.5	LOS F	88.2	624.0	1.00	3.73	7.55	18.2
Approach		870	11	916	1.3	1.131	139.3	LOS F	88.2	624.0	1.00	3.73	7.55	18.2
East: Gerald St														
4	L2	76	2	80	2.6	0.774	17.9	LOS B	10.3	73.9	1.00	1.24	1.59	44.9
5	T1	293	10	308	3.4	0.774	18.2	LOS B	10.3	73.9	1.00	1.24	1.59	45.6
6	R2	159	2	167	1.3	0.774	21.9	LOS C	10.3	73.9	1.00	1.24	1.59	45.5
Approach		528	14	556	2.7	0.774	19.3	LOS B	10.3	73.9	1.00	1.24	1.59	45.5
North: Springs Rd														
7	L2	174	1	183	0.6	1.464	442.9	LOS F	138.9	980.7	1.00	5.31	12.79	7.2
8	T1	321	3	338	0.9	1.464	443.2	LOS F	138.9	980.7	1.00	5.31	12.79	7.2
9	R2	92	2	97	2.2	1.464	447.1	LOS F	138.9	980.7	1.00	5.31	12.79	7.2
Approach		587	6	618	1.0	1.464	443.7	LOS F	138.9	980.7	1.00	5.31	12.79	7.2
West: Ellesmere Junction Rd														
10	L2	84	2	88	2.4	1.522	483.6	LOS F	275.9	1947.3	1.00	8.09	18.02	6.7
11	T1	405	8	426	2.0	1.522	483.8	LOS F	275.9	1947.3	1.00	8.09	18.02	6.8
12	R2	643	1	677	0.2	1.522	487.6	LOS F	275.9	1947.3	1.00	8.09	18.02	6.8
Approach		1132	11	1192	1.0	1.522	486.0	LOS F	275.9	1947.3	1.00	8.09	18.02	6.8
All Vehicles		3117	42	3281	1.3	1.522	302.2	LOS F	275.9	1947.3	1.00	5.19	11.33	10.1

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 (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: NOVO GROUP LIMITED | Licence: PLUS / 1PC | Processed: Tuesday, 20 October 2020 9:21:21 am
Project: S:\Novo Projects\020-100 Favourites\021 Carter Group\021028 1491 Springs Road\04 Transport\Traffic Model\021-028 - Lincoln South Rev A.sip9

Appendix 9

Springs Rd / Ellesmere Junction Rd / Gerald St Council Traffic Signals Operation

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM Council (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Springs Rd														
1	L2	703	1	740	0.1	1.317	344.4	LOS F	184.1	1296.5	1.00	1.99	2.98	8.8
2	T1	320	6	337	1.9	*1.317	338.8	LOS F	184.1	1296.5	1.00	1.99	2.98	8.9
3	R2	76	1	80	1.3	0.745	71.6	LOS E	5.1	35.8	1.00	0.85	1.21	27.2
Approach		1099	8	1157	0.7	1.317	323.9	LOS F	184.1	1296.5	1.00	1.91	2.85	9.3
East: Gerald St														
4	L2	126	2	133	1.6	1.020	123.1	LOS F	11.9	84.5	1.00	1.18	1.96	19.6
5	T1	288	8	303	2.8	*1.590	581.7	LOS F	65.8	471.7	1.00	2.36	3.99	5.5
6	R2	139	2	146	1.4	0.637	61.4	LOS E	8.5	59.9	1.00	0.82	1.02	29.5
Approach		553	12	582	2.2	1.590	346.4	LOS F	65.8	471.7	1.00	1.70	2.78	8.7
North: Springs Rd														
7	L2	175	9	184	5.1	0.144	10.3	LOS B	3.0	21.9	0.35	0.65	0.35	50.6
8	T1	312	5	328	1.6	0.375	22.5	LOS C	12.4	87.9	0.70	0.60	0.70	43.8
9	R2	115	11	121	9.6	*1.194	246.2	LOS F	16.3	123.4	1.00	1.46	2.68	11.4
Approach		602	25	634	4.2	1.194	61.7	LOS E	16.3	123.4	0.66	0.78	0.98	29.2
West: Ellesmere Junction Rd														
10	L2	59	3	62	5.1	0.219	53.7	LOS D	3.2	23.5	0.91	0.75	0.91	31.4
11	T1	334	27	352	8.1	*1.309	337.5	LOS F	57.8	432.4	1.00	2.07	3.04	8.9
12	R2	292	5	307	1.7	1.135	198.3	LOS F	37.0	262.8	1.00	1.35	2.30	13.6
Approach		685	35	721	5.1	1.309	253.7	LOS F	57.8	432.4	0.99	1.65	2.54	11.2
All Vehicles		2939	80	3094	2.7	1.590	258.1	LOS F	184.1	1296.5	0.93	1.58	2.38	11.2

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.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM Council (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Springs Rd														
1	L2	409	5	431	1.2	1.460	472.3	LOS F	151.7	1075.5	1.00	2.39	3.53	6.7
2	T1	320	6	337	1.9	*1.460	466.8	LOS F	151.7	1075.5	1.00	2.39	3.53	6.7
3	R2	141	0	148	0.0	*1.370	395.0	LOS F	26.2	183.5	1.00	1.72	3.34	7.7
Approach		870	11	916	1.3	1.460	457.7	LOS F	151.7	1075.5	1.00	2.28	3.50	6.8
East: Gerald St														
4	L2	76	2	80	2.6	0.351	58.7	LOS E	4.4	31.5	0.96	0.77	0.96	30.1
5	T1	293	10	308	3.4	*1.502	504.3	LOS F	62.4	449.6	1.00	2.27	3.73	6.3
6	R2	159	2	167	1.3	0.727	63.5	LOS E	10.0	70.7	1.00	0.85	1.10	29.0
Approach		528	14	556	2.7	1.502	307.4	LOS F	62.4	449.6	0.99	1.63	2.54	9.6
North: Springs Rd														
7	L2	174	1	183	0.6	0.164	12.3	LOS B	3.6	25.5	0.42	0.67	0.42	49.3
8	T1	321	3	338	0.9	0.653	37.4	LOS D	16.6	116.8	0.89	0.77	0.89	37.2
9	R2	92	2	97	2.2	0.908	80.3	LOS F	6.6	47.2	1.00	0.99	1.55	25.6
Approach		587	6	618	1.0	0.908	36.7	LOS D	16.6	116.8	0.77	0.77	0.86	37.3
West: Ellesmere Junction Rd														
10	L2	84	2	88	2.4	0.157	37.8	LOS D	3.7	26.7	0.76	0.74	0.76	36.4
11	T1	405	8	426	2.0	0.832	45.7	LOS D	24.3	172.9	0.95	0.92	1.07	34.3
12	R2	643	1	677	0.2	*1.494	504.2	LOS F	138.3	969.3	1.00	1.92	3.66	6.3
Approach		1132	11	1192	1.0	1.494	305.6	LOS F	138.3	969.3	0.96	1.47	2.52	9.7
All Vehicles		3117	42	3281	1.3	1.502	297.7	LOS F	151.7	1075.5	0.94	1.59	2.48	9.9

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.
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.

* Critical Movement (Signal Timing)

Appendix 10

Springs Rd / Ellesmere Junction Rd / Gerald St Upgraded Traffic Signals Operation

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Springs Rd														
1	L2	703	1	740	0.1	0.646	15.5	LOS B	19.6	137.5	0.58	0.76	0.58	48.6
2	T1	320	6	337	1.9	0.583	44.9	LOS D	12.9	91.8	0.93	0.77	0.93	34.7
3	R2	76	1	80	1.3	* 0.652	68.8	LOS E	4.9	34.7	1.00	0.81	1.10	27.9
Approach		1099	8	1157	0.7	0.652	27.7	LOS C	19.6	137.5	0.71	0.76	0.72	41.6
East: Gerald St														
4	L2	126	2	133	1.6	0.333	49.8	LOS D	6.6	46.9	0.89	0.78	0.89	32.9
5	T1	288	8	303	2.8	0.770	50.2	LOS D	17.4	124.5	0.99	0.90	1.07	33.0
6	R2	139	2	146	1.4	* 0.682	63.2	LOS E	8.6	61.3	1.00	0.83	1.07	29.1
Approach		553	12	582	2.2	0.770	53.4	LOS D	17.4	124.5	0.97	0.85	1.03	31.9
North: Springs Rd														
7	L2	175	9	184	5.1	0.397	44.6	LOS D	9.2	66.9	0.87	0.80	0.87	34.1
8	T1	312	5	328	1.6	* 0.695	41.9	LOS D	16.7	118.5	0.94	0.80	0.94	35.6
9	R2	115	11	121	9.6	0.597	62.0	LOS E	7.0	53.0	1.00	0.80	1.00	29.4
Approach		602	25	634	4.2	0.695	46.5	LOS D	16.7	118.5	0.93	0.80	0.93	33.8
West: Ellesmere Junction Rd														
10	L2	59	3	62	5.1	0.710	41.5	LOS D	20.3	151.1	0.90	0.79	0.90	37.1
11	T1	334	27	352	8.1	* 0.710	35.1	LOS D	20.3	151.1	0.90	0.79	0.90	37.8
12	R2	292	5	307	1.7	0.424	46.1	LOS D	9.6	68.2	0.87	0.79	0.87	34.0
Approach		685	35	721	5.1	0.710	40.4	LOS D	20.3	151.1	0.89	0.79	0.89	36.0
All Vehicles		2939	80	3094	2.7	0.770	39.3	LOS D	20.3	151.1	0.84	0.79	0.86	36.5

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.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Springs Rd														
1	L2	409	5	431	1.2	0.393	11.5	LOS B	7.8	55.2	0.41	0.68	0.41	50.5
2	T1	320	6	337	1.9	0.843	58.1	LOS E	15.4	109.2	0.98	0.90	1.14	30.8
3	R2	141	0	148	0.0	* 0.872	74.0	LOS E	9.8	68.3	1.00	0.96	1.37	26.8
Approach		870	11	916	1.3	0.872	38.8	LOS D	15.4	109.2	0.71	0.81	0.83	36.7
East: Gerald St														
4	L2	76	2	80	2.6	0.297	52.5	LOS D	5.5	39.4	0.89	0.76	0.89	32.9
5	T1	293	10	308	3.4	0.745	50.3	LOS D	16.0	114.9	0.98	0.87	1.04	32.9
6	R2	159	2	167	1.3	* 0.839	70.2	LOS E	10.7	75.7	1.00	0.92	1.28	27.5
Approach		528	14	556	2.7	0.839	56.6	LOS E	16.0	114.9	0.98	0.87	1.09	31.1
North: Springs Rd														
7	L2	174	1	183	0.6	0.500	51.3	LOS D	10.1	71.2	0.93	0.81	0.93	32.2
8	T1	321	3	338	0.9	* 0.875	59.0	LOS E	20.9	147.7	1.00	1.01	1.24	30.5
9	R2	92	2	97	2.2	0.353	55.9	LOS E	5.2	37.0	0.94	0.78	0.94	30.9
Approach		587	6	618	1.0	0.875	56.2	LOS E	20.9	147.7	0.97	0.91	1.10	31.1
West: Ellesmere Junction Rd														
10	L2	84	2	88	2.4	0.865	49.0	LOS D	29.0	206.8	0.90	0.91	1.05	34.5
11	T1	405	8	426	2.0	* 0.865	42.5	LOS D	29.0	206.8	0.90	0.91	1.05	35.1
12	R2	643	1	677	0.2	0.770	47.1	LOS D	23.6	165.2	0.93	0.85	0.96	33.9
Approach		1132	11	1192	1.0	0.865	45.6	LOS D	29.0	206.8	0.92	0.88	1.00	34.4
All Vehicles		3117	42	3281	1.3	0.875	47.6	LOS D	29.0	206.8	0.88	0.86	0.99	33.7

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.
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.

* Critical Movement (Signal Timing)

Appendix 11

Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Operation - Baseline

MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 AM Base + Subdivisions (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Ellesmere Rd														
1	L2	23	2	24	8.7	0.117	9.9	LOS A	0.4	3.1	0.38	0.97	0.38	59.0
2	T1	56	0	59	0.0	0.117	12.1	LOS B	0.4	3.1	0.38	0.97	0.38	61.2
3	R2	3	0	3	0.0	0.117	16.2	LOS B	0.4	3.1	0.38	0.97	0.38	61.1
Approach		82	2	86	2.4	0.117	11.4	LOS B	0.4	3.1	0.38	0.97	0.38	60.6
East: Lincoln Tai Tapu Rd														
4	L2	2	0	2	0.0	0.083	8.3	LOS A	0.1	1.0	0.12	0.08	0.12	72.5
5	T1	124	7	131	5.6	0.083	8.2	LOS A	0.1	1.0	0.12	0.08	0.12	77.6
6	R2	15	0	16	0.0	0.083	8.0	LOS A	0.1	1.0	0.12	0.08	0.12	71.9
Approach		141	7	148	5.0	0.083	1.2	NA	0.1	1.0	0.12	0.08	0.12	76.9
North: Ellesmere Rd														
7	L2	2	0	2	0.0	0.322	9.8	LOS A	1.4	10.1	0.55	1.03	0.65	59.9
8	T1	19	2	20	10.5	0.322	12.7	LOS B	1.4	10.1	0.55	1.03	0.65	56.8
9	R2	157	3	165	1.9	0.322	13.2	LOS B	1.4	10.1	0.55	1.03	0.65	58.9
Approach		178	5	187	2.8	0.322	13.1	LOS B	1.4	10.1	0.55	1.03	0.65	58.7
West: Edward St														
10	L2	259	5	273	1.9	0.212	7.0	LOS A	0.2	1.3	0.04	0.46	0.04	66.6
11	T1	95	5	100	5.3	0.212	8.1	LOS A	0.2	1.3	0.04	0.46	0.04	71.6
12	R2	15	2	16	13.3	0.212	7.5	LOS A	0.2	1.3	0.04	0.46	0.04	62.2
Approach		369	12	388	3.3	0.212	5.3	NA	0.2	1.3	0.04	0.46	0.04	67.6
All Vehicles		770	26	811	3.4	0.322	7.0	NA	1.4	10.1	0.21	0.58	0.23	66.0

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.

MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 PM Base + Subdivisions (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h]	INPUT VOLUMES HV] veh/h	DEMAND FLOWS [Total veh/h]	DEMAND FLOWS HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	95% BACK OF QUEUE Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Ellesmere Rd														
1	L2	25	0	26	0.0	0.063	9.2	LOS A	0.2	1.6	0.26	0.94	0.26	62.2
2	T1	27	1	28	3.7	0.063	11.6	LOS B	0.2	1.6	0.26	0.94	0.26	60.8
3	R2	1	0	1	0.0	0.063	10.7	LOS B	0.2	1.6	0.26	0.94	0.26	61.8
Approach		53	1	56	1.9	0.063	10.5	LOS B	0.2	1.6	0.26	0.94	0.26	61.5
East: Lincoln Tai Tapu Rd														
4	L2	3	0	3	0.0	0.057	7.8	LOS A	0.1	0.4	0.07	0.06	0.07	73.3
5	T1	93	1	98	1.1	0.057	0.1	LOS A	0.1	0.4	0.07	0.06	0.07	78.4
6	R2	6	0	6	0.0	0.057	7.7	LOS A	0.1	0.4	0.07	0.06	0.07	72.6
Approach		102	1	107	1.0	0.057	0.8	NA	0.1	0.4	0.07	0.06	0.07	77.9
North: Ellesmere Rd														
7	L2	30	0	32	0.0	0.469	10.6	LOS B	2.8	19.7	0.54	1.04	0.74	59.9
8	T1	56	0	59	0.0	0.469	12.5	LOS B	2.8	19.7	0.54	1.04	0.74	59.6
9	R2	219	0	231	0.0	0.469	13.6	LOS B	2.8	19.7	0.54	1.04	0.74	59.4
Approach		305	0	321	0.0	0.469	13.1	LOS B	2.8	19.7	0.54	1.04	0.74	59.5
West: Edward St														
10	L2	186	3	196	1.6	0.195	7.0	LOS A	0.3	2.4	0.07	0.39	0.07	67.5
11	T1	122	2	128	1.6	0.195	0.1	LOS A	0.3	2.4	0.07	0.39	0.07	72.5
12	R2	35	0	37	0.0	0.195	7.0	LOS A	0.3	2.4	0.07	0.39	0.07	67.6
Approach		343	5	361	1.5	0.195	4.6	NA	0.3	2.4	0.07	0.39	0.07	69.2
All Vehicles		803	7	845	0.9	0.469	7.7	NA	2.8	19.7	0.26	0.63	0.34	65.5

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.

Appendix 12

Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Operation – With Subdivision

MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 AM Base + Plan Change (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Ellesmere Rd														
1	L2	23	2	24	8.7	0.569	12.1	LOS B	3.9	27.6	0.64	1.12	1.05	55.8
2	T1	328	0	345	0.0	0.569	15.7	LOS C	3.9	27.6	0.64	1.12	1.05	57.8
3	R2	3	0	3	0.0	0.569	14.1	LOS B	3.9	27.6	0.64	1.12	1.05	57.7
Approach		354	2	373	0.6	0.569	15.5	LOS C	3.9	27.6	0.64	1.12	1.05	57.7
East: Lincoln Tai Tapu Rd														
4	L2	2	0	2	0.0	0.083	8.3	LOS A	0.1	1.0	0.12	0.08	0.12	72.5
5	T1	124	7	131	5.6	0.083	0.2	LOS A	0.1	1.0	0.12	0.08	0.12	77.6
6	R2	15	0	16	0.0	0.083	8.0	LOS A	0.1	1.0	0.12	0.08	0.12	71.9
Approach		141	7	148	5.0	0.083	1.2	NA	0.1	1.0	0.12	0.08	0.12	76.9
North: Ellesmere Rd														
7	L2	2	0	2	0.0	0.595	12.6	LOS B	3.7	26.3	0.70	1.15	1.24	54.9
8	T1	110	2	116	1.8	0.595	15.0	LOS C	3.7	26.3	0.70	1.15	1.24	54.3
9	R2	157	3	165	1.9	0.595	21.8	LOS C	3.7	26.3	0.70	1.15	1.24	54.1
Approach		269	5	283	1.9	0.595	19.0	LOS C	3.7	26.3	0.70	1.15	1.24	54.2
West: Edward St														
10	L2	259	5	273	1.9	0.212	7.0	LOS A	0.2	1.3	0.04	0.46	0.04	66.6
11	T1	95	5	100	5.3	0.212	0.1	LOS A	0.2	1.3	0.04	0.46	0.04	71.6
12	R2	15	2	16	13.3	0.212	7.5	LOS A	0.2	1.3	0.04	0.46	0.04	62.2
Approach		369	12	388	3.3	0.212	5.3	NA	0.2	1.3	0.04	0.46	0.04	67.6
All Vehicles		1133	26	1193	2.3	0.595	11.2	NA	3.9	27.6	0.39	0.78	0.65	61.6

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.

Organisation: NOVO GROUP LIMITED | Licence: PLUS / 1PC | Processed: Friday 23 October 2020 2:56:52 pm
Project: S:\Novo Projects\020-100 Favourites\021 Carter Group\021028 1491 Springs Road\04 Transport\Traffic Model\021-028 - Lincoln South Rev A.sip9

MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 PM Base + Plan Change (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Ellesmere Rd														
1	L2	25	0	26	0.0	0.265	9.3	LOS A	1.1	7.6	0.43	1.00	0.44	61.4
2	T1	161	1	169	0.6	0.265	11.9	LOS B	1.1	7.6	0.43	1.00	0.44	60.9
3	R2	1	0	1	0.0	0.265	14.1	LOS B	1.1	7.6	0.43	1.00	0.44	61.0
Approach		187	1	197	0.5	0.265	11.6	LOS B	1.1	7.6	0.43	1.00	0.44	61.0
East: Lincoln Tai Tapu Rd														
4	L2	3	0	3	0.0	0.057	7.8	LOS A	0.1	0.4	0.07	0.06	0.07	73.3
5	T1	93	1	98	1.1	0.057	8.1	LOS A	0.1	0.4	0.07	0.06	0.07	78.4
6	R2	6	0	6	0.0	0.057	7.7	LOS A	0.1	0.4	0.07	0.06	0.07	72.6
Approach		102	1	107	1.0	0.057	8.8	NA	0.1	0.4	0.07	0.06	0.07	77.9
North: Ellesmere Rd														
7	L2	30	0	32	0.0	0.843	17.7	LOS C	12.3	85.9	0.78	1.38	2.14	52.5
8	T1	284	0	299	0.0	0.843	20.5	LOS C	12.3	85.9	0.78	1.38	2.14	52.3
9	R2	219	0	231	0.0	0.843	25.1	LOS D	12.3	85.9	0.78	1.38	2.14	52.1
Approach		533	0	561	0.0	0.843	22.2	LOS C	12.3	85.9	0.78	1.38	2.14	52.2
West: Edward St														
10	L2	186	3	196	1.6	0.195	7.0	LOS A	0.3	2.4	0.07	0.39	0.07	67.5
11	T1	122	2	128	1.6	0.195	8.1	LOS A	0.3	2.4	0.07	0.39	0.07	72.5
12	R2	35	0	37	0.0	0.195	7.0	LOS A	0.3	2.4	0.07	0.39	0.07	67.6
Approach		343	5	361	1.5	0.195	4.6	NA	0.3	2.4	0.07	0.39	0.07	69.2
All Vehicles		1165	7	1226	0.6	0.843	13.4	NA	12.3	85.9	0.45	0.91	1.07	59.6

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.

Appendix 13

Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Roundabout Operation – With Subdivision

MOVEMENT SUMMARY

Site: 101v [Edward St / Ellesmere Rd - 2020 AM Base + Plan Change - Conversion (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Ellesmere Rd														
1	L2	23	2	24	8.7	0.357	8.2	LOS A	2.4	17.2	0.60	0.66	0.60	60.9
2	T1	328	0	345	0.0	0.357	8.5	LOS A	2.4	17.2	0.60	0.66	0.60	64.8
3	R2	3	0	3	0.0	0.357	13.1	LOS B	2.4	17.2	0.60	0.66	0.60	64.4
Approach		354	2	373	0.6	0.357	8.5	LOS A	2.4	17.2	0.60	0.66	0.60	64.5
East: Lincoln Tai Tapu Rd														
4	L2	2	0	2	0.0	0.147	7.4	LOS A	0.9	6.5	0.52	0.62	0.52	63.3
5	T1	124	7	131	5.6	0.147	8.2	LOS A	0.9	6.5	0.52	0.62	0.52	63.3
6	R2	15	0	16	0.0	0.147	12.6	LOS B	0.9	6.5	0.52	0.62	0.52	64.5
Approach		141	7	148	5.0	0.147	8.6	LOS A	0.9	6.5	0.52	0.62	0.52	63.4
North: Ellesmere Rd														
7	L2	2	0	2	0.0	0.229	6.4	LOS A	1.7	12.2	0.41	0.60	0.41	62.4
8	T1	110	2	116	1.8	0.229	7.1	LOS A	1.7	12.2	0.41	0.60	0.41	63.4
9	R2	157	3	165	1.9	0.229	11.7	LOS B	1.7	12.2	0.41	0.60	0.41	62.9
Approach		269	5	283	1.9	0.229	9.8	LOS A	1.7	12.2	0.41	0.60	0.41	63.1
West: Edward St														
10	L2	259	5	273	1.9	0.408	8.5	LOS A	3.1	22.2	0.70	0.73	0.70	63.2
11	T1	95	5	100	5.3	0.408	9.2	LOS A	3.1	22.2	0.70	0.73	0.70	63.8
12	R2	15	2	16	13.3	0.408	14.1	LOS B	3.1	22.2	0.70	0.73	0.70	60.8
Approach		369	12	388	3.3	0.408	8.9	LOS A	3.1	22.2	0.70	0.73	0.70	63.2
All Vehicles		1133	26	1193	2.3	0.408	9.0	LOS A	3.1	22.2	0.58	0.66	0.58	63.6

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.

MOVEMENT SUMMARY

Site: 101v [Edward St / Ellesmere Rd - 2020 PM Base + Plan Change - Conversion (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	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: Ellesmere Rd														
1	L2	25	0	26	0.0	0.194	7.6	LOS A	1.2	8.5	0.56	0.63	0.56	63.7
2	T1	161	1	169	0.6	0.194	8.3	LOS A	1.2	8.5	0.56	0.63	0.56	65.0
3	R2	1	0	1	0.0	0.194	12.8	LOS B	1.2	8.5	0.56	0.63	0.56	64.8
Approach		187	1	197	0.5	0.194	8.2	LOS A	1.2	8.5	0.56	0.63	0.56	64.9
East: Lincoln Tai Tapu Rd														
4	L2	3	0	3	0.0	0.134	9.2	LOS A	0.9	6.1	0.70	0.71	0.70	62.4
5	T1	93	1	98	1.1	0.134	9.9	LOS A	0.9	6.1	0.70	0.71	0.70	63.5
6	R2	6	0	6	0.0	0.134	14.4	LOS B	0.9	6.1	0.70	0.71	0.70	63.5
Approach		102	1	107	1.0	0.134	10.1	LOS B	0.9	6.1	0.70	0.71	0.70	63.5
North: Ellesmere Rd														
7	L2	30	0	32	0.0	0.458	7.0	LOS A	4.1	28.7	0.56	0.62	0.56	62.4
8	T1	284	0	299	0.0	0.458	7.7	LOS A	4.1	28.7	0.56	0.62	0.56	63.8
9	R2	219	0	231	0.0	0.458	12.3	LOS B	4.1	28.7	0.56	0.62	0.56	63.5
Approach		533	0	561	0.0	0.458	9.5	LOS A	4.1	28.7	0.56	0.62	0.56	63.6
West: Edward St														
10	L2	186	3	196	1.6	0.305	6.8	LOS A	2.2	15.7	0.48	0.59	0.48	64.0
11	T1	122	2	128	1.6	0.305	7.5	LOS A	2.2	15.7	0.48	0.59	0.48	65.6
12	R2	35	0	37	0.0	0.305	12.0	LOS B	2.2	15.7	0.48	0.59	0.48	65.6
Approach		343	5	361	1.5	0.305	7.6	LOS A	2.2	15.7	0.48	0.59	0.48	64.7
All Vehicles		1165	7	1226	0.6	0.458	8.8	LOS A	4.1	28.7	0.55	0.62	0.55	64.1

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.

Appendix E

Landscape and Urban Design Assessment

LINCOLN SOUTH PLAN CHANGE

FOR ROLLESTON INDUSTRIAL DEVELOPMENTS LIMITED

28 OCTOBER 2020
PROJECT. 2020_113
REVISION D

LINCOLN SOUTH PLAN CHANGE - URBAN DESIGN STATEMENT

Project no:	2020_113
Document title:	2020_113 Carter Lincoln South Plan Change_Urban Design Statement_D
Revision:	D
Date:	28 October 2020
Client name:	Rolleston Industrial Developments Limited

Author: David Compton-Moen / Peter McAuley

DOCUMENT HISTORY AND STATUS

REVISION	DATE	DESCRIPTION	BY	REVIEW	APPROVED
A	15/10/2020	DRAFT ISSUE	DCM / PM	JP (NOVO)	BVD
B	20/10/2020	DRAFT ISSUE	DCM/PM	JP (NOVO)	BVD
C	23/10/2020	COUNCIL ISSUE	DCM/PM	JP (NOVO)	BVD
D	28/10/2020	COUNCIL ISSUE	DCM/PM	JP(NOVO)	

DCM URBAN DESIGN LIMITED

Level 3, 329 Durham Street North
Christchurch 8013

INOVO PROJECTS LIMITED

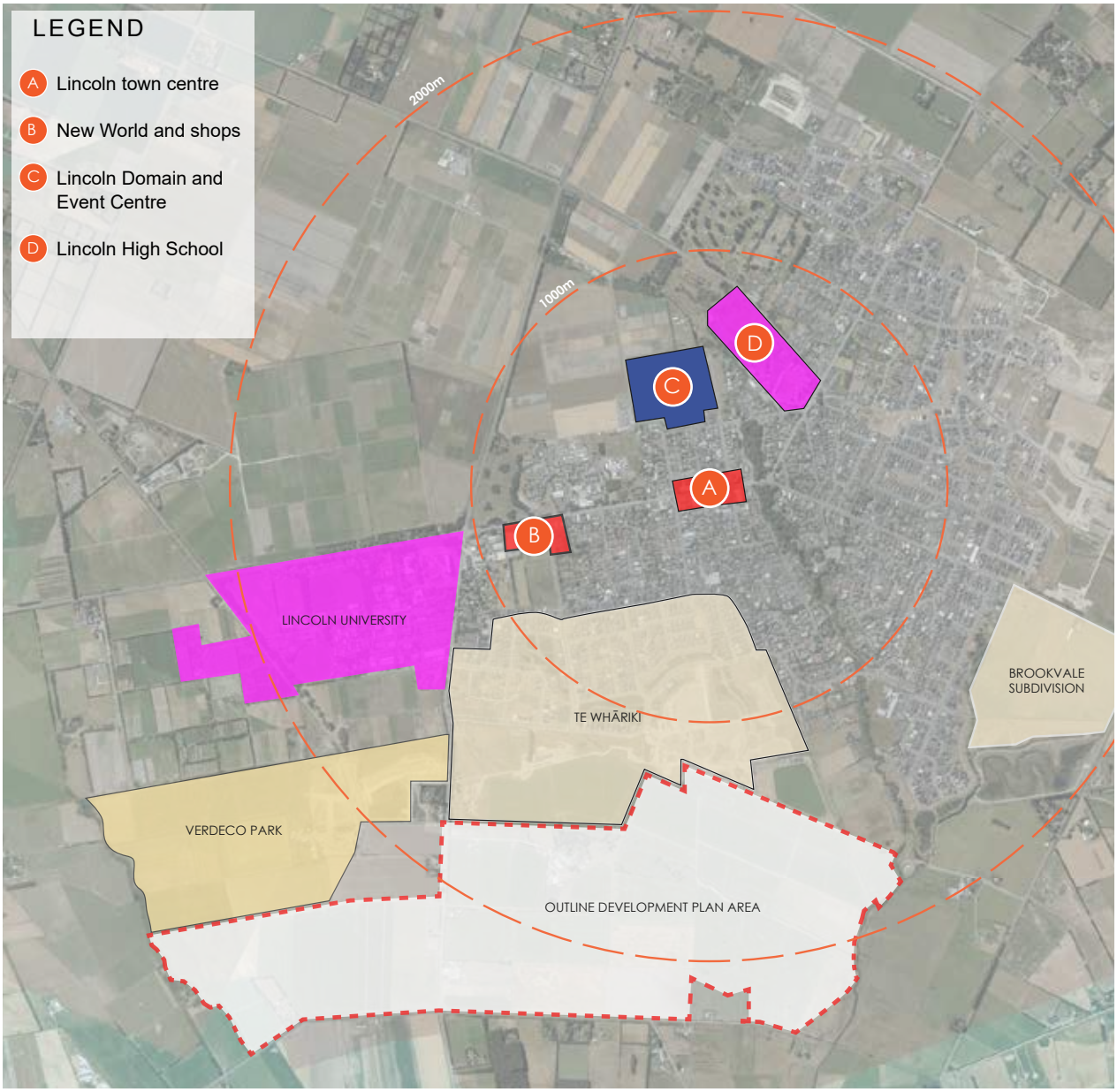
122 Montreal Street
PO Box 7069 Sydenham
Christchurch 8023

CONTENTS

INTRODUCTION

DCM Urban and Inovo Projects Limited have been commissioned by Rolleston Industrial Developments Limited to prepare an Urban Design Statement and Outline Development Plan (ODP) for approximately 186Ha area on the southern edge of the existing settlement. Input into this plan and statement has also been provided by:

- Mainland Surveying - Survey
- Novo Group Limited - Planning and Traffic
- E2 Environmental - Stormwater
- Coffey - Geotechnical and PSI



LOCATION MAP (nts)

LOCATION AND CONTEXT

Lincoln South Plan change site is approximately a 186ha area immediately to the south of Lincoln township, adjacent to the Te Whariki (Residential - Living Z) and Verdeco (Residential - Living Z, Living 3 and Business 2) developments, straddling either side of Springs Road. The site extends south to Collins Road. The land is currently zoned Rural – Outer Plains. Stage 4 of Te Whariki is currently under development, consisting of approximately 360 lots, typically ranging in size from 430-1000m^2. The development is supported by an extensive blue and green network running through the area, providing a mix of amenity and informal recreation values to current and future residents. Dwellings are typically single storey ranging in size from 150-220m^2, with a range of materials and forms.

The plan change site is typically flat, sloping down from northwest to southeast towards LI and the LII River. Vegetation and landcover is predominantly open grass paddocks with large vegetation restricted to internal and road boundaries. Shelter belts, including poplar and macrocarpa species, line Springs Road but otherwise the ODP is free of any significant vegetation with the exception of around the Homestead and Springs Creek. Springs Creek traverses the eastern half of the ODP before linking with the LII River.

CURRENT LINCOLN ODP'S - GROWTH AREAS

There are 8 Outline Development Plans currently in the Selwyn District Plan for Lincoln. Each ODP is at a different stage of development with a brief summary below:

ODP 1 – TE WHARIKI SUBDIVISION

Three stages of this subdivision have been completed and the fourth (final – 34.0ha with a net density of 10.6HH/ha) stage is currently under construction, due for completion next year. Stages 1-3 are mostly built out with only lots remaining in the final stage, being 360 lots with an average lot size of 647m^2.

ODP 2 – LIFFEY SPRINGS AND ARARIRA SPRINGS PRIMARY – TE PUNA O ARARIRA

The subdivision design is currently underway for Brookvale as an extension of the existing development of Liffey Springs, extending the township up to the intersection of Edward Street and Ellesmere Road. The development comprising of approximately 248 general residential lots and 40 medium density lots. All of the sites within Liffey Springs, west of the LII River have been, constructed.

ODP3 – ROSEMERRYN AND FLEMINGTON DEVELOPMENT

Stages 1-11 of Rosemerryn have been constructed and sold with Stages 13, 14 and 16 currently on the market. Eventually the development will extend out to Ellesmere Road with the development of Stages 15, 17-24. The residential development is supported by a small commercial development. Stages 1-5 of Flemington have been constructed and sold, with Stages 6-11 sold and awaiting construction, and Stage 12 currently on the market. The development is proposed to be supported by a small commercial development.

ODP 4 – BARTON FIELDS

In northern Lincoln and currently under construction.

ODP 5 - VERDECO

The residential area of this ODP is complete with the Business area yet to be established.

ODP 6 - 'VEGE BLOCK' MEDIUM DENSITY

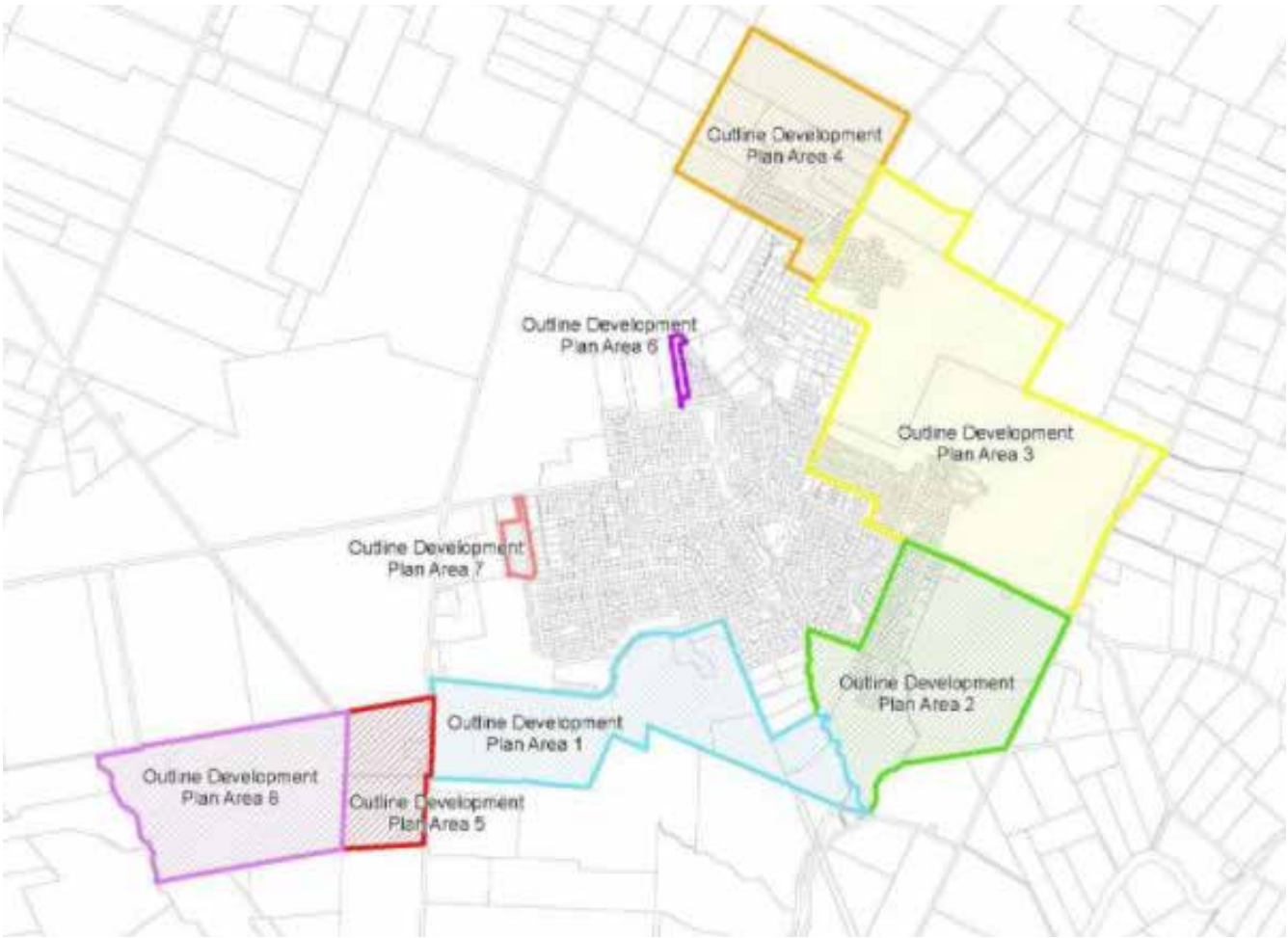
Is designed to achieve a density in excess of 15hh/Ha but is yet to be developed.

ODP 7 - VERNON DRIVE BUSINESS 3 TO LIVING Z ZONE

Is designed to achieve a density in excess of 20hh/Ha but is yet to be developed.

ODP 8 - VERDECO PARK

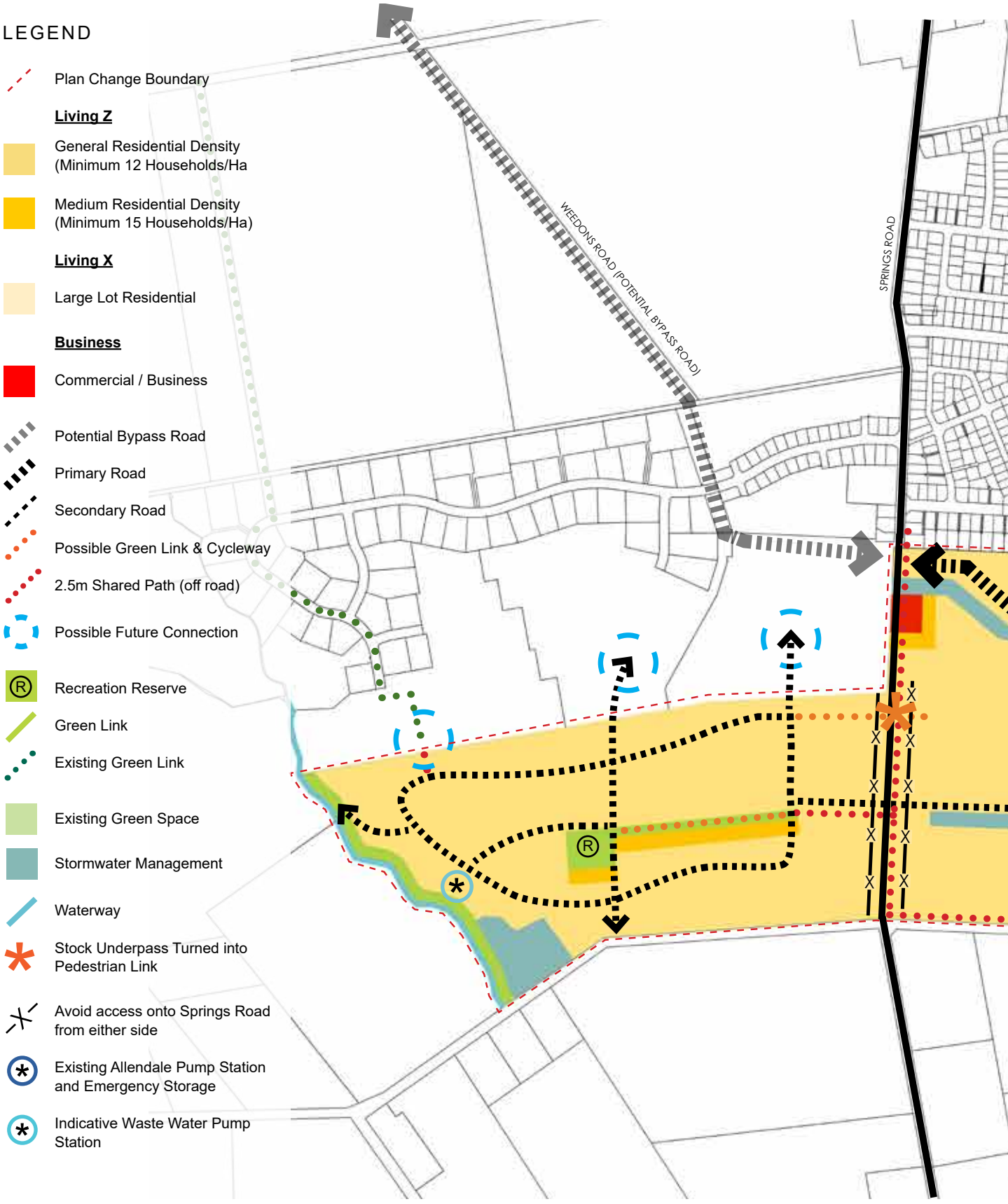
Comprises rural residential lots with a general approach of locating smaller lots (minimum of 3,000m^2) around the outside of the site. Currently under construction.



The image above was sourced from the Operative Selwyn District Plan, highlighting 8 current ODP areas in Lincoln. The majority of these ODP's are either built out, under construction or in the design phase.

CURRENT OPD MAP (source: eplan.selwyn.govt.nz)

OUTLINE DEVELOPMENT PLAN (ODP)




MORS LANE
SPRINGS CREEK
ELLESMERE ROAD
COLLINS ROAD

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. Three residential densities are proposed within the ODP being Medium Density Small Lot; General Residential and Large Lot 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 X	2,000m^2	1,400m^2 (minimum)
Living Z - Low Density	500m^2	600m^2 (minimum)
Living Z - Medium Density (small lot)	400m^2	500m^2 (maximum)

The ODP adopts three zone types from the District Plan, being: Living Z, Living X and Business. The Living Z zone is a natural extension of the existing Te Whāriki and Verdeco developments. A small commercial area, or neighbourhood shops, is proposed at the intersection of Springs Road and the proposed primary road. This development 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
- Retention and protection of the Homestead

LEGEND

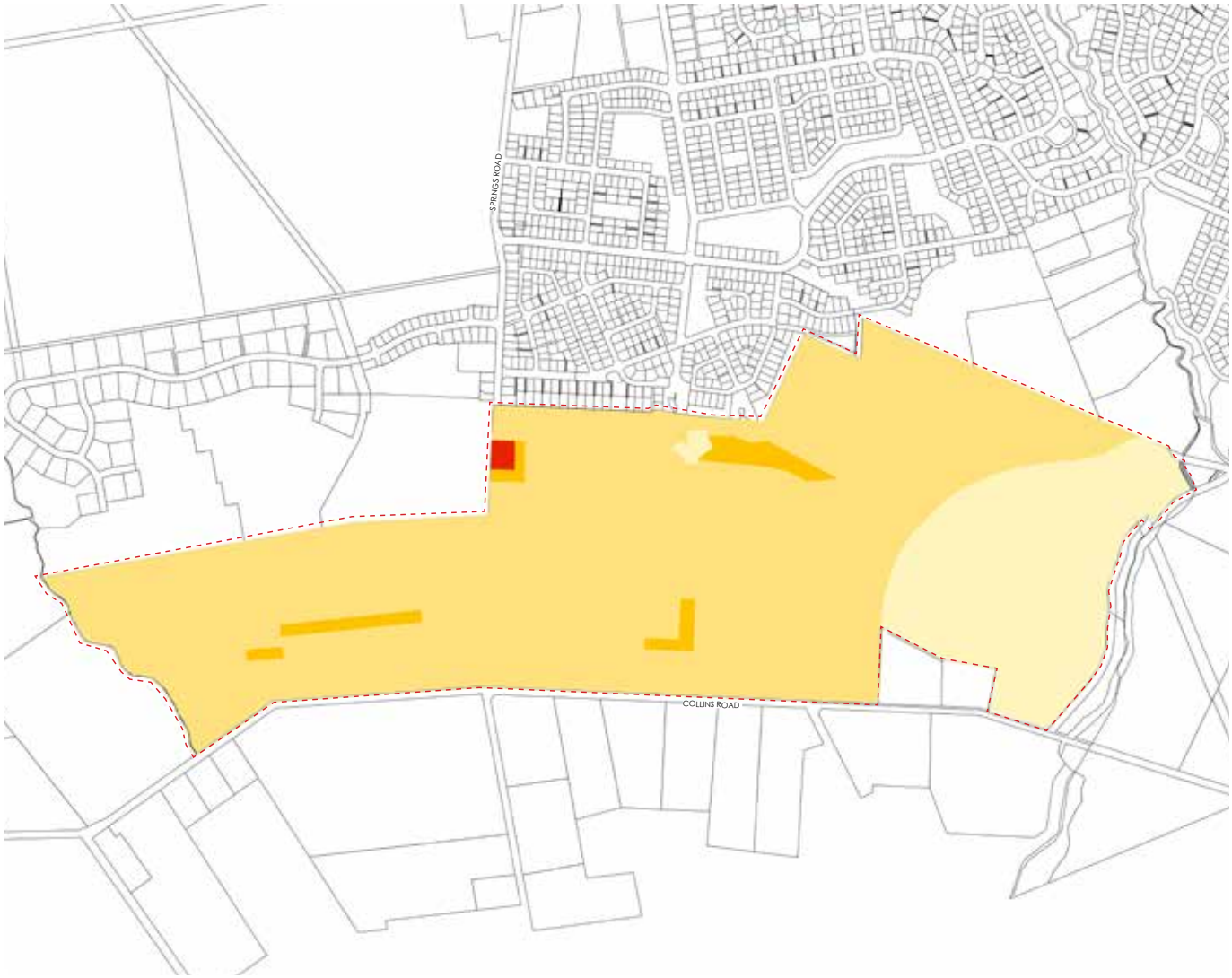
Study Boundary

LIVING Z
General Residential Density
(Minimum 12 Households/Ha)

Medium Residential Density
(Minimum 15 Households/Ha)

LIVING X
Large Lot Residential

BUSINESS
Commercial / Business



LANDUSE AND DENSITY MAP (nts)

The ODP provides a minimum net density of 12 households per hectare with higher density develop located near high amenity spaces or close to commercial amenities.

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 a future primary connection from Springs Road through to Moirs Lane. The routes will connect through to existing roads where possible, including Springs, Collins, the Verdeco development and Moirs Lane. The Primary Road's connection with Springs Road is proposed to align where it is possible to connect to a Potential Bypass Road through ODP Area 5 (Verdeco Business 2B and Living Z area) and then on to an unformed section of Weedons Road.
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 orietnation where possible to maximise solar gain into rear yards (outdoor living spaces) of all properties.

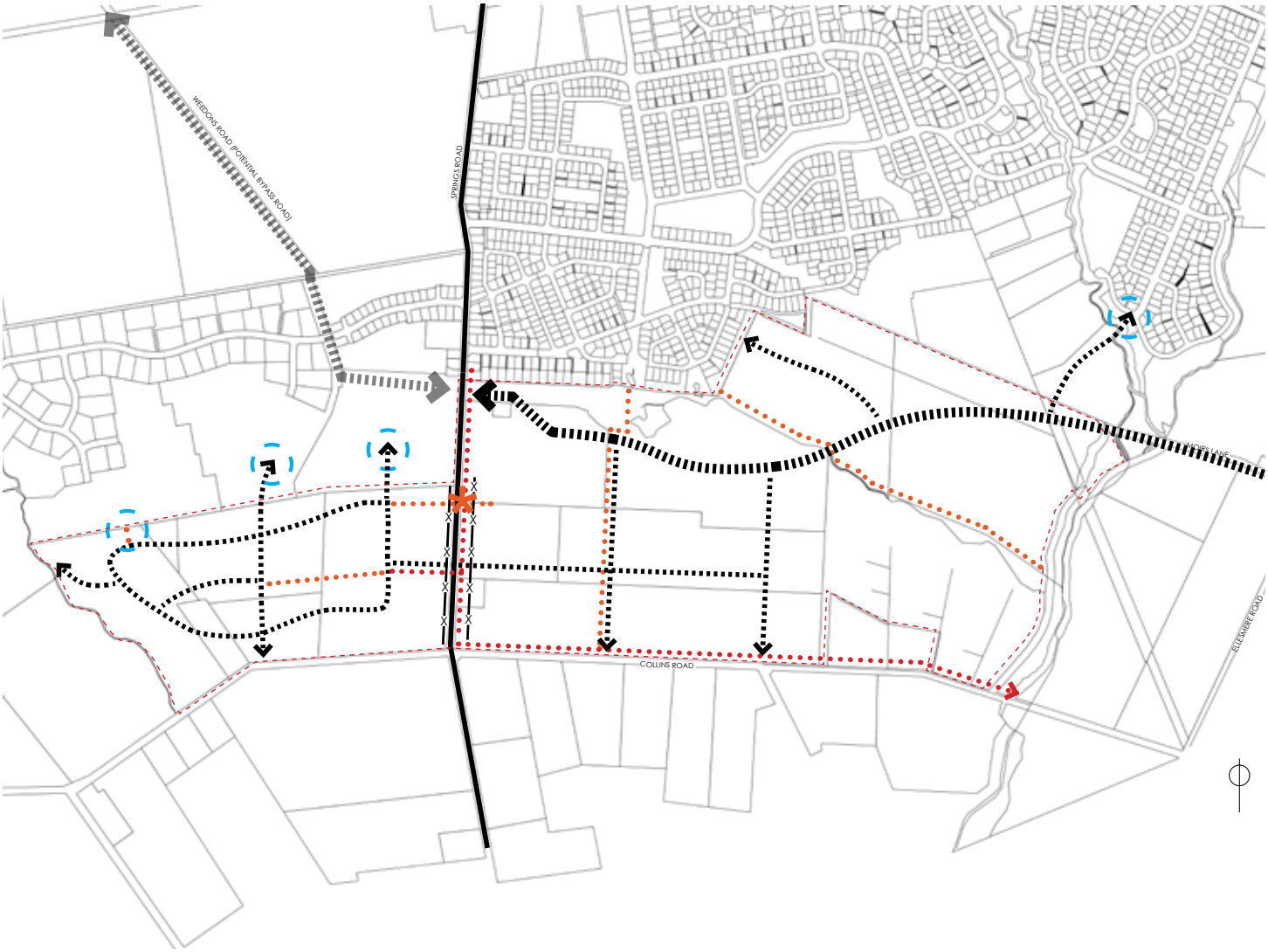
Supporting the road network, off road pedestrian and cycle paths connect through to existing networks in Te Whariki, Liffey Springs and the Rail Trail.

KEY ASPECTS

- Street heirarchy providing different modal allocation
- Connection with a potential bypass road highlighted in Lincoln ODP Area 5 (Verdeco)
- A well-connected network which combines with the green / blue network and existing facilities connecting to key destinations (school, 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 Springs Road for individual properties should be avoided
- Streets with a high level of amenity

LEGEND

- Study Boundary
- Potential Bypass Road (Weedons Road
- Primary Road
- Secondary Road
- 2.5m Shared Path (off road)
- Possible Green Link & Cycleway
- Possible Future Connection
- Avoid direct access onto Springs Road from either side
- Stock Underpass Turned into Pedestrian Link



MOVEMENT AND CONNECTIVITY MAP (nts)

Providing for a variety of different modal options over a well-connected movement network provides future residents with choice.

GREEN / OPEN SPACE NETWORK

(Choice, Connections, Custodianship and Collaboration)
The Green network proposed builds on the existing network through Te Whāriki and the Springs Creek corridor to provide a green strip running through the eastern half of the Plan Change area providing amenity to a large number of future residents. The network also combines with the movement network to provide shared off-road facilities connecting through to Ararira Springs Primary – Te Puna o Ararira, the homestead and the future playground being developed in Te Whāriki.

The ODP proposes four additional Neighbourhood reserves within the project boundary 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 reserve 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 the ODP to existing Te Whāriki residential development, green links 10-20m wide are proposed, and in many cases will be integrated with landscape features such as natural waterways and stormwater management areas/corridors.

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 Lincoln University's fields and Lincoln Domain and Event Centre (1.8km away).

KEY ASPECTS

- Integrating green, blue and movement networks to create a high level of connectivity, amenity and active travel options
- Celebrating Springs Creek as an important natural feature of the ODP area, to create a sense of place
- Provides sufficient space near waterways and wetland areas to enable habitat protection as well as providing access for future residents

LEGEND

Study Boundary

Green Link

Existing Green Space

Recreation Reserve

Existing Green Link

500m and 800m Walkable catchment

GREEN / OPEN SPACE MAP (nts)

The ODP connects with existing green spaces to provide a high level of amenity for future residents. The design recognises the importance of Springs Creek traversing the eastern half of the ODP to create future residential dwellings with a high degree of amenity and space.

BLUE NETWORK

The blue network is an integral component of the ODP area with several springs and waterways present. Springs Creek traverses the eastern half of the ODP area, starting at the Homestead and running east before combining with LII River. LII River is positioned along the eastern boundary of the ODP area along with a waterway from the Te Whāriki development directed to the north of the development. The Te Whariki development includes several stormwater detention basins along its southern boundary which are planted with native species and contain walking and cycling paths. Springs Creek is a spring fed tributary of the LII River with headwater springs situated within the grounds of the historic 'Chudleigh' homestead. The creek alignment has been modified over time to straighten the channel and improve its drainage function. There is opportunity to enhance and incorporate this natural feature into the wider green and blue network of the site.

Stormwater management areas are proposed in the southwestern and southeastern corners of the ODP. The intention is for stormwater to be separate from natural waterways, ensuring water is treated before it can enter LII River. Stormwater runoff from the majority of the site will be conveyed by a network of swales and pipes to two proposed Stormwater Management Areas (SMA's) for treatment and attenuation before being discharged into the LII River to the east and an existing private drain to the west of the site. Detailed design of the SMA's will be determined by the developer in collaboration with Council at the subdivision stage and in accordance with Environment Canterbury requirements.

The spring-fed Lincoln Main Drain (LMD) crosses the northeast portion of the site from northwest to southeast and serves as the main drain outlet for the Te Whariki subdivision. The drain is to be diverted to the northern boundary of the development site but detailed design will ensure its ongoing function is not compromised. There is opportunity to naturalise and enhance the LMD as part of the wider green and blue network of the site.

KEY ASPECTS

- Separation of stormwater from natural waterways
- Use of low impact design techniques including grass swales and detention basins
- Development setback, via a reserve, from Springs Creek

LEGEND

Study Boundary

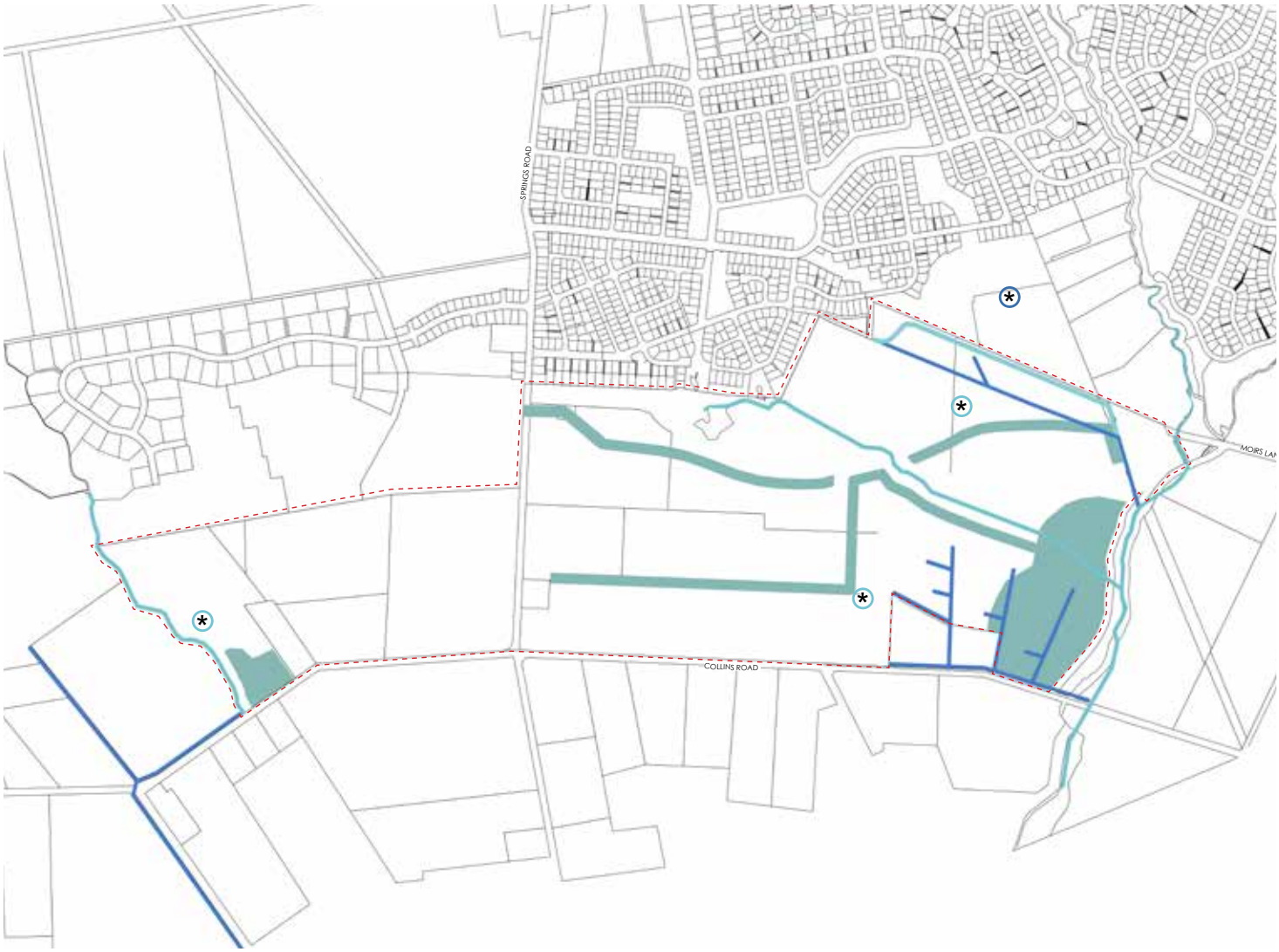
Waterway

Existing Allendale Pump Station and Emergency Storage

Stormwater Management System / areas

Existing Drain

Indicative Waste Water Pump Station



BLUE NETWORK MAP (nts)

SUMMARY AND CONCLUSIONS

The proposed Lincoln South Plan Change is a natural extension of existing residential development occuring to the south of the existing developments of Te Whāriki and Verdeco. Covering an area of approximately 186Ha, the ODP 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 blue network provides a base for the development, recognising and protecting natural features in the area.

Many of the Lincoln's ODP's have been developed, or are in the process of being developed creating the need to identify future growth areas for the township over the coming years. The ODP will:

- Provide a diversity of house size and lot size to provide choice
- Locate higher density with higher amenity areas
- Retain and protect heritage and cultural elements, including the Homestead
- Create a street heirarchy providing different modal allocation
- Create a connection with a potential bypass road highlighted in Lincoln ODP Area 5 (Verdeco)
- Continue a well-connected network which combines with the green / blue network and existing facilities connecting to key destinations (school, 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 Springs 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 green, blue and movement networks to create a high level of connectivity, amenity and active travel options
- Celebrate Springs Creek as an important natural feature of the ODP area, to create a sense of place
- Provide sufficient space near waterways and wetland areas to enable habitat protection as well as providing access for future residents
- Ensure stormwater is kept separate from natural waterways prior to treatment
- Encourage the use of low impact design techniques including grass swales and detention basins
- Ensure a development setback, via a reserve, from Springs Creek

URBAN DESIGN PRINCPLES

The design principles that underpin this ODP 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 and Blue 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 and Blue Network - To promote urban environments that are responsive to natural features, ecosystems, water quality, reduced energy usage and waste production.

LINCOLN SOUTH PLAN CHANGE, LINCOLN

ROLLESTON INDUSTRIAL DEVELOPMENTS LIMITED

Landscape and Visual Impact Assessment

Project No. 2020_113 | B

LINCOLN SOUTH PLAN CHANGE LVIA

Project no:	2020_113
Document title:	Landscape and Visual Impact Assessment
Revision:	B
Date:	28 October 2020
Client name:	Rolleston Industrial Developments Limited
Author:	Dave Compton-Moen
File name:	\\GOOSE\Storage\4_DCM - Projects\2020_113 Carter Lincoln South Plan Change\3_Working Files\5_Word\2020_113 Carter Lincoln South Plan Change_LVIA_A.docx

DOCUMENT HISTORY AND STATUS

REVISION	DATE	DESCRIPTION	BY	REVIEW	APPROVED
A	23/10/2020	Draft LVIA	DCM	DCM	
B	28/10/2020	Draft LVIA	DCM	DCM	

DCM URBAN DESIGN LIMITED

Level 3, 329 Durham Street North

Christchurch 8013

1. INTRODUCTION AND PROPOSAL

DCM urban has been commissioned by Rolleston Industrial Developments Limited to prepare a Landscape and Visual Impact Assessment for a proposed Plan Change to provide a greater area of residential development in Lincoln South. The proposal seeks to create a new zone as an extension of the existing settlement of Lincoln. The proposal, covering an approximate area of 186ha, is currently zoned rural and located within the Outer Plains Zone respectively of Selwyn District Plan. The proposal seeks to establish an Outline Development Plan (ODP) within the following zones: Living X, Living Z, and Business 1. The ODP is shown on page 3 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.

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 site is zoned Outer Plains Rural.

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 site is bound by Collins Road to the south and by neighbouring rural properties to the east and west. To the north of the proposal lies the southern edge of Lincoln 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 a site which is typical of a rural property 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. Vegetation is used predominantly for shelter belts running along the paddock boundaries and includes species such as Pinus radiata, Cupressus macrocarpa, Populus nigra 'Italica' 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.

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, though are intermittently screened by large shelter belts and buildings at various locations. 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 along Collins Road, including 1, 36, 47, 87, 107, 117, 185 and 221, along Springs Road at 1506, 1472, 1480, 1482 and 1484, as well as a number of proposed dwellings in the neighbouring subdivisions of Te Whāriki and Verdeco park. The closest residential property is approximately 80m from the proposed site boundary. Some of these dwellings are supported by additional infrastructure such as sheds and storage buildings. These residential lots are typically separated by large open fields and exotic vegetation. The proposal is approximately 1km to the south of Lincoln Township and 300m from existing medium density housing which has a rural suburban character.

Overall, the receiving environment has a rural, open character with various structures including dwellings, auxiliary structures, power lines and exotic vegetation clustered throughout the landscape. The character of the region is captured through the views across flat topography to the Southern Alps and Port Hills, the scattered and sporadic vegetation, the structured shelter belts, and the irregular location of housing in relation to one another.

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 open, rural and is used principally for agricultural purposes. The proposed development modifies the character of the landscape from a more open and agricultural to a more suburban character. Where infrastructure and amenities are concentrated. Aspects of rural character will be maintained through the mitigation of fencing and landscape planting. A sense of open character is promoted through the proposed bulk and location as it is not greater than current infrastructure and vegetation, such as shelterbelts. To retain open character where possible, higher density development is to be concentrated towards the centre of the site, with lower density dwellings towards the boundary allowing blue and green networks to provide a buffer between the existing rural and proposed suburban land types. The character of existing housing is typically single storey detached dwellings, which the proposal intends to continue at a higher density.

The natural landscape character is highly modified, having been cleared for agricultural land use. This is reflective in the lower quality waterways and native vegetation present in the area. Existing amenity of the natural landscape is to be enhanced and retained through the planting and development of green corridors following Springs Creek and LII River. The network of blue and green corridors enhances the amenity of the site and provide pedestrian/cyclist connections to adjoining developments and access to areas which are not currently accessible. Limited access proposed from Springs Road into the development intends to retain the integrity of Springs Road and maintain aspects of open character by creating a high amenity corridor.

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 and significant landscape components 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 area is considered to naturally extend existing residential development at Te Whāraki, Verdeco Park, and Liffey Springs to the south of Lincoln Township. 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 broader context. While the proposed density is relatively higher than the existing land use, the proposed plan change retains similar levels of density when compared to surrounding development. 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 area is an in-sequence development adding to development capacity of Lincoln, while retaining a similar level to existing surrounding development.

SELWYN DISTRICT PLAN – TOWNSHIP VOLUME

The proposed plan change covers existing Outer Plains rurally zoned land. 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, existing and proposed green and blue networks, and heritage protection to help the retention of the open and spacious rural character. The Plan Change has also provided a buffer of low density lots along the eastern edge of the development to soften the transition into rural land and celebrate Springs Creek and the L II river. 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. Celebrating Springs Creek and the L II river as a protected waterway throughout the development helps preserve the aesthetic and amenity values of the local character. The use of large lot residential housing against the eastern edge of the creek further helps retain the spacious character by mitigating potential adverse effects of higher density development.

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.*

The proposed plan change aims to maintain and enhance existing vegetation along Springs Creek and to incorporate this natural feature into the wider green and blue network of the site. Habitat protection for waterways and wetland is ensured by allowing for sufficient space between development promoting the possibility of restoration and creating a wider sense of place. Several recreation reserves are one aspect of a larger green network which links through to surrounding development such as Te Whāraki and Verdeco Park. 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.

The retention and restoration of natural features within the development such as the existing Homestead, Springs Creek, the L II River, existing springs, and a wetland area would act to maintain and improve amenity of the development. Utilising reserve spaces and a wider green network helps provide sufficient space for allotment boundaries around these areas for restoration and recreation. By responding to the natural features of the landscape, the proposed plan change can maintain and enhance the amenity of the area.

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 site also encourage a high degree of connectivity and permeability within and in/out of the proposal. Off-road shared paths, including utilising an existing stock underpass, 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.

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 Springs Road avoid access onto Springs 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.

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 and Business Zones to the north. The proposal does not leave rural zoned land with three or more boundaries against living or business zones.

Policy B4.3.58

Ensure stormwater disposal from any land rezoned for new residential or business development will not adversely affect water quality in the LI or LII waterbodies; or exacerbate potential flooding from the LI or LII waterbodies "downstream".

The proposed plan change addresses potential adverse water quality through a combination of on-site stormwater management and wetland restoration allowing or a 'natural' cleaning of run off before entering waterways. Sufficient setback for built form has been provided for around the Springs Creek and L II waterways to reduce first flush run off and to aid in mitigating potential flooding issues. To further mitigate flooding issues, development of housing is restricted to the south east of the site to avoid building on known floodplains.

Policy B4.3.59

Achieve integration between the rezoning of land for new residential development at Lincoln and associated provisions for utilities, community facilities and areas for business development.

Areas for community facilities and business development has been incorporated into the proposed plan change. These areas are centralised within the development and are accessed through the green network providing for convenient access.

Policy B4.3.61

Consider any potential adverse effects of rezoning land for new residential or business development to the north of Lincoln Township on the 'rural-urban' landscape contrast of the area with Christchurch City, as identified in the RPS.

The proposed plan change avoids effects on the 'rural-urban' contrast between Lincoln Township and Christchurch City by proposing new residential development to the south of Lincoln Township, naturally extending existing development and preserving the valued contrast as identified in the Regional Policy Statement.

SELWYN DISTRICT PLAN – RURAL VOLUME

Policy B4.1.1

Avoid residential density greater than 1 unit per 20 hectares in the Outer Plains outside the areas identified in Policies B4.1.3 to B4.1.6.

While the proposed plan change is not consistent with existing rural policy for the outer plains zone, the proposal aligns itself with the National Policy Statement on Urban Development 2020 by enabling people to live in a an area of high demand within areas of other urban development. Additional housing would be supplied by achieving greater density within the range of 12 to 15 hh/hectare, responding to the changing needs and community of Lincoln Township.

Policy B4.1.2

Except in the Inner Plains area, allow a house to be built on any sized allotment, provided:

a) *The balance of land area needed to comply with Policy B4.1.1 is kept free of dwellings by covenant or some other method*

b) *The house allotment is of an appropriate size and shape to avoid adverse effects on adjoining properties, the road network, or potential reverse-sensitivity effects; and*

c) *The number of houses clustered together on small allotments is kept small, to avoid creating new villages or settlements; and*

d) *The balance of land area adjoins the house allotment and is of a shape that maintains the sense of "open space".*

The proposed plan change promotes lots with an east -west orientation on a variety of lot sizes to promote appropriate housing variety for the lot size. While the development presents a more suburban context, key areas such as the existing homestead, L II River, and Springs Creek achieve a balance of land that incorporates a high level of public amenity and connectivity to promote a more 'open' sense of space. The use of large lot residential housing against the eastern edge of the site further helps retain the spacious character by mitigating potential adverse effects of higher density development.

Policy B4.1.4(b)

Within the Greater Christchurch area covered by Chapter 6 to the Canterbury Regional Policy Statement, any new residential development at densities higher than those provided for in Policy B4.1.1 shall only be provided for in the Living 3 Zone in locations identified in the adopted Selwyn District Council Rural Residential Strategy 2014.

While the proposed plan change is not consistent with existing rural policy, the proposal aligns itself with the National Policy Statement on Urban Development 2020 by enabling people to live in an area of high demand within areas of other urban development. Additional housing would be supplied by achieving greater density within the range of 12 to 15 units per hectare, responding to the changing needs and community of Lincoln Township.

Policy B4.1.13

Encourage allotment boundaries to follow natural or physical features on the land, wherever practical.

Allowing for natural features within the development such as the existing Homestead, Springs Creek, the L II River, existing springs, and a wetland area to form the development would act to maintain and improve amenity of the development. Utilising reserve spaces and a wider green network helps provide sufficient space for allotment boundaries around these areas for restoration and recreation. By responding to the natural features of the landscape, the proposed plan change is able to maintain and enhance the amenity of the area for the community.

3.4 EFFECTS ON VISUAL AMENITY

The visual context of the receiving environment is considered to be a 2km 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 Allandale Land Rail Trail
2) View north from 1 Collins Road
3) View North from 61 Collins Road
4) View north east from 1585 Springs Road
5) View north west from 221 Collins Road
6) View south east from 1491 Springs Road
7) View south from 111 Southfield Drive

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 Allandale Lane Rail Trail	Pedestrians and cyclists accessing the rail trail	<50m	Open	The view from this point is of large open grassed paddocks, with boundaries delineated by open style post and wire fencing. Existing vegetation is sporadic and dispersed in large clusters. Established vegetation frames the background of the view, partially screening existing residential development.	Medium - High	Minor	The proposed plan change area is openly visible. Where large lot residential is proposed along the boundary of the development, these would likely act as a buffer between the existing rural landscape and more suburban development. While there will be a loss in the existing 'open' character, as the development appears as a natural extension of existing development it is seen to have minor effects.
2. View north from 1 Collins Road	Residents at 1 Collins Road	100m	Open	The existing view from this location has open sightlines over the proposed site. The view has a typically open character, consisting mainly of open grass fields with open tyle timber fencing and post and wire fencing which delineate boundaries. A stream can be seen in the foreground with overgrown grass along the edges. Shelterbelts and mature vegetation is present in the background, with rooflines of existing development present in the distance, forming the skyline. The port hills frame the horizon to the right.	High	Minor	Stormwater management and key green and blue networks are openly visible form this view with proposed development in the distance. While development of dwellings reduces the open character or the landscape, the retention and restoration of vegetation and access around existing waterways such as the LII River encourage a sense of openness. Effects are anticipated to be minor.
3. View north from 61 Collins Road	Residents at 61 Collins Road	<50m	Open	This viewpoint has an expansive view of open grass paddocks with irrigators. The fields are lined with shelterbelt planting and post and wire fencing, the fence line in the foreground is surrounded by overgrown grass. Rooflines of existing development are visible in the background, spanning across the viewpoint horizon	High	Minor	The proposed plan change area is openly visible. Fencing along the boundaries of Collins 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. As the development would appear as a natural extension of existing development it is seen to have minor effects.
	Vehicle users along Collins Road				Low		
4. View north east from 1585 Springs Road	Vehicle users along Springs Road and Collins Road	<50m	Open	Open views from this point look across Springs Road onto open grass fields. Post and wire fencing spans the foreground of the view, separating the paddock from the roadside grass berm. Power lines are visible, running adjacent to Springs Road to the right side of the view. Shelterbelt planting and existing residential development is visible in the distance. Faintly visible in the background of this view is the Southern Alps mountain range.	Low	Minor	The proposed plan change area is openly visible. Fencing along the boundaries of Springs Road will be managed to promote a more open character. Incorporating existing infrastructure along Springs 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. Development will form the skyline. As the development would appear as a natural extension of existing development it is seen to have minor effects.
5. View north west from 221 Collins Road	Residents at 221 Collins Road	50 - 100m	Open	This viewpoint looks towards the proposed site over Collins Road. Existing views are partially screened by a mature shelterbelt lining the road. Beyond the shelterbelt is open grass fields bounded with other shelter belts. Post and wire fencing is visible from this location to delineate the boundary of grass fields to the roadside verge.	High	Minor	The proposal, including stormwater management and key green and blue networks are openly visible form this view. While development of dwellings reduces the open character of the landscape, the management of fencing along the Collins Road boundary will retain openness. The retention and restoration of vegetation around the stream on the western boundary of development promotes a more open sense of character. Effects are anticipated to be minor.
	Vehicle users along Collins Road				Low		
6. View south east from 1491 Springs Road	Residents at 1491 Springs Road	<50m	Open and Partial	Views from this point are partially open looking from Springs road to the proposed site. The foreground is framed by an open style timber fence at the entrance of a private driveway. Shelterbelts are visible throughout the view alongside post and wire fencing separating paddocks. A single dwelling and various farm sheds are present in the background. From this location views of the Port Hills are disrupted by vegetation and existing infrastructure.	High	Minor	From this view there would be open views over the development, including a stormwater network and a small commercial centre. Dwellings along Springs Road and the stormwater corridor will retain a sense of openness through the management of boundary fencing. Areas of more intensive development, such as the business zone and medium residential density, 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. Development will form the skyline. Given the surrounding level of permitted baseline development, including commercial activity, effects are anticipated to be minor.
	Vehicle users of Springs Road				Low		
7. View south from 111 Southfield Drive	Residents at 111 Southfield Drive	500m	Screened	Views of the proposal are currently screened through existing development and vegetation. Native vegetation which lines wetland margins and road medians is prominent from this view. The view is dominated by roading infrastructure, street lighting and existing residential properties. Views from this location look towards the extension of residential development currently under construction.	High	Negligible	Views of the proposed plan change area are not visible from this location due to existing and future development. Effects are negligible.
	Vehicle users of Southfield Drive				Low		

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. The receiving environment is to maintain aspects of openness through the restoration and retention of green and blue 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 Collins road. Though there is a change from rural to suburban, from this location the effects are minor as the proposal is an extension of the existing development present in the background. Views from Te Whāriki are screened by the existing level of development and have negligible effects. 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 Lincoln township. Effects for motorists are considered Less than Minor to Indiscernible.

Overall, the scale and bulk and location of the proposal would allow it to appear as a natural extension of existing development within Lincoln, with the anticipated effects being minor.

4. MITIGATION MEASURES

The following mitigation measures are suggested to either avoid, remedy or mitigate any potential effects on Landscape Character, Landscape Values and/or Visual Amenity from the proposed Plan Change. Several of the measures are adopted from the Urban Design Statement prepared for this application:

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. • This is provided for through the proposed location of Living X and Living Z zones and the corresponding provisions in the District Plan.
MM2	Locate higher density towards the centre of the development, buffered by lower density development along the edges of the plan change • This is provided for through the proposed Living Z zoning for the majority of the site and Living X zoning at its eastern extent.
MM3	Retain and protect heritage and cultural elements, including the Homestead and Springs Creek from inappropriate development • This is provided for through the proposed Living X zoning around the Homestead, and buffers adjacent to Springs Creek identified on the ODP.
MM4	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 • These considerations would be addressed through the detailed design and consenting of any subdivision proposal(s) within the plan change area.

MM5	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 • Key connections are identified on the ODP and may be supplemented through additional connections provided for at the time of subdivision consent.
MM6	Avoid direct vehicle access onto Springs Road for individual properties to allow for a high-quality landscape treatment along this corridor, creating a high amenity southern entrance into Lincoln • This is provided for on the ODP.
MM7	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. • This is provided for on the ODP.
MM8	Provide an approximate 20m wide landscape, green corridor along either side of Springs Creek and LII River which can be used to amenity, stormwater and recreation purposes. Any design should ensure untreated stormwater is kept separate from natural waterways prior to treatment. Provide sufficient space near waterways and wetland areas to enable habitat protection as well as providing access for future residents • This is provided for on the ODP. Detailed stormwater design matters would be confirmed at the time of any subdivision and discharge consent applications.
MM9	Solid fencing should preferably be restricted to rear and side yards to retain an open character along streets and existing roads (in particular Springs and Collins) 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. • This is a matter that would be incorporated into developer covenants that manage and implement specific design outcomes sought within the plan change area.

5. CONCLUSIONS

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 proposed, the proposal will result in an acceptable magnitude of change on the existing rural landscape character and values. Key landscape features, including Springs Creek, LII River and natural springs will be retained and protected from development. Medium density areas will be 'internalised' within the development with lower density development providing a buffer with adjoining rural areas. The site will change from one rural and open in character to one which is more compartmentalised and suburban in nature, with the change partially mitigated through fencing controls and landscape planting.

In terms of visual amenity, the rural properties will experience a change in the openness of views across the space, noting that many of the adjoining properties are surrounded by well-established shelter belt and boundary plantings restricting views out. Adjoining suburban residential properties, current and future, overlooking the Plan Change area will have a mix of open, partial, and screened views of future development. In many cases these views will be across stormwater areas or are separated from the site by Liffey Creek, allowing for any future development to be assimilated into the existing residential character of Lincoln. The setback from existing walkways and extensions to existing walkways, while a physical attribute, will provide significant amenity to existing residents by allowing access to areas which are not currently accessible.

APPENDIX ONE - LANDSCAPE AND VISUAL IMPACT ASSESSMENT FIGURES

LINCOLN SOUTH PLAN CHANGE

FOR CARTER

28 OCTOBER 2020

REVISION B (STATUS - FINAL)

dcm URBAN

LINCOLN SOUTH PLAN CHANGE

Project no: 2020_113
Document title: LANDSCAPE AND VISUAL IMPACT ASSESSMENT
Revision: B
Date: 28 October 2020
Client name: Rolleston Industrial Developments Limited

Author: David Compton-Moen
File name: \\GOOSE\Storage\4_DCM - Projects\2020_113 Carter Lincoln South Plan Change\3_Working Files\3_InDesign\2020_113 Carter Lincoln South Plan Change_LVIA_A

DOCUMENT HISTORY AND STATUS

REVISION	DATE	DESCRIPTION	BY	REVIEW	APPROVED
A	23/10/2020	LVIA Figures	DCM	DCM	
B	28/10/2020	LVIA Figures	DCM	DCM	

DCM URBAN DESIGN LIMITED

Level 3, 329 Durham Street North
Christchurch 8013

CONTENTS

LEGEND

- Plan Change Boundary

Living Z

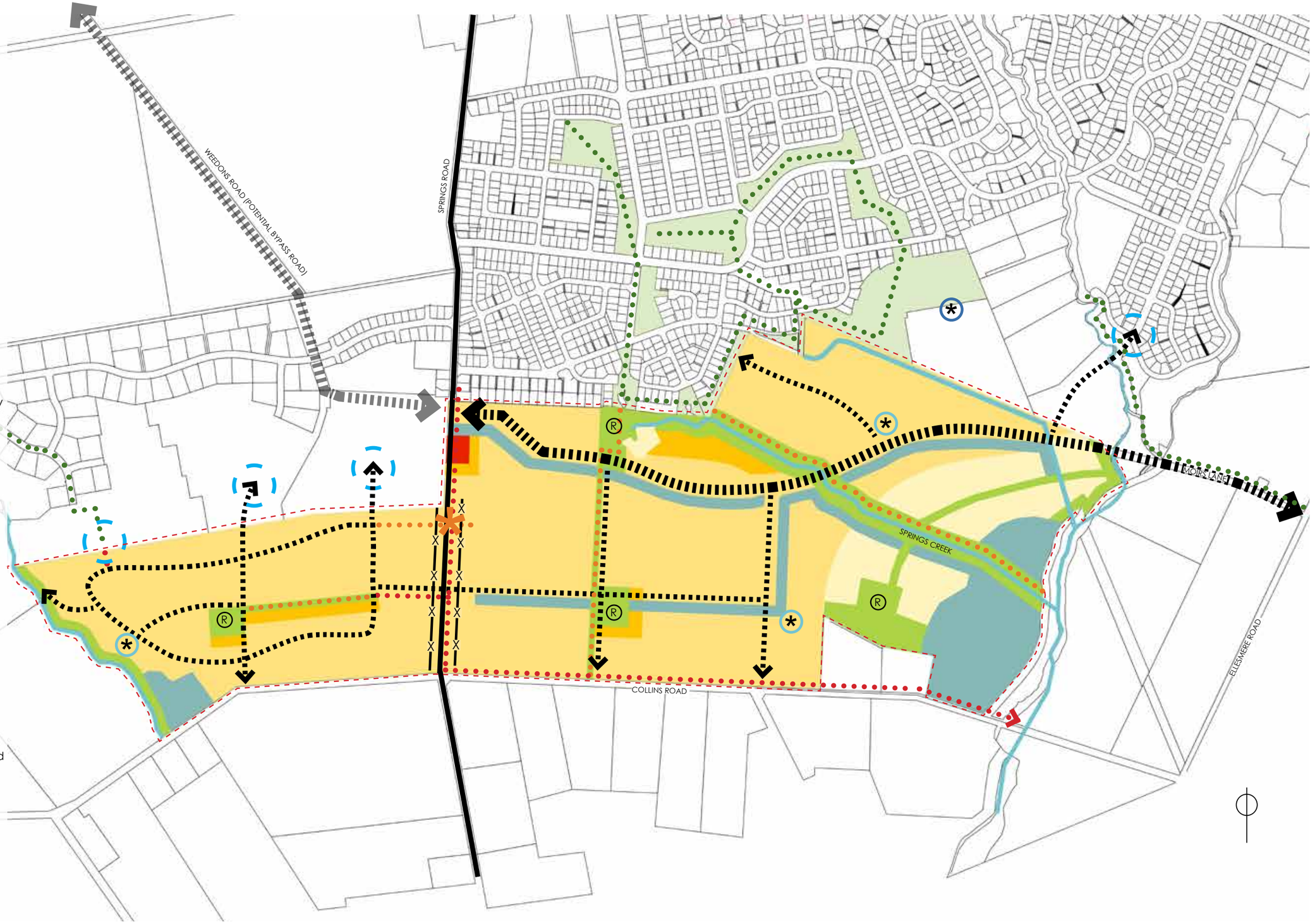
- General Residential Density (Minimum 12 Households/Ha
- Medium Residential Density (Minimum 15 Households/Ha)

Living X

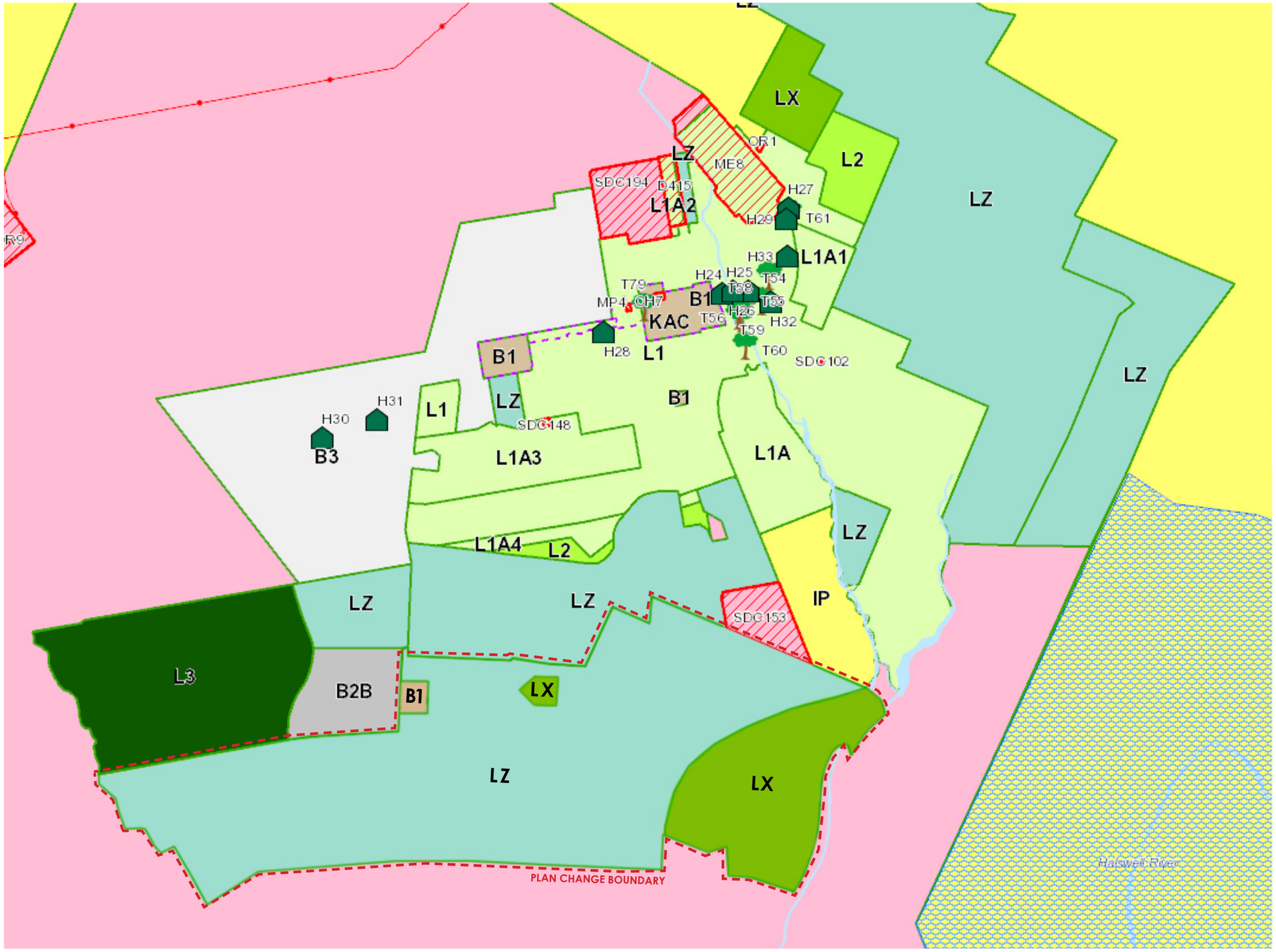
- Large Lot Residential

Business

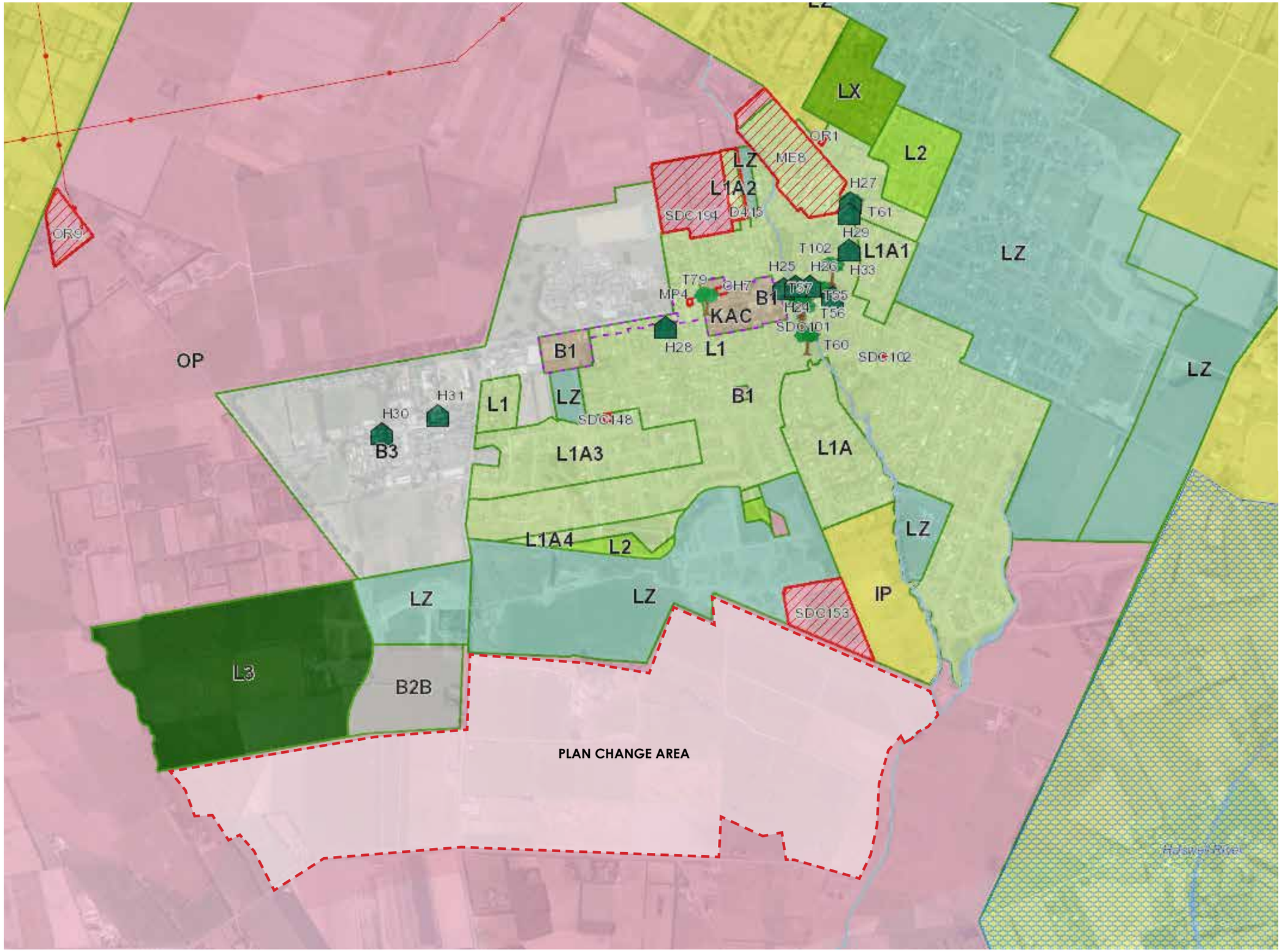
- Commercial / Business
- Potential Bypass Road
- Primary Road
- Secondary Road
- Possible Green Link & Cycleway
- 2.5m Shared Path (off road)
- Possible Future Connection
- Recreation Reserve
- Green Link
- Existing Green Link
- Existing Green Space
- Stormwater Management
- Waterway
- Stock Underpass Turned into Pedestrian Link
- Avoid access onto Springs Road from either side
- Existing Allendale Pump Station and Emergency Storage
- Indicative Waste Water Pump Station



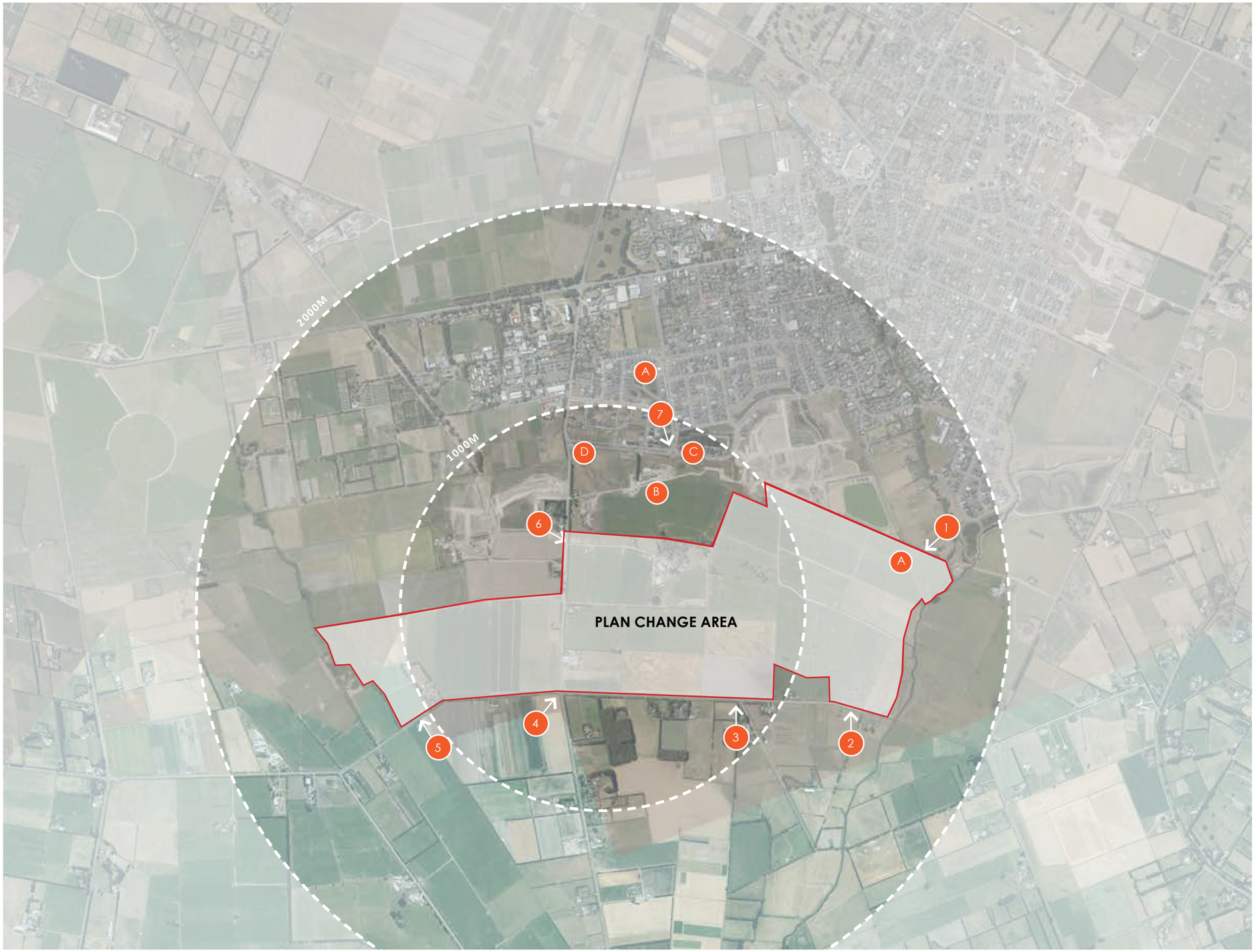
A. OUTLINE DEVELOPMENT PLAN



Map / image source: Selwyn District Council



Map / image source: Selwyn District Council



LEGEND

CHARACTER PHOTOS

- A Existing Vegetation
- B Open Space Network
- C Blue Network
- D Residential Development

VIEWPOINT LOCATIONS

1. View South West from Allandale Lane, Rail Trail
2. View North from 1 Collins Road
3. View North from 61 Collins Road
4. View North East from 1585 Springs Road
5. View North West from 221 Collins Road
6. View South East from 1491 Springs Road
7. View South from 111 Southfield Drive

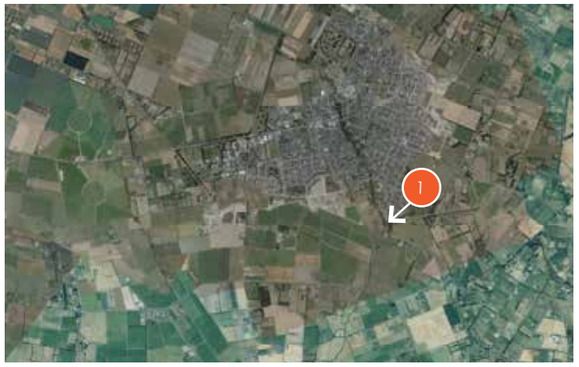
A. LOCATION MAP FOR CHARACTER PHOTOS AND KEY VIEWPOINTS

A Existing Vegetation - Within the Plan Change Area vegetation is primarily exotic and used for shelterbelts, with small pockets of native plantings near some waterways. Species such as Pine, Macrocarpa, Eucalyptus and polars are common through the area. Within surrounding developments vegetation is primarily native throughout reserves, water margins and streetscapes.

B Open Space Network - Te Whariki has a prominent network of open spaces providing a green pedestrian connection through the development. The open nature of the network allows passive surveillance (CPTED) from adjoining houses.

C Blue Network - A high level of amenity is achieved throughout the development with the existing blue network. Residential housing adjoining wetland reserves have open style fencing which helps to obtain aspects of natural open character.

D Residential Development - Existing housing is predominantly single storey, 3-4 bedrooms with double garage on lots typically ranging from 600m² to 1000m². There are a variety of materials, colours and forms present throughout the development.



A. IMAGE LOCATION

APPROXIMATE PROPOSAL LOCATION

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

VP1 - VIEW SOUTH WEST FROM ALLANDALE DRIVE, RAIL TRAIL

LINCOLN SOUTH PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 12th October 2020 at 12:12 pm
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 FROM 1 COLLINS ROAD

LINCOLN SOUTH PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 12th October 2020 at 12:32 pm
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 FROM 61 COLLINS ROAD

LINCOLN SOUTH PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 12th October 2020 at 12:12 pm
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 1585 SPRINGS ROAD

LINCOLN SOUTH PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 12th October 2020 at 12:20 pm
Height of 1.7 metres
Photos merged in Photoshop CS to create panorama

A. IMAGE LOCATION

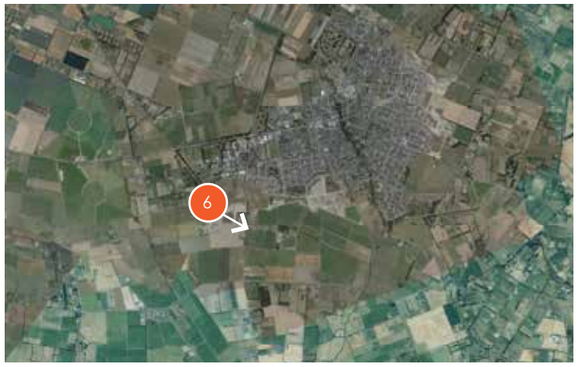
APPROXIMATE PROPOSAL LOCATION

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

VP5 - VIEW NORTH WEST FROM 221 COLLINS ROAD

LINCOLN SOUTH PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 12th October 2020 at 12:23 pm
Height of 1.7 metres
Photos merged in Photoshop CS to create panorama



A. IMAGE LOCATION

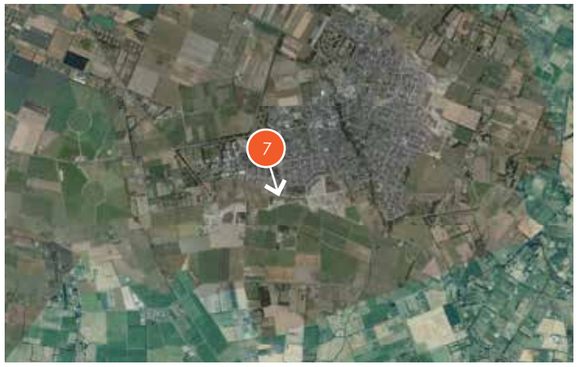
APPROXIMATE PROPOSAL LOCATION

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

VP6 - VIEW SOUTH EAST FROM 1491 SPRINGS ROAD

LINCOLN SOUTH PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 12th October 2020 at 12:17 pm
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 SOUTH FROM 111 SOUTHFIELD DRIVE

LINCOLN SOUTH PLAN CHANGE

Image captured on Sony A6000
Focal length of 50mm
Date: 12th October 2020 at 12:12 pm
Height of 1.7 metres
Photos merged in Photoshop CS to create panorama

Appendix F

Ecological Assessment

District Plan change for Lincoln South Development Area; Aquatic Ecology

Prepared for:

Rolleston Industrial Developments Ltd.

AEL Report No. 183

Mark Taylor

Final Report

October 2020

Aquatic Ecology Ltd.
Email: info@ael.org.nz

Contents

1 Executive Summary

A private plan change is proposed for a rezone of an approximate 186 Ha land parcel south of the Lincoln Township. The area is currently zoned for rural land use, and is currently used largely for dairying and grazing.

There is some ecological information available in the region to be rezoned and the surrounding area. These indicate the presence of several common fish, many with marine lifecycles, and a compromised aquatic macroinvertebrate fauna and low stream health metrics. Some fish in the receiving waters have a conservation status, this includes the longfin eel and inanga (the common whitebait). There is a historic lamprey record, a threatened species, but it is unknown if this species still exists in the catchment, let along the receiving waters. It is considered the freshwater crayfish (koura) may reside in flow-stable waterways in the region, especially where the banks are stable.

A zone change, per se, does not, in isolation guarantee aquatic habitat improvement degradation or improvement. However, in Canterbury, there is an increasing number of successful restorations of degraded aquatic habitats in rezoned rural land which demonstrates improved ecological values from residential watersheds under a regime of treated stormwater restored habitats, and consideration of ecological dispersal and life-cycling.

Notwithstanding zone change issues, a number of habitats in the region need to be ecologically surveyed. This is required prior to a detailed assessment of environmental effects at a future subdivision consent stage and/or in the event that works are undertaken within the District Plan's 10m waterbody setback for earthworks and development. These habitats are specified in the recommendations.

2 Introduction

Rolleston Industrial Developments Ltd. is proposing to develop rural land for residential use on the immediate south boundary of the Lincoln township (Fig. 1). It lies directly south of the Verdeco Park and Te Whariki developments. The area, based on the topographic maps, is relatively flat, of approximately 186 Ha, and at an elevation of about 9 m a.s.l. It is bounded to the north by the Verdeco Park and Te Whariki residential developments and to Collins Road to the south. The west boundary is an ephemeral waterway termed Western Boundary Drain and the area extends eastwards to the setback boundary of the LII River, south of Moirs Lane. The land is currently zoned as rural, and its current land use is primarily for dairying and grazing.

3 Objectives

In support of the private plan change application, and the section 32 (RMA) evaluation, the overall scope of this study is to provide an assessment of the following matters:

- An assessment of the existing ecological values of the Lincoln South Area,
- An assessment of the ecological effects associated with the type of development likely to result from the proposed residential zoning.

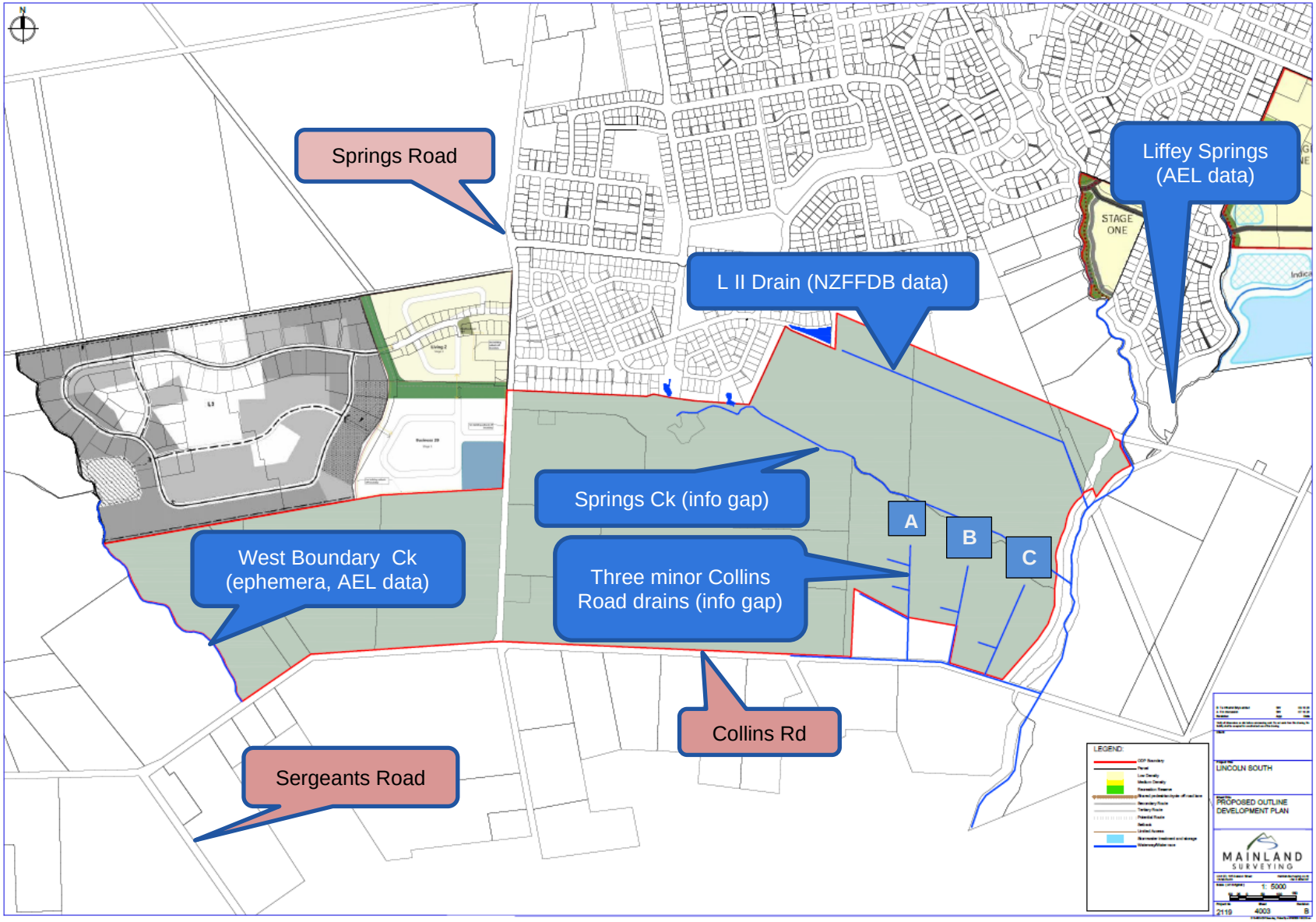


Figure 1. Red polygon = proposed plan change area, with major waterways and roads indicated.

4 Existing ecological knowledge of waterways

4.1 West Boundary Drain

West Boundary Drain borders the west boundary of the development area (Fig. 1), and the reach bordering the Verdeco Park Development Area to the north was surveyed by Aquatic Ecology Limited (AEL) in April 2019. This reach was found to be ephemeral, thus, conveying rainwater during rain events, but drying out between rain events. It was fished during a rain event, to check for transitory aquatic values, including fish, but none were caught.

The reach bordering the plan change area is also suspected to be dry. At the south-east corner of the development area, at Collins Road, West Boundary Drain was dry in October 2020 (Fig. 2a). The waterway was also dry in April 2019 during our Verdeco Park survey when the bed was similarly covered in willow weed and creepers (Figs.2 b,c).

Collins Road Drain appears ephemeral too, but during rain events would flow south-west to the intersection with Sergeants Road, and with inflows form further west, would appear to provide permanent flowing water southwards along Sergeants Road. During the recent October reconnaissance, the channel of Collins Road Drain was filled with tall fescue grass, indicating a normally dry channel (Fig. 3a).

Figure 2a. West Boundary Drain looking north from Collins Road (9/10/20).

Figure 2b. The bed of West Boundary Drain at Collins Road (April 2019)

Figure 2c. Looking south-west along Collins Road Drain, no surface water, damp bed with willow weed (April 2019).

Figure 3a. Looking eastwards along Collins Road Drain (9/10/20).

4.2 LI Creek (Liffey Stream)

The L1 rises north of the Lincoln township, flows south through the town, and enters the LII River below its headwaters. AEL ecologically evaluated the L1 headwaters upstream of the proposed development area in March 2018. This work was undertaken in pursuit of civil works required for the construction on a new school in the area and consenting for the dewatering discharge for trenching operations.

The waters were very clear at baseflow, with a measured mean baseflow turbidity of 2.4 NTU (n=3). A temperature and dissolved oxygen logger indicated that the autumnal diel (i.e. over a 24 hr period) temperature regime varied between approximately 12.9-15.5 degrees, and dissolved oxygen levels varied between 94% in the mid-afternoon to a minimum of 72% just after dawn. We considered that the LI Creek is a thermally stable spring-fed river exhibiting normal variation in dissolved oxygen concentrations typical for a well-vegetated and shaded waterway.

Physical habitat scores for the LI headwaters, compared to national values, were low, but in well-shaded habitats, the lack of sunlight appeared to inhibit the growth of weeds like watercress and monkey musk in some places, and native charophytes (*Nitella* sp.) were prominent. The physical habitat scored highly for bank stability, low erosion, and high levels of shade. Hydraulic variation and habitat abundance for invertebrates and fish cover abundance was usually low.

Koura were quite common, 5 caught in the fishing catch, and one with eggs (in berry). Invertebrate stream health metrics based on previously available data indicated poor stream health in the upper L1 River (MCI-sd = 65). A total of 200 fish were caught, composed of 6 species, common bully, longfin eel, upland bully, brown trout, bluegill bully, and shortfin eel. Of these, the longfin eel and bluegill bully have a conservation status of “declining”. The bluegill bully record was a first for this catchment, and adopts habitats in particularly fast water. Therefore, it is currently unknown, but considered unlikely, if it would inhabit resident habitats in the receiving waters of the LII River for this Plan-change area.

The upper reach of the L1 provided stable gravels downstream of the Gerald Street culvert (Taylor & Good 2006), and the New Zealand Freshwater Fish Database (NZFFDB) lists a historic (1920) record of lamprey in the upper reaches of the LII Creek (Edward Street, Lincoln, Card No. 50483). There is a recent (2015) giant bully record from the Lincoln township, surprisingly inland (33 km) for this species, and I consider that this record may be a misidentification.

4.3 LII River

The outline development plan depicts the development area extending to approximately 10 m (not counting the proposed green space along the boundary) of the LII River, a waterway with significant instream values. As noted above, the District Plan requires a 10m setback for earthworks from waterbodies.

The LII River, nears its confluence with the LI tributary, forms the eastern boundary of the development area. In 2007, AEL was involved in the plan change, stormwater AEE and monitoring of the Liffey Springs residential development between Liffey Stream (the spring-fed headwaters of the LII River) and the LI tributary.

At the time of the 2007 survey, the upper reaches of the LII, at the north-east corner of the development area, was composed of four common native fish species, shortfin eel, longfin eel (some large), common bully, and upland bully. Of these, the longfin eel has a conservation status of “declining” (numbers) (Dunn *et al.* 2017).

The invertebrate fauna contained koura (freshwater crayfish), but the remaining macroinvertebrates were commonly encountered species, with a stream health metric indicating ‘poor’ stream health (MCI-sb = 67.6), where a score less than 80 is categorised as poor (Stark & Maxted 2007).

4.4 New Zealand Freshwater Fish Database Records

Currently (19/10/20), there are 32 fish records in the LII catchment on the New Zealand Freshwater Fish Database (NZFFDB), with a species list provided below (Table 1). Within the LII dataset, the 5 most frequently encountered species are the common bully, upland bully, longfin eel, inanga (the common whitebait) and the shortfin eel.

Of these 32 records, 4 are quite recent (September 2020), and from an unnamed aligned waterway which passes through the development area and discharges into the LII River (Figs. 1, 4). These records indicate that this waterway provides habitat for a number of common lowland species: longfin eel, shortfin eel, inanga, upland bully, and common bully. Of these the longfin eel and inanga have a national conservation status of declining (numbers) Dunn *et al.* (2017).

The fish pest rudd was recorded near the mouth at Te Waiora/Lake Ellesmere, distant from the plan change area. Rudd has been recorded from other rivers near the lake. Goldfish, which can form problematic wild populations, have been recorded near Te Waiora/Lake Ellesmere, and in a pond near Templeton Hospital, both well away from the plan change area.

Koura have been infrequently recorded from the catchment (Table 1), but because they are difficult to catch, are often more common and well-distributed than records indicate.

Table 1. Freshwater Fish Species List from the LII River (NZFFDB), sorted from the most commonly recorded to the least recorded.

Common name	Scientific name	No. of records
Common bully	*Gobiomorphus cotidianus*	28
Upland bully	*Gobiomorphus breviceps*	24
Longfin eel	*Anguilla dieffenbachii*	23
Inanga	*Galaxias maculatus*	20
Shortfin eel	*Anguilla australis*	14
Brown trout	*Salmo trutta*	8
Unidentified eel	*Anguilla sp.*	8
Koura	*Paranephrops*	3
Unidentified bullies	*Gobiomorphus sp.*	3
Unidentified galaxias	*Galaxiid*	3
Goldfish	*Carassius auratus*	2
Common smelt	*Retropinna retropinna*	1
Freshwater mussel	*Hyridella menziesi*	1
Giant bully	*Gobiomorphus gobioides*	1
Rudd	*Scardinius erythrophthalmus*	1
Southern lamprey	*Geotria australis*	1
Torrentfish	*Cheimarrichthys fosteri*	1

Figure 4. The four NZFFDB records (red pins) in, or close, to the development area (green polygon).

4.5 Ecological values and sensitivity of the wider receiving environment

There is some information on the ecology of the LII River. Historically in the Te Waihora catchment, after the Selwyn River, the lower reaches of the LII was the most heavily fished for brown trout (Hardy & Taylor 1989).

There are two routes which stormwater can discharge from the site into the LII River. One is via Collins Road, Sergeants Road drain, finally discharging into the LII River near Yarrs Road. The identified fish fauna downstream of that point is composed of longfin eel, shortfin eel, inanga, common bully, and near the lake, goldfish and rudd, .However, there is fishing method bias in these records, and a number of other native and introduced fish will be present, including brown trout and common smelt.

Stormwater discharge to the east enters the LII River more directly and further upstream than *via* the Collins Road drain. The LII was apparently well-fished by the Department of Conservation in 2015 downstream of this potential discharge point (NZFFDB 10468). At that point, common native fish species were identified, specifically common bully, longfin and shortfin eels, inanga, upland bully and brown trout.

The most sensitive fish will be the common smelt which has been only electric-fished from the roadside drain along Days Road, but not the mainstem. However, this sea-migratory fish must migrate up the main river to reach the Days Road drain, but this location is well downstream of the Lincoln South area. Given that this fish is sensitive to urban contaminants (Cd, Zn, phenols *in* Hickey 2000) , in terms of an eventual assessment of environmental effects (AEE), it is important to know the upstream limit of common smelt in the LII River.

In almost all situations, NZ's aquatic invertebrates are more sensitive to urban contaminants than the fish. In this potential receiving environment, and based on available information (Hickey 2000) the freshwater shrimp (*Paratya curvirostris*) is likely to be the most sensitive.

4.6 Ecological knowledge gaps in the proposed development area

There are information gaps about the ecological values in three principal locations as indicated in Fig. 1. This information will be required to assess the level of protection these habitats require because of a Zone change, and potential assessment of ecological effects following potential residential development. The ecological issues surrounding these three locations are discussed below.

4.6.1 Springs Creek

Based on the recent photographic reconnaissance, and the recent survey in an adjacent waterway (see Sec. 4.4), I expect ecological values to be moderately high in Springs Creek. This opinion is based on the observation that the waterway is mostly fenced, with stable banks, and at least around the homestead, the margins are well vegetated with a wide riparian strip (Google Earth imagery, Drop boxed INOVO, e2 field photographs).

The discharges from the springheads at the top of the system form the basis of the baseflow, but augmented by more (fenced) spring-head inflows further downstream and eastwards. The waterway is subject to surface-water abstraction for dairy production. There is some gravel in the vicinity, which would form particularly valuable habitat for bullies and juvenile eels.

The fish fauna is currently unknown, but expected to be quite similar to that in the LII Drain indicated in Fig. 1 (i.e. longfin eel, shortfin eel, inanga, upland bully, and common bully). Where the hydraulics are suitable, there may be some trout spawning gravels, and these may be utilised for spawning by the upland bully. However, the linear nature of the channel, along with even gradient would suggest any trout spawning habitat is quite limited. Where the banks are stable, it is quite possible freshwater crayfish are present.

4.6.2 Isolated permanent and semi-permanent waterbodies

Along with Springs Creek, and the minor lateral drains, several isolated waterbodies require further investigation. These are located north-east of the intersection of Collins Road and Springs Road, and are comprised of 5 ponds visible on imagery in the recent past (i.e. since 2004, Fig. 5). These waterbodies align with old fluvial channels possibly dating back to the old course of the Waimakariri River.

Isolated ponds in Canterbury may form habitats of the Canterbury mudfish, a species with high conservation status. No Canterbury mudfish records exist on the NZFFDB in the LII catchment. However, at the time of writing, few suitable habitats appear to have been surveyed in this catchment. Maintenance of Canterbury mudfish habitat is not necessarily at odds with a plan change, but identification of habitats is critical as early as possible in the planning process.

Figure 5. The five isolated ponds which warrant ecological survey in the eastern half of the area proposed for re-zoning.

4.6.3 Collins Road Drains

These three spring-fed waterways discharge to Collins Road Drain, and recent imagery suggests that they are currently well-fenced from stock (Figs. 6 a, b). Collectively, these 3 waterways appear to be fed by approximately 10 (or so) springs heads. There also appears to be number of springs heads along the bank of the L II River, but which for the most part, may be protected by the waterway setback.

Given the evident stability of the channel form, these stable channels may form habitat for koura, inanga, common bully and upland bully. Given easy fish access to the LII, freshwater mussels may also be present. Freshwater mussels have a juvenile lifestage which attaches to fish for the purpose of dispersal.

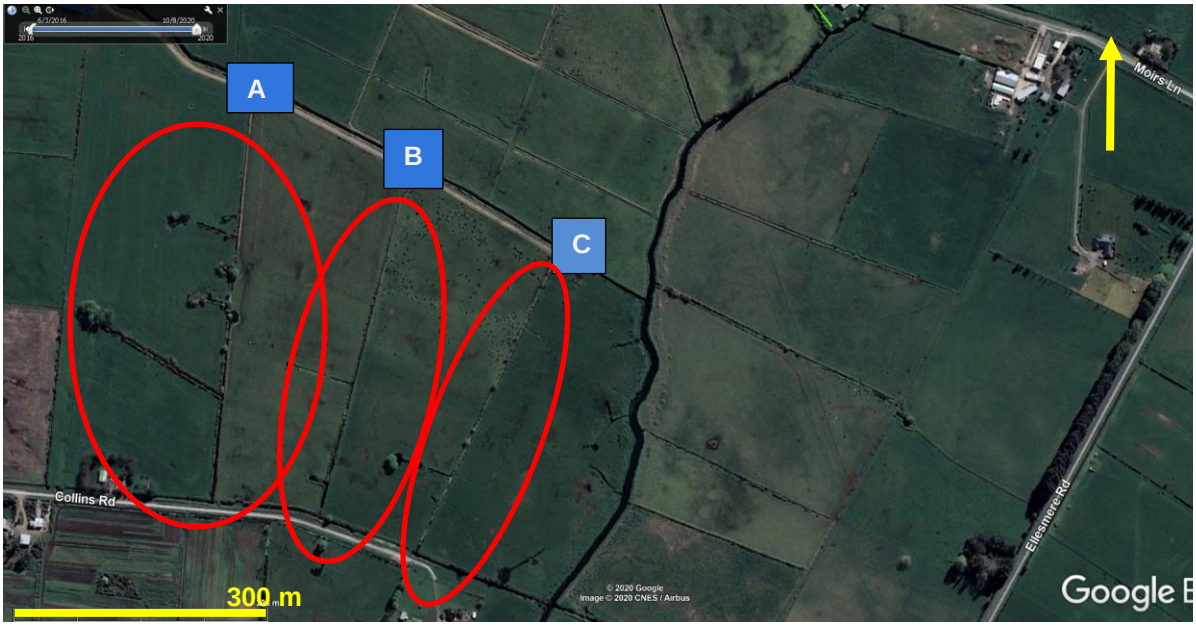


Figure 6a. The three springfed drains discharging into Collins Drain.

Figure 6b. The confluence of a Minor Collins Road Drain and Collins Road Drain "A". The waterway and springheads appear to be well-fenced based on the Google imagery. The fencing around the waterways "B" & "C" were similar.

5 General notes to protect ecological values and plan change level

5.1 Physical habitat notes

Spring fields are aquatic habitats sensitive to hydrological changes potentially manifested by change in land use. Maintaining groundwater flow to the springs is paramount to their future viability, and often at odds with high density development, where stormwater may be diverted away from areas of groundwater and springwater recharge.

It is apparent most of the spring heads and outlets in the proposed development area are already partially protected by fencing, and they are otherwise protected by the 10m setback for waterbodies in the District Plan. The riparian vegetation suggests they have been fenced in the recent past, but possibly not historically. The now-stable banks form important refuge habitat for all of the native fish and the native freshwater crayfish, but also form refuge and roosting areas for the native invertebrates upon which the fish feed. Koura require extensive cover, as they are vulnerable to cannibalism, but also predation from eels and trout.

Gravel substrate is important for native bully spawning, as they adhere their eggs to the large stones and cobbles, but coarse substrate is also valuable for fish cover, and bully abundance has been experimentally demonstrated to increase (and decrease) with the amount of available stony substrate (Jowett & Boustead 2001).

5.2 Possible change in ecological values associated with Plan Change

A plan rezoning from pervious rural land to residential will inevitably lead to higher stormwater discharge, because the proportion of impervious land will increase. The quality and quantity of the stormwater discharge will be dictated by the development intensity, the quality of the stormwater treatment train, the degree to which stormwater volumes are retained, and their discharge rate to surface waters. However, ultimately, all surface stormwater discharge will enter the LII River. Thus, quantification of ecological impacts, as for an AEE approach will be set out when stormwater design and flow rates are available.

Generally, the more peaked storm hydrograph associated with discharge from urbanised catchments which lack storm discharge attenuation can be quite averse to ecological values in the receiving environment (Suren & Elliott 2004). However, with improvements in stormwater treatment, along with physical habitat enhancements, within a development, and along the local receiving waterway, these adverse impacts can be reduced.

However, often rural waterways, at least in New Zealand, have been ecologically compromised in the past by the lack of fencing. While recent fencing is a welcome change for the natural environment, often the years of stock-accelerated bank erosion has meant the channel have already become over-widened in relation to the baseflow and prone to further sedimentation due to adverse hydraulics. The sediment, often nutrient rich, facilitates weed growth to the point it must be mechanically dredged causing further bank damage and widening.

Over time, Plan change from rural to residential can lead to further baseflow loss in channels which are already artificially widened as described above. Ecologically, this change is manifested by the gradual sedimentation of any stream gravels and its diverse habitat-specific fauna (i.e. caddisflies, mayflies, abundance of small native fish). With baseflow loss, even with banks now stabilised, this leads to a shallow, warm, silted channel inhabited by little else but midge larvae, segmented worms, and mud snails.

On a positive note, the development phase, and the associated mechanisation, provides a unique opportunity to reduce and restore effective wetted widths of waterways for low baseflows, yet still engineer hydraulic capacity for stormflows. An example of rural-to-residential land use change with good ecological outcomes is the spring-fed Kaputone Stream catchment of the Styx River in Christchurch where both ecological and water quality parameters indicate improving stream health. However, this beneficial change does take some years to manifest, probably largely due to access issues for instream inhabitants.

Invertebrate and fish dispersal are important elements to maintain life cycles. There is an increasing body of knowledge about dispersal and fish migration requirements to ensure restored habitats are available for colonisation. The recent MFE specifications on culvert placement in waterways will allow sea-migratory fish to colonise restored habitats.

In summary, changes in ecological values associated with Plan and land use change, can be detrimental, or beneficial, to the associated waterways. It all depends on utilising the critical time window when waterways are available for design and construction in respect to ecological function.

6 Recommendations

Overall, from a plan change/rezoning perspective if the development incorporates key design items such as:

- Stormwater discharging via first flush basins, detention basins and wetlands to attenuate stormflow and reduce contaminants to appropriate SDC & ECan guidelines.
- Reserves/green space placed directly adjacent to key ecological waterways to protect them (i.e. western boundary drain, Springs Creek, LII River, natural springs and isolated waterbodies)
- Fencing waterways with ecological value from further stock access.
- Adherence to the 10m waterbody setback rules, or detailed assessment through a resource consent process

then the possibility of the plan change/rezoning ecological impacts being beneficial to the environment are likely to be increased. Currently, the draft outline development plan (ODP) proposed for the Lincoln South plan change shows many of these key design items proven to protect aquatic ecology.

As a prerequisite to a submission of any subdivision consent application and subsequent land development, AEL recommends ecological assessment of the following habitats, in order to identify any ecologically significant biota, and construct mitigation measures to maintain and protect ecological values:

- isolated waterbodies east of Springs Road
- minor drains in the south east corner of the development
- the LII River immediately downstream of the region proposed for re-zoning.
- Springs Creek

In summary, if the listed key design items are implemented, along with the further ecological assessments, AEL believes this plan change will not necessarily manifest adverse ecological effects.

7 References

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.

Hardy, C. J.; Taylor, M. J. 1989. Fish habitats, fish, and fisheries of the Ellesmere catchment. Freshwater Fisheries Centre, MAFFish, Christchurch. *New Zealand Freshwater Fisheries Report No. No. 104*. 151 p.

Hickey, C. W. 2000: Ecotoxicology: laboratory and field approaches.415 *In:* Collier, K. J.; Winterbourn, M., J. *eds*: New Zealand Stream Invertebrates: Ecology and Implications for Management. New Zealand Limnological Society. Christchurch.

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.

Stark, J. D.; Maxted, J. R. 2007. A User Guide for the Macroinvertebrate Community Index. Cawthron Institute, Nelson. *Cawthron Report No. No. 1166*.p.

Suren, A.; Elliott, S. 2004: Impacts of urbanisation on streams.18 *In*: Freshwaters of New Zealand. New Zealand Hydrological Society and the New Zealand Limnological Society.

Taylor, M. J.; Good, M. 2006. Brown trout spawning in the Lake Ellesmere (Te Waihora) tributaries, and some surrounding catchments Aquatic Ecology Limited, Christchurch. *AEL Report No. No. 31*. 116 p.

Appendix G

Economic Assessment

ROLLESTON INDUSTRIAL DEVELOPMENTS LTD

APPLICATION FOR LINCOLN SOUTH PLAN CHANGE

ASSESSMENT OF ECONOMIC EFFECTS

Mike Copeland
Brown, Copeland & Co Ltd

27 October, 2020

1. INTRODUCTION

Background

1.1 Rolleston Industrial Developments Limited (RIDL) controls the land at 1491 Springs Road on the southern outskirts of Lincoln township and proposes a Plan Change, the Lincoln South Plan Change, which will rezone this land and some other adjacent properties owned by others from Rural (Outer Plains) to Residential (Living Z and Living X). The proposed Plan Change will allow for a maximum of 2,000 new lots at a minimum density of 12 households per hectare. Included within the rezoning will be provision for a small 'local centre' (Business 1 zoning) to meet the convenience shopping needs of the development's residents.

Report Objective

1.2 The objective of this report is to assess the economic effects of RIDL'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 Lincoln South Plan Change;

(d) A discussion of some potential economic costs from the proposed Lincoln South Plan Change;

(e) Consideration of the development capacity significance of the proposed Lincoln South 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:

> *"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].

[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.
[2] Pass, Christopher and Lowes, Bryan, 1993, *Collins Dictionary of Economics* (2nd edition), Harper Collins, page 148.

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 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 RIDL's site and adjacent properties 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 also in relation to the broader Greater Christchurch economy.

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

RIDL and the additional landowners covered by the Plan Change. 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 Lincoln, within the Selwyn District and Greater Christchurch.

Intangible Costs and Benefits

2.11 This report addresses the economic effects[4] of RIDL's proposed Lincoln South 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. South Lincoln) 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. 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 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.

[5]Data in this section from Statistics New Zealand.
[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.

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).

4. ECONOMIC BENEFITS OF PROPOSED SOUTH LINCOLN 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;

(c) Reduced unemployment and underemployment[7] 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.[8]

[7]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.
[8]There may be additional commuting costs for Christchurch residents attracted to jobs at the Lincoln South development site, depending on their place of residence and the location of alternative employment for them.

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[9]:

"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:

[9] At page 4.

"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[10], local authorities shall also provide an additional margin of feasible development capacity over and above projected demand of ***at least****:*

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.

[10]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.

4.12 RIDL'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 LINCOLN SOUTH PLAN CHANGE

Lost Agricultural Production

5.1 The area to be covered by the proposed Plan Change is zoned "Rural Outer Plains" and is used for 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 RIDL in agreeing to purchase the land has agreed a price reflective of future net returns from alternative uses for the land. Other land owners covered by the proposed Plan Change, if their land is developed, will have opportunity costs in the form of net returns from existing uses of 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 Lincoln South land is developed in advance of other land zoned for residential development, this other land will generally[11] 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 centre proposed to be included on the Lincoln South site is 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 a supermarket and the centre will not undermine the viability, vibrancy and amenity values of existing larger centres within Lincoln or elsewhere within the Selwyn District, noting that retail activity will be limited in the 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 Lincoln and the District, the proposed Plan Change will increase the viability, vibrancy and amenity values of larger centres in Lincoln and the District.

[11] 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.

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 the Lincoln South site no such externality costs will arise. Development contributions, rates and user charges will cover the capital and ongoing O&M 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 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 site.

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 Lincoln South site, 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 the proposed development. Also the site is adjacent, and well connected to the existing Lincoln 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 LINCOLN SOUTH 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 Lincoln South Plan Change would be significant, whether in the context of Lincoln township 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[12]. Therefore the proposed development of 2,000 dwellings represents around 8% of the existing dwellings in the District. RIDL expects that once the Plan Change is approved

[12]This is the average size of household assumed by Statistics New Zealand in their medium growth forecasts over the next decade.

(assumed to be sometime in 2021), development of the up to 2,000 dwellings will approximately occur over an 8 year period – i.e. from say mid–2021 to mid-2029, with an average of up to 250 dwellings coming onto the market in each of the 8 years 2022-2029 (inclusive).

6.5 Within the context of Lincoln township the development capacity enabled by the proposed Lincoln South Plan Change is even more significant. The current combined population of Lincoln West and Lincoln East statistical areas is 8,130[13] or 2,904 households assuming an average of 2.8 persons per household. The up to 2,000 additional dwellings of the proposed Plan Change represents up to 69% of the existing dwellings.

6.6 Furthermore, the population of Lincoln is proposed to be around 12,116 or 4,327 households in the year 2029/2030[14], when the development may be coming towards its capacity. Therefore, at that time, the up to 2,000 dwellings of the proposed Plan Change would represent up to 46% of the dwellings.

7. CONCLUSIONS

7.1 RIDL's proposed Plan Change enabling the rezoning of Rural Outer Plains land at Lincoln South 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 Lincoln 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 Lincoln South Plan Change is consistent with:

[13] Source: Statistics New Zealand NZStat. Subnational population estimates (RC,SA2) by age and sex at 30 June 1996-2020 (2020 boundaries).
[14] 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).

(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"*.

7.5 The Plan Change would add significantly to residential development capacity both in the context of the existing scale of Lincoln and the Selwyn District, and for the future forecast growth of both areas.