Private Plan Change Request – Hughes Developments Limited
Appendix A – Infrastructure Report

Hughes Developments Ltd

Faringdon Plan Change – Rolleston

Infrastructure Report

18727 R0

December 2019

DAVIE LOVELL-SMITH

PLANNING SURVEYING ENGINEERING

Shaping the future since 1880

Revision History

Rev Number:	Prepared By:	Description:	Date:

Document Control

Action:	Name:	Signed:	Date:
Prepared By	Andy Hall		13/12/19
Reviewed By	Jamie Verstappen		13-12-19
Approved By	Andy Hall		13/12/19

Contents:

Appendices:

1.0 INTRODUCTION

The proposed Plan Change sites are located on the southern urban fringe of Rolleston. There are two areas where a Plan Change is being sought. Both areas are north of Selwyn Road and are directly adjacent to the existing Faringdon Development. One is the area to the east, and one to the west.

Please refer to the location plan in Appendix A.

The whole area falls towards the south east at an approximate grade of 1 in 200. The land is currently comprised of a number of lifestyle blocks of varying sizes. The boundaries are generally lined with pine tree shelter belts and the blocks are fenced into smaller paddocks. Most blocks contain a substantial home and assorted out buildings. The homes may or may not be retained in the development of the site. There are also some small stands of plantation timber that will be removed.

The land is generally covered with approximately 200-300mm of good topsoil that overlays a layer of silts. The silt layer varies in depth between 0mm and 1000mm. Below the silts is a deep layer of gravel. The groundwater table is at approximately 5m depth.

This proposed plan change area is an extension of the successful Faringdon Development. Faringdon has grown to over 1500 new lots and has now reached the extent of its developable land. There is still very strong demand for this product. The proposed Plan Change will allow for another 930 Residential Lots.

Davie Lovell-Smith (DLS) have held several meetings with Strategic Planners and Infrastructure Engineers at Selwyn District Council (SDC), primarily Murray England with specific regards to servicing the proposal for water supply and sewer. It is the applicant's intention to construct infrastructure that will meet the demands of this project and also compliment the long-term requirements of the southern end of the Rolleston Urban Area. The proposed infrastructure will be integrated into the existing networks and all efforts will be made to ensure that the installations are complimentary to the current assets.

The applicant recognises the strategic approach required for the servicing of this area of Rolleston and understands the need to integrate the greater catchment area into these concepts being proposed in this report. To that end please refer to the Wastewater Catchment Plan provided here in Appendix B. It is hoped that this proposal provides some impetus to achieving the Councils strategic servicing goals.

All proposed infrastructure will be designed and constructed in compliance with SDC Standards unless otherwise agreed. All infrastructure works will be designed in detail following subdivision consent and referred back to Council engineers for approval prior to any construction being undertaken on site.

All sites will be serviced for sewage, water supply, gas, telecommunications and power. Stormwater will be discharged to ground on-site under a separate Consent to be obtained from Environment Canterbury. The approval of this consent is considered a formality as there is no intention to change the designs from what has previously been used in the Faringdon Development. An attempt will be made to simply extend the consented area of the existing Ecan Consent.

All sites will be earthworked to ensure drainage to the streets or natural flow paths. All building platforms will be elevated above secondary flow paths and the 1 in 50 year critical storm event.

2.0 WATER SUPPLY

The Council have a strategic plan for the delivery of water trunk mains to the south east side of Rolleston. It is contained in the SDC 5 Waters Activity Management Plan and is described as the Rolleston Master Plan 2017-2048. The plan describes and network of pipe sizes and bore upgrades with specific timing.

Please refer to the attached Figure 19-5 Rolleston Mater Plan in Appendix B

The Master Plan provides a very good framework for the roll out of water supply services but the timing is no longer valid as the development of land in Rolleston has overtaken these predictions. Added to this, the construction of the Faringdon Development has provided additional up-sized mains, and the area in fact may be better supplied than what was originally intended. The reason for this added supply is that the original intentions for the development of the town were based on a minimum housing density on 10 per hectare. In reality the density is closer to 12 homes per hectare.

Please refer to the attached Proposed Trunk Mains plan in Appendix B

This plan shows the existing pipework, 200mm (ID) or over. It also shows the future proposed 200mm (ID) pipes into the proposed plan change areas. This plan has been forwarded to SDC Officer Murray England for assessment in the Councils overall Network Analysis Model. We understand that modelling is underway.

The modelling will determine the verification of the pipe sizes and will also ascertain the timing for the upgrading of bores. For the purposes of this modelling, it is predicted that these plan change areas will be completed by 2023. This is a significant departure from the current Master Plan.

These main pipes will follow main connecting traffic routes but it is worth noting that all other streets will contain a watermain of 100mm or 150mm (ID).

Calculation of Flows - West Block
Area within the Block = 42.3ha
Potential number of lots for modelling purposes = 42.3 x 12 = 508 lots
With reference to Chart 1 in Chapter 7 of the SDC Code of Practice, the Peak design flow will be 0.14l/s/lot. This equates to 71.12l/s. We add to this 25l/s for fire fighting purposes. Assuming that a third of this flow may be going down any one trunk main, the max flow becomes 32l/s.

Pipe diameter	200mm	
Gradient - 1 in	211	
Pipe Roughness - ks	0.06mm	

Results for Full Bore Conditions:

Velocities	1.017	m/s
Discharge	31.96	litres/sec

For a 200mm (ID) pipe this equates to a unit headloss of 1 in 211m

Calculation of Flows - East Block
Area within the Block = 35.3ha
Potential number of lots for modelling purposes = 35.3 x 12 = 423 lots

With reference to Chart 1 in Chapter 7 of the SDC Code of Practice, the Peak design flow will be 0.145l/s/lot. This equates to 61.3l/s. We add to this 25l/s for fire fighting purposes. Assuming that a half of this flow may be going down any one trunk main, the max flow becomes 43l/s.

Pipe diameter	200	mm
Gradient - 1 in	120	
Pipe Roughness - ks		0.06mm

Results for Full Bore Conditions:

Velocities	1.373	m/s
Discharge	43.12	litres/sec

The development area will also be designed to comply with the New Zealand Fire Service Firefighting Water Supplies Code of Practice SNZ PAS 4509:2008. The water supply classification will be FW2(25l/s).

The calculated pipe sizes will be a good starting point for the modelling.

3.0 STORMWATER

As discussed previously, the development will be designed to ensure that secondary flow will be safely drain through the site via the road networks. The land falls to the south east towards Selwyn Road.

Primary stormwater from the site will be discharged to ground. The soakholes on the individual sites will be constructed as part of the Building consent process but the drainage and soakholes associated with the roads will be constructed as part of the subdivision and will be vested in SDC.

The soakholes on the house sites will deal with storms up to a 10% AEP 1hr event. The soakholes in the streets will deal with the flows off the streets up to a 2% AEP event plus the runoff from the house sites once the on-sitye soakhole is inundated This will be calculated as the flows generated by a 2% AEP event, less a 10% AEP event. Particular care is made to ensure that the sumps can handle these flows.

Consent or a certificate of compliance for stormwater discharge to ground from the development site will be obtained from Environment Canterbury (ECAN). All consenting from ECAN will be verified by SDC as being suitable for transfer to their ownership if required.

It is expected that all stormwater will be able to be permitted to discharge to ground without treatment. Stormwater discharge during construction will comply with the Environment Canterbury (ECAN) Erosion and Sediment Control Guidelines. Erosion and Sediment Control Management Plans will be compiled for both ECAN and SDC approval.

The proposed methods of stormwater treatment and disposal, replicates what is currently being used in Faringdon.

4.0 SEWER

As part of the Eastern Selwyn Sewage Scheme, a large pump station was constructed at the corner of Selwyn Road and Springston-Rolleston Road. This pump station is known as the RADAR Pump Station.

This pump station was designed to receive the flows from the southern side of Rolleston and also flows from other communities before pumping directly to the Pines Wastewater Treatment Plant west of Rolleston.

As part of the Faringdon development, a large sewer pipe was laid from the RADAR station, south along Selwyn Road and then north into the Faringdon Development Area. This pipe along Selwyn Road is a 525mm dia uPVC pipe and has been laid at a grade of 1 in 430. By applying the Colebrook White Equation, we can obtain the following flow data:

Pipe diameter 525mm
Gradient - 1 in 430
Pipe Roughness ks = 0.6mm

Results for Full Bore Conditions:
Velocities 1.072 m/s
Discharge 232.11 litres/sec

Part-Full Conditions:
Proportion depth = 0.92
Actual depth = 483mm
Velocity = 1.189 m/s
Discharge = 247.64 litres/sec

If we were to relate this flow back to Equation 3 of the Wastewater Section of the SDC Code of Practice, then we can determine the number of sites that this sewer can service.

MF = 247.64 litres/sec
ASF = MF/ 2.5 / 2 = 49.53 litres/sec
= 4,279,392 litres/day
No of lots = ASF / 220 / 2.7 = 7204 homes

If we make an assumption that there are on average, a density of twelve homes per hectare over the catchment then the pipe should be able to service 600ha.

Please refer to the attached plan of the Wastewater Catchments in Appendix C. The overall shaded area (red, blue and green) is the catchment entering into the 525mm sewer. This overall catchment area amounts to around 411ha. From this we can establish that the 525mm sewer can easily service the whole catchment.

The proposed Eastern Block will drain directly to the 525mm sewer. Provision will be made to ensure that the pipe sizing in the Eastern Block will be sized to accommodate the development of the undeveloped land to the north, between the Eastern Block and the existing edge of Faringdon.

It is expected that the land fronting onto Springston-Rolleston Rd will drain to the existing sewer in that road.

Sewers have been designed and installed through Faringdon and up East Maddison Road to service the balance of the Red Catchment on the attached plan.

The Green Catchment on Selwyn Road is served by a small pump station. The Pump Station is essentially a Lift Station with a full Pump Station specification. That is to say that if the station fails, it will overtop into the 525mm dia gravity sewer but there is still a full pumping arrangement. The rising main from this station will only service this catchment so overall, this system will not be able to assist with the flows from any other catchment.

The blue catchment includes for most of the proposed Western Block. Part of the Western Block will gravitate to the existing sewer on East Maddisons Rd but the majority will need to be serviced by a new pump station. The area of the Western Block inside the Blue catchment is 40ha.

The sewer demand for the proposal has been calculated using SDC Code of Practice. Please refer to the calculation below for the peak domestic demands.

Blue Catchment area = 127ha
At 12 sites per hectare that equates to 1524 lots
Faringdon is currently developing at about this density but it is conservative.

Average sewer flow
ASF = 1524 lots x 220 l/person/day x 2.7 people/lot

ASF = 905 m^3/day
ASF = 10.48 l/s

Peak wet weather flow
P/A ratio = 2.5 Part 6: Wastewater drainage SDC Code of Practice

SPF = 2 Part 6: Wastewater drainage SDC Code of Practice

MF = P/A ratio x SPF x ASF

MF = 2 x 2.5 x 10.48
MF = 52.4 l/s = Pump rate

The proportion of this flow that is associated with the Western Block is 40ha/127ha = 31.5%. Faringdon would be prepared to contribute 31.5% of the cost of the pump station.

The flows will need to be pumped to the head of the 525mm dia gravity main on Selwyn Road, approximately 880m to the east. An early estimate of the pipe size would be a 250mm PE PN12.5 with a headloss of around 1m per 80m length.

The pump station would be located on Selwyn Road approximately 420m southwest of the intersection with East Maddisons Rd. This is the general location of where Selwyn Road will intersect with a major local road entering into the catchment area.

To determine the depth of the proposed pump station we have analysed two pipe routes within the catchment.
Route One – Down Dunns Crossing Road and along Selwyn Road

Route Two – following expected traffic routes through the catchment based on the Outline Development Plan and the preliminary proposed layout of the Western Block.

Route One is approximately 2200m long and at a grade of 1 in 200 plus say 1.5m drop in manholes plus say 1.5m cover at the terminal point then the overall fall in the system is 11m + 1.5m + 1.5m = 14m. The ground level at the head of the pipe is RL44.1. The ground level at the pump station is approximately RL35.5. Therefore the depth of the Inlet pipe on the pump station is 44.1 – 14.0 = 30.1 or a depth of 35.5 – 30.1 = 5.4m.

Route Two is approximately 2000m long and at a grade of 1 in 200 plus say 2m drop in manholes plus say 1.5m cover at the terminal point then the overall fall in the system is 10m + 2m + 1.5m = 13.5m. The ground level at the head of the pipe is RL43.6. The ground level at the pump station is approximately RL35.5. Therefore the depth of the Inlet pipe on the pump station is 43.6 – 13.5 = 30.1 or a depth of 35.5 – 30.1 = 5.4m.

Both routes give the same result. Through detailed design we can assume that the pipes at the lower end of the catchment will be able to be flatter due to the larger flows. With this in mind perhaps the depth could be reduced to say 4-4.5m. The following calculations show the various pipes sizes with a gradient of 1 in 300. The target velocity is 0.6m/s.

Pipe diameter 175mm

Gradient - 1 in 300
Pipe Roughness – ks 0.6mm

Results for Full Bore Conditions:

Velocities	0.635	m/s
Discharge	**15.27**	litres/sec
Discharge	0.0153	m^3/sec

Part-Full Conditions:
Proportion depth = 0.44

Actual depth =	77mm	
Velocity	0.600	m/s
Discharge	**6.12**	litres/sec
Discharge	0.0061	m^3/sec

Pipe diameter 225mm

Gradient - 1 in 300
Pipe Roughness - ks 0.6mm

Results for Full Bore Conditions:

Velocities	0.748	m/s
Discharge	**29.75**	litres/sec
Discharge	0.0297	m^3/sec

Part-Full Conditions:
Proportion depth = 0.32

Actual depth =	72mm	
Velocity	0.604	m/s
Discharge	**6.62**	litres/sec
Discharge	0.0066	m^3/sec

Pipe diameter 300mm
Gradient - 1 in 300
Pipe Roughness - ks 0.6mm

Results for Full Bore Conditions:
Velocities 0.901 m/s
Discharge **63.69** litres/sec
Discharge 0.0637 m^3/sec

Part-Full Conditions:
Proportion depth = 0.23
Actual depth = 69mm
Velocity 0.608 m/s
Discharge **7.46** litres/sec
Discharge 0.0075 m^3/sec

From this information we can deduce the number of sites that need to be connected before a grade of 1 in 300 can be used.

Pipe size	Min Flow at 1/300	Equivalent Homes	Max Flow at 1/300	Equivalent Homes
mm	l/s	MF = 0.034375 l/s/home	l/s	MF = 0.006875 l/s/home
175	6.12	178	15.27	444
225	6.62	193	29.75	865
300	7.46	217	63.69	1853

150mm pipes at 1 in 300 cannot achieve a velocity of 0.6m/s.

From this we can see that once we get to a catchment of 176 homes then we can up size to 175mm pipe at a grade of 1 in 300.

At this depth we can assume that the groundwater may become an issue. We do not want to be in the groundwater at all. Please refer to Appendix D for the local bore data. This shows a depth to groundwater as shallow as 5.2m. From this we should be trying to get the pump station inlet invert to around the 4.0m mark.

The pump station will also need to be fitted with a suitable amount of storage for emergency situations. This volume can be derived from calculating 8hrs of mean flow. That is 8hrs at 10.48l/s. This amounts to 302m^3. Part of this can be stored in the system and in the pump chamber but this is still a very large volume to cater for. To that end we would like council to consider a lesser period of storage, perhaps 6 hours or 225m^3.

All works will be to Council Standards. All public sewer pipes over private land or reserves will be covered by appropriate easements in favour of SDC. The pump station will be located on its own utility lot to be vested in SDC.

5.0 POWER / TELECOMMUNICATIONS / STREET LIGHTS / GAS

Gas, power and telecommunications will be provided to all sites to utility company and industry standards. All cables will be placed underground and all kiosks will be constructed on separate individual lots. The kiosk sites will be forwarded to Council for approval following the power design.

Street lights will be provided to the roading and reserves to SDC standards. The applicant will provide a street light style consistent with the style used previously in Faringdon.

Full appraisals will proceed once the Plan Change has been obtained. This will include for potential substation sites and similar large scale infrastructure items.

6.0 ROADING

The proposed plan change areas will be serviced with road connections with reference to the CRETS Network. The layouts will be further dictated by the road alignments from the existing Faringdon Development.

Please refer to the Traffic Report by Carriageway Consulting Ltd, also attached to this application. The traffic report describes a hierarchy of roads describing Goulds Road and East Maddisons Roads as Collector Roads. We should add to this Springston Rolleston Road and Selwyn Road.

There is some ongoing confusion regarding the naming of the roading Hierarchy. In terms of the Outline Development Plans, the hierarchy of roads are described as being either Primary Roads or Secondary Roads. In the District Plan the descriptions are quite different. To help with the interpretation of this we consider ODP Primary Roads to be either Collector Roads or Major Local Roads and Secondary Roads to be Major Local Roads or Intermediate Local Roads.

It should also be noted from the Traffic Report that there no roundabouts considered necessary for this proposal.

Where the proposed development fronts onto an existing Road, it is accepted that the upgrading of that frontage will be undertaken by the developer. The cost of any other works such as widening and works on the opposite side of the road will need to be addressed by Council.

No specific provision will be made for cyclists. Footpaths will be to Council standards. Street lighting will be to Council standards.

All carriageways, pavements and kerbs will be constructed to Council standards and will be sealed with asphalt. Some cobbling may be included to indicate a change in road hierarchy and to add visual amenity.

Provision will be made for future road access to adjacent sites for the purpose of future development. The applicant reserves the right to place point strips across the end of these connections.

Please refer to the attached Appendix D for Typical Cross Sections.

Western Block
Please refer to the proposed Faringdon South West Outline Development Plan shown here.

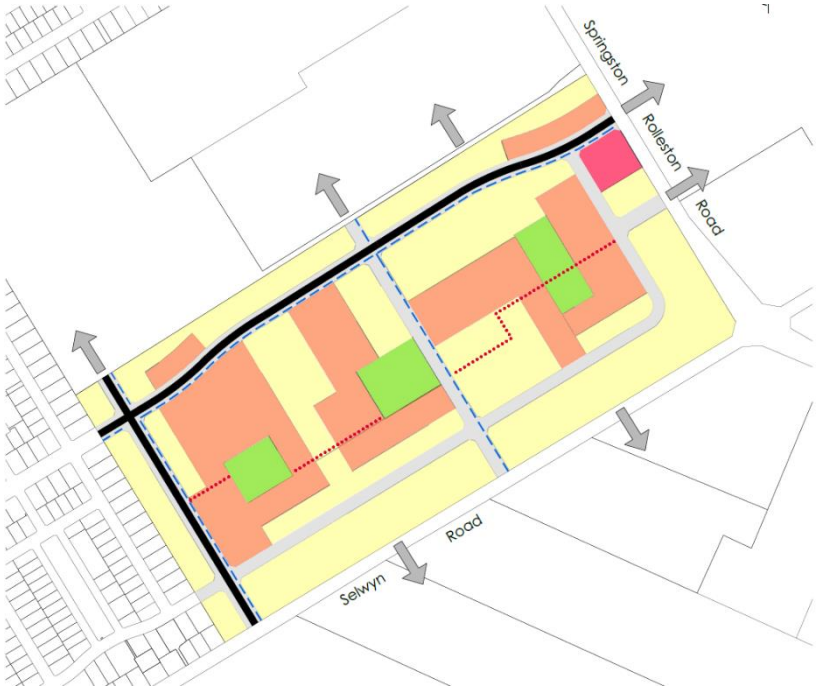
This block is bounded by Selwyn Rd, East Maddisons Rd and Goulds Road. The area will include a new Primary Road being an extension of Northmoor Boulevard, extending out over East Maddisons Road from the existing Faringdon development area, and terminating on Goulds Road.

Also included are a number of Secondary Roads linking into neighbouring sites and existing roads.

Faringdon South-West Roading ODP

Eastern Block

Please refer to the proposed Faringdon South East Outline Development Plan shown here.



Faringdon South-East Roading ODP

This block is bounded by Selwyn Rd, and Springston Rolleston Road. The area will include a new Primary Road being an extension of Northmoor Boulevard, extending, and terminating on Springston Rolleston Road. There will also be a Primary Road starting at Selwyn Road, intersecting with Northmoor Boulevard and terminating at the boundary of the area. This road will eventually link to Faringdon Boulevard.

Also included are a number of Secondary Roads linking into neighbouring sites and existing roads.

7.0 EARTHWORKS AND CLEARING

A key intention of the development of Faringdon is to create simple building sites with as little earthworks as possible.

Earthworks will be carried out on the site to ensure that all future house sites will drain towards the street at a grade of 1/500. Subject to design the house sites will be elevated above the street to facilitate drainage. The minimum elevation from the street boundary to the building site will be 100mm and may be as high as 500mm.

The area is not prone to flooding as the soils generally allow very good soakage, however, the design of the site levels will take into consideration flood levels in the streets and all homes will be above potential secondary flows associated with the 1 in 50 year event.

The total estimated cut to fill volume in the Western Block may exceed 100,000m³. The Eastern Block earthworks volume may exceed 80,000m³. The significant areas of cut are in the roadways where the depth to the subgrade may be as much as half a metre or more below existing ground level. Trenching for drainage will be lower than this again.

The deepest excavation will be associated with the construction of the pump station on Selwyn Road. This excavation is expected to reach nearly 5m depth.

All topsoil on site will be stripped, stockpiled and replaced on the land immediately following bulk earthworks. All disturbed topsoil will be resown with Council specification grass seed mixes. A balance of cut and fill will be maintained on site and removal of material from site will be kept to a minimum. Some topsoil may be removed from site due to contamination.

Sediment off the site will be controlled as per Council requirements. The basis of the sediment control will be the Environment Canterbury Guidelines and the discharge during construction will be undertaken either under Council's overall discharge consent or in accordance with Environment Canterbury rules. All dust created on the site will be controlled by water cart or other such Council approved methods.

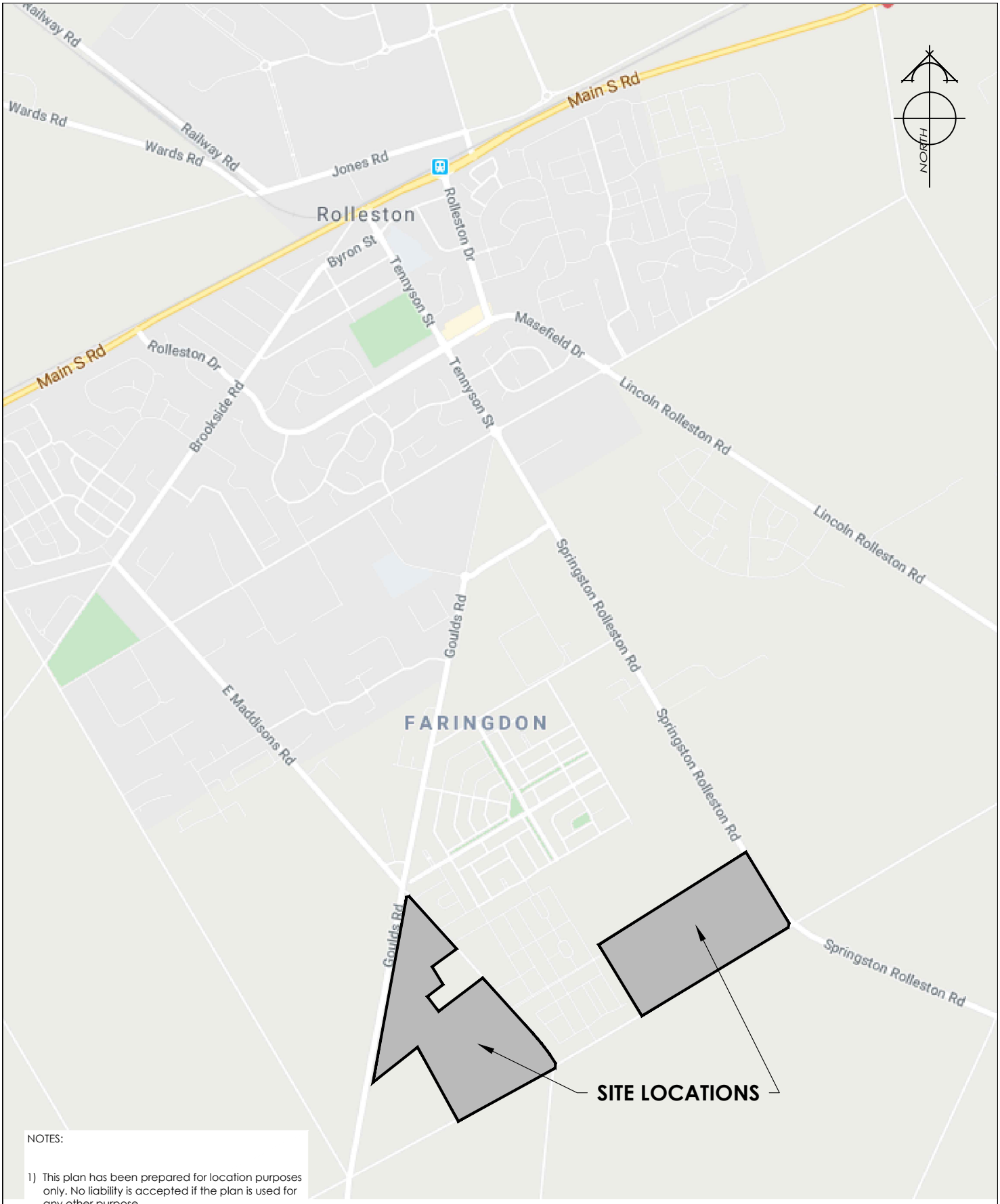
All bulk filling will be compacted in accordance with NZS 4431:1989. All fill testing will be carried out by an independent laboratory.

Andy Hall
Chartered Professional Engineer
Davie Lovell-Smith Ltd

December 2019

APPENDIX A

Location Plan



NOTES:

1) This plan has been prepared for location purposes only. No liability is accepted if the plan is used for any other purpose.

2) Any measurements taken from information which is not dimensioned on the electronic copy are at the risk of the recipient.

Revision: R0

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South West Rolleston Location Plan

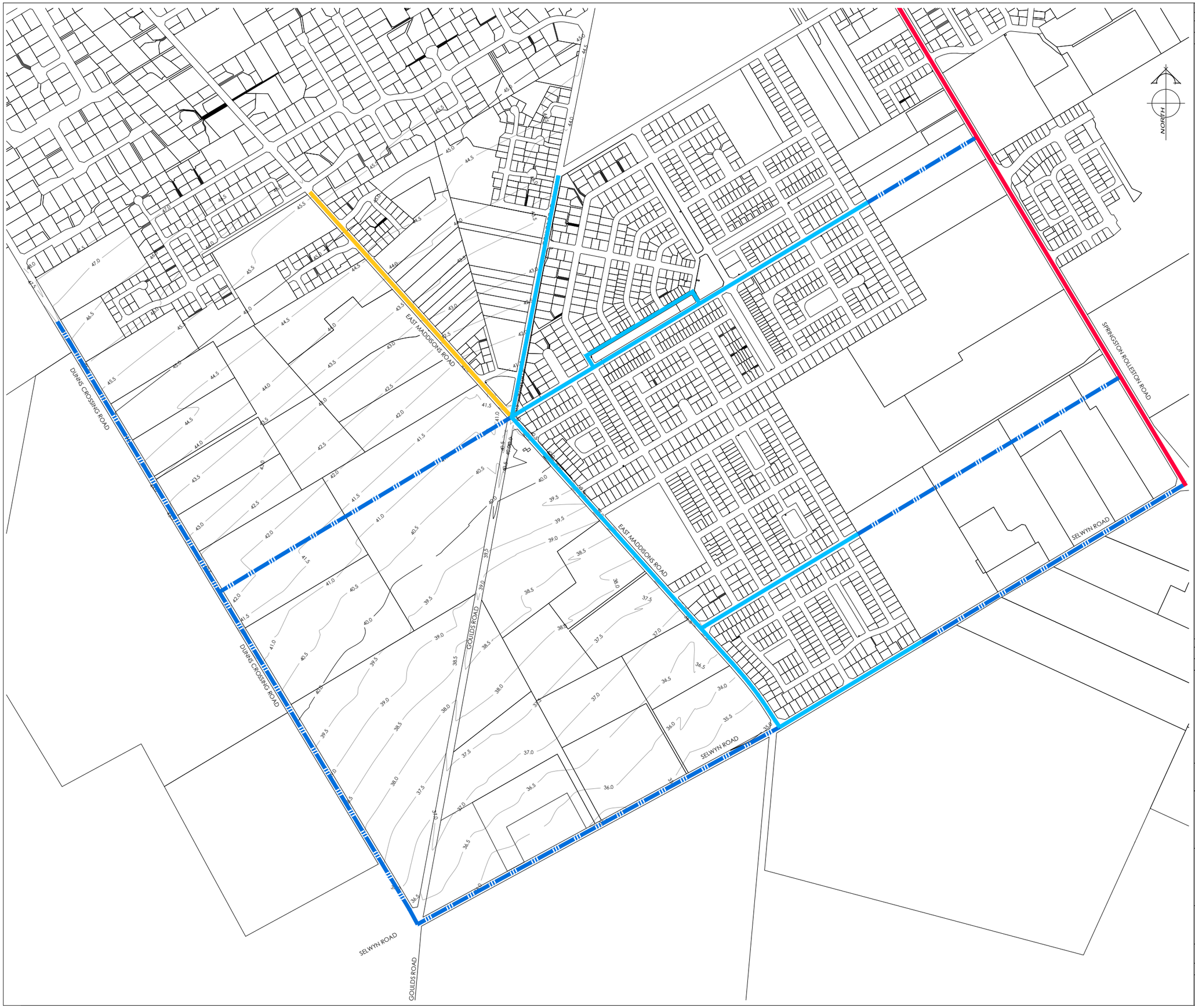
Scale:1:25000@A4
Date: December 2019

Drawing No: P18727

J:\18727\ENG Concepts\Location Plan.dwg

APPENDIX B

Water Supply Plans



AMENDMENTS :

AMENDMENT	DATE	DESCRIPTION

NOTES :

Legend

- Existing 200mmØ
- Existing 300mmØ
- Existing 450mmØ
- Proposed 200mmØ

	NAME	SIGNED	DATE
DESIGNED BY	JAMIE VERSTAPPEN		
CHECKED BY	ANDY HALL		

DAVIE LOVELL-SMITH
PLANNING SURVEYING ENGINEERING

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JOB TITLE:

South West Water Supply Rolleston

SHEET TITLE:

Proposed Trunk Mains

DRAWING STATUS

For Discussion

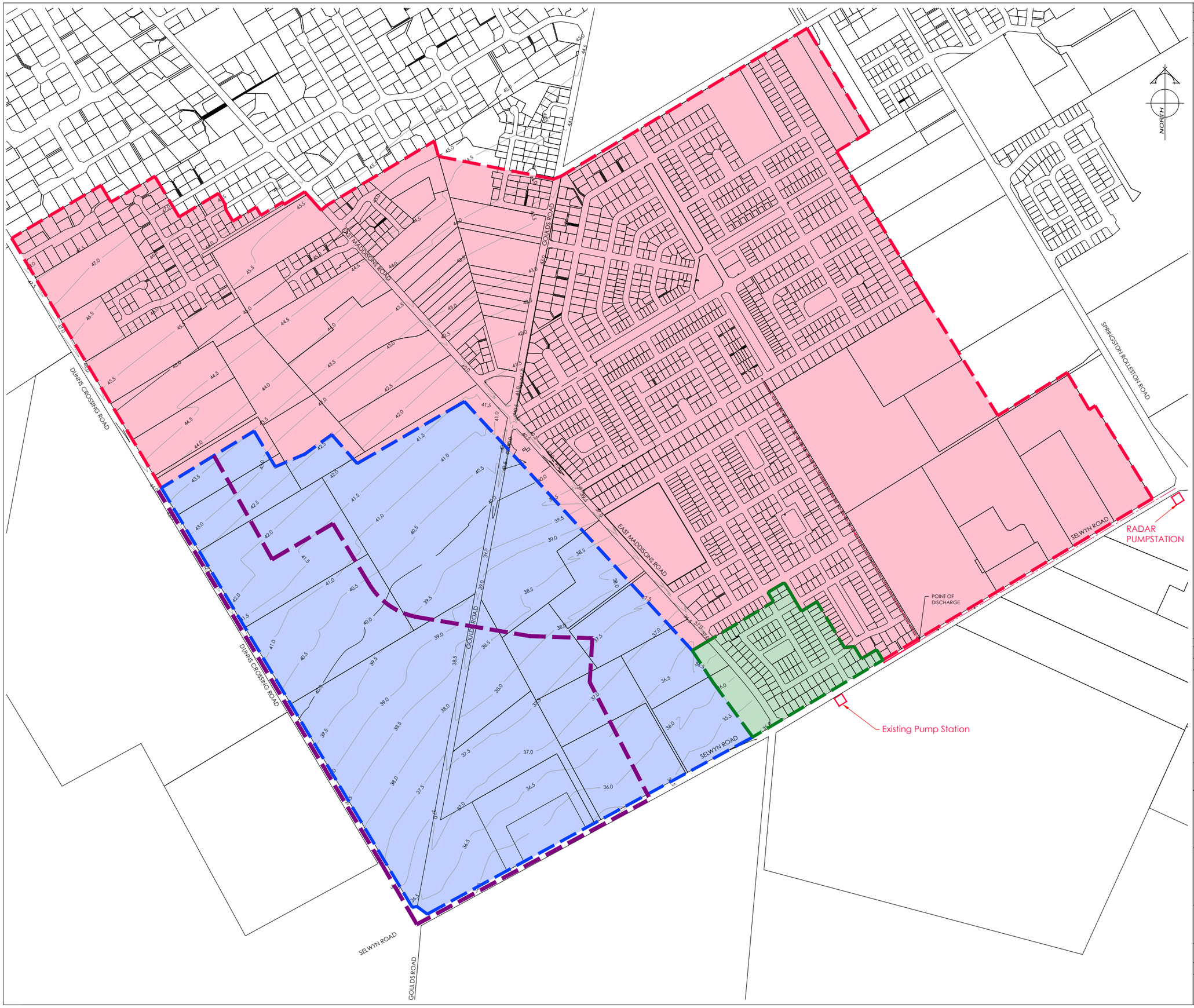
SCALE : 1:5000@A1 1:10000@A3 DATE : October 2019

CAD FILE : J:\18727\ENG Concepts\Water Supply Trunkmains.dwg DRAWN : GC

DRAWING No : **P18727** SHEET No: **E06.0** REVISION : **R0**

APPENDIX C

Wastewater Plans



AMENDMENTS :

AMENDMENT	DATE	DESCRIPTION

NOTES :

TOTAL CATCHMENT AREA:

GRAVITY CATCHMENT AREA = 273.34ha

PUMPED CATCHMENT AREA = 126.76ha

LIFT STATION 1 CATCHMENT AREA = 11.02ha

SERVICES

EX.SS — STD. MH

FUTURE PRESSURE SS

FUTURE GRAVITY SS — STD. MH

	NAME	SIGNED	DATE
DESIGNED BY	JAMIE VERSTAPPEN		
CHECKED BY	ANDY HALL		

DAVIE LOVELL-SMITH
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JOB TITLE:

South West Sewer Rolleston

SHEET TITLE:

Catchment and Layout Plan

DRAWING STATUS

For Discussion

SCALE : 1:5000@A1 1:10000@A3

DATE : October 2019

CAD FILE : J:\18727\ENG Concepts\South West Sewer Catchment_021019.dwg

DRAWN : GC

DRAWING No : **P18727**

SHEET No: **E06.0**

REVISION : **R0**

APPENDIX D

Existing Bore Data Sheets

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Canterbury Maps

N

0 0 0.1 0.1 0.1 Kilometres

Scale: 1:3,000 @A4

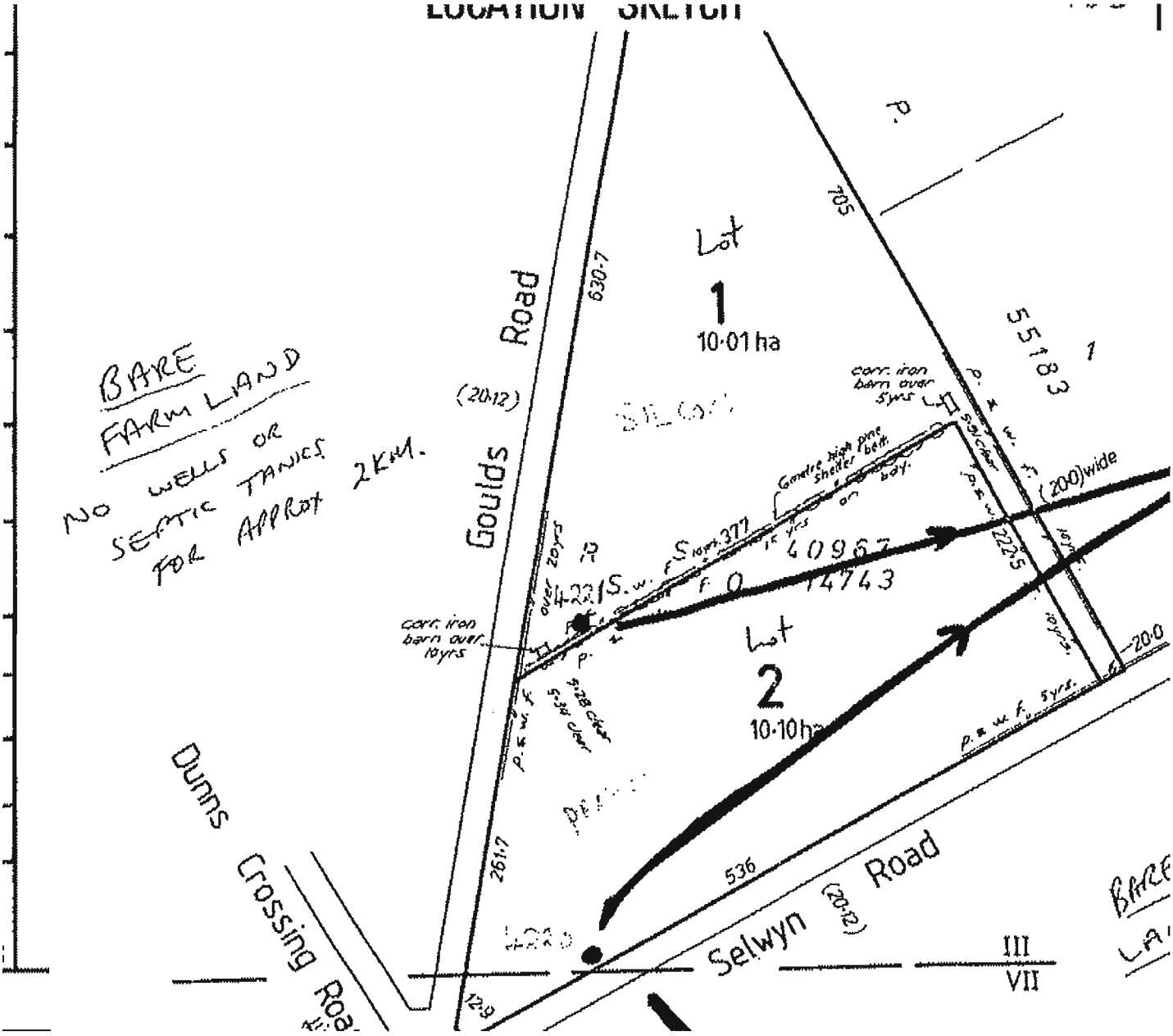
Map Created by Canterbury Maps on 25/10/2019 at 12:24 PM

12727

Bore or Well No	M36/4220
Well Name	SELWYN RD
Owner	Mr G B Shadwell

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Well Number	M36/4220	File Number	CO6C/13726
Owner	Mr G B Shadwell	Well Status	Active (exist, present)
Street/Road	SELWYN RD	NZTM Grid Reference	BX23:50117-68868
Locality	ROLLESTON	NZTM X and Y	1550117 - 5168868
Location Description		Location Accuracy	2 - 15m
CWMS Zone	Selwyn - Waihora	Use	Irrigation,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	--
Depth	21.30m	Water Level Count	0
Diameter	150mm	Initial Water Level	5.80m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	34.29m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	4	Calc Min 95%	6.10m below MP
Aquifer Name	Riccarton Gravel	Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	05 Feb 1991	Max Tested Yield	6 l/s
Driller	Weedons WellDrilling	Drawdown at Max Tested Yield	13 m
Drilling Method	Rotary/Percussion	Specific Capacity	0.44 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	20 Oct 2010
Water Use Data	No		



Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	20.3	21.3				

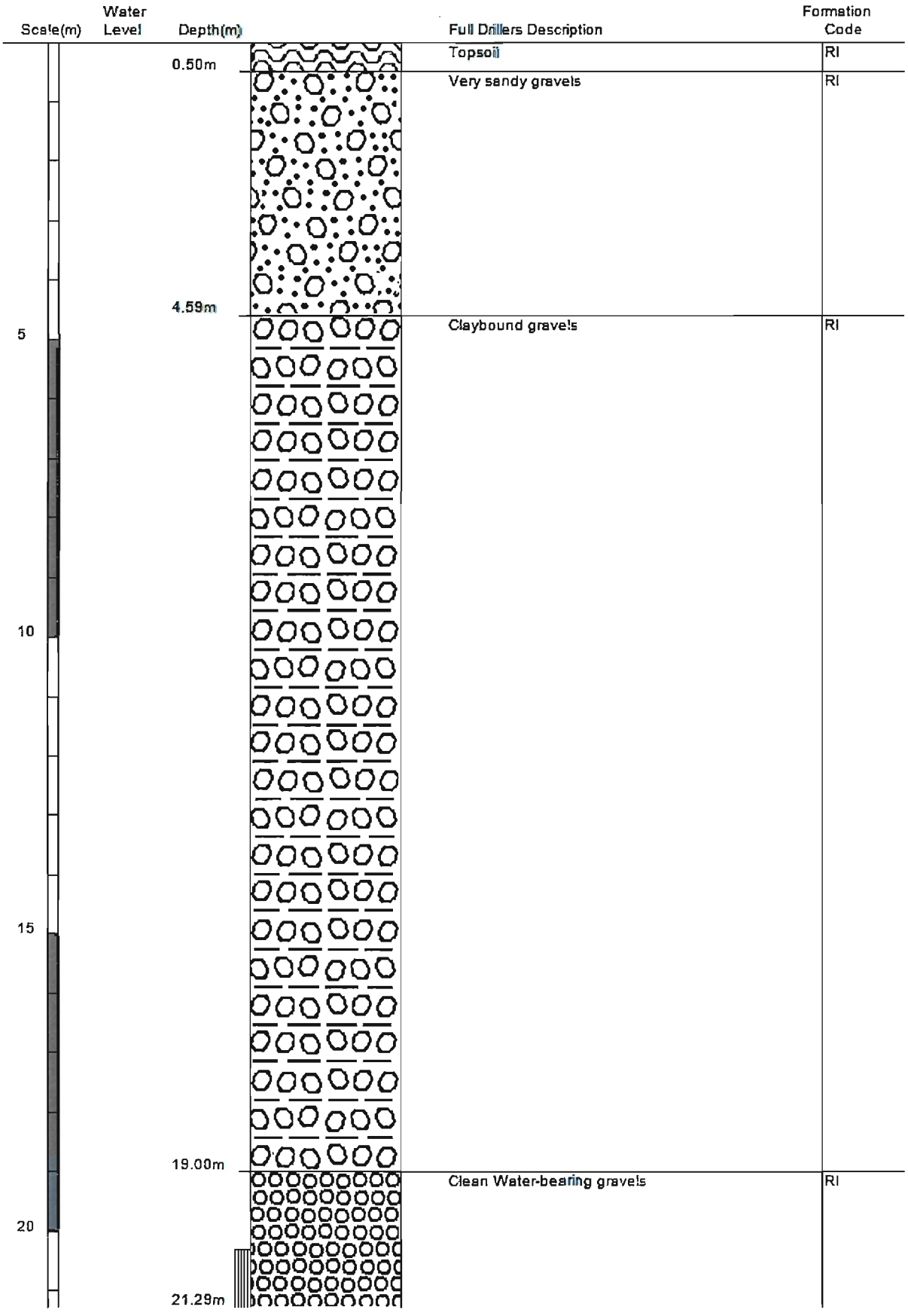
Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
05 Feb 1991	1	5.8	76.54947	13.1	0

Borelog for well M36/4220

Grid Reference (NZTM): 1550118 mE, 5168868 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 34.3 m +MSD Accuracy: < 2.5 m
Driller: Weedons WellDrilling
Drill Method: Rotary/Percussion
Borelog Depth: 21.3 m Drill Date: 05-Feb-1991

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha



Bore or Well No	M36/4221
Well Name	Cnr GOULDS RD and SELWYN RDS
Owner	Mr & Ms R J & S E Silcock & Russell

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Well Number	M36/4221	File Number	CO6C/01718
Owner	Mr & Ms R J & S E Silcock & Russell	Well Status	Active (exist, present)
Street/Road	Cnr GOULDS RD and SELWYN RDS	NZTM Grid Reference	BX23:50160-69165
Locality	ROLLESTON	NZTM X and Y	1550160 - 5169165
Location Description	SEE M36/4220	Location Accuracy	2 - 15m
CWMS Zone	Selwyn - Waihora	Use	Irrigation,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	--
Depth	21.44m	Water Level Count	0
Diameter	150mm	Initial Water Level	6.60m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	35.47m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	7	Calc Min 95%	6.60m below MP
Aquifer Name	Riccarton Gravel	Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	2
Drill Date	04 Feb 1991	Max Tested Yield	6 l/s
Driller	Weedons WellDrilling	Drawdown at Max Tested Yield	11 m
Drilling Method	Rotary/Percussion	Specific Capacity	0.51 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	20.4	21.4				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
04 Feb 1991	1	5.8	76.54947	11.35	3

Borelog for well M36/4221

Grid Reference (NZTM): 1550161 mE, 5169165 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 35.5 m +MSD Accuracy: < 2.5 m
Driller: Weedons WellDrilling
Drill Method: Rotary/Percussion
Borelog Depth: 21.4 m Drill Date: 04-Feb-1991

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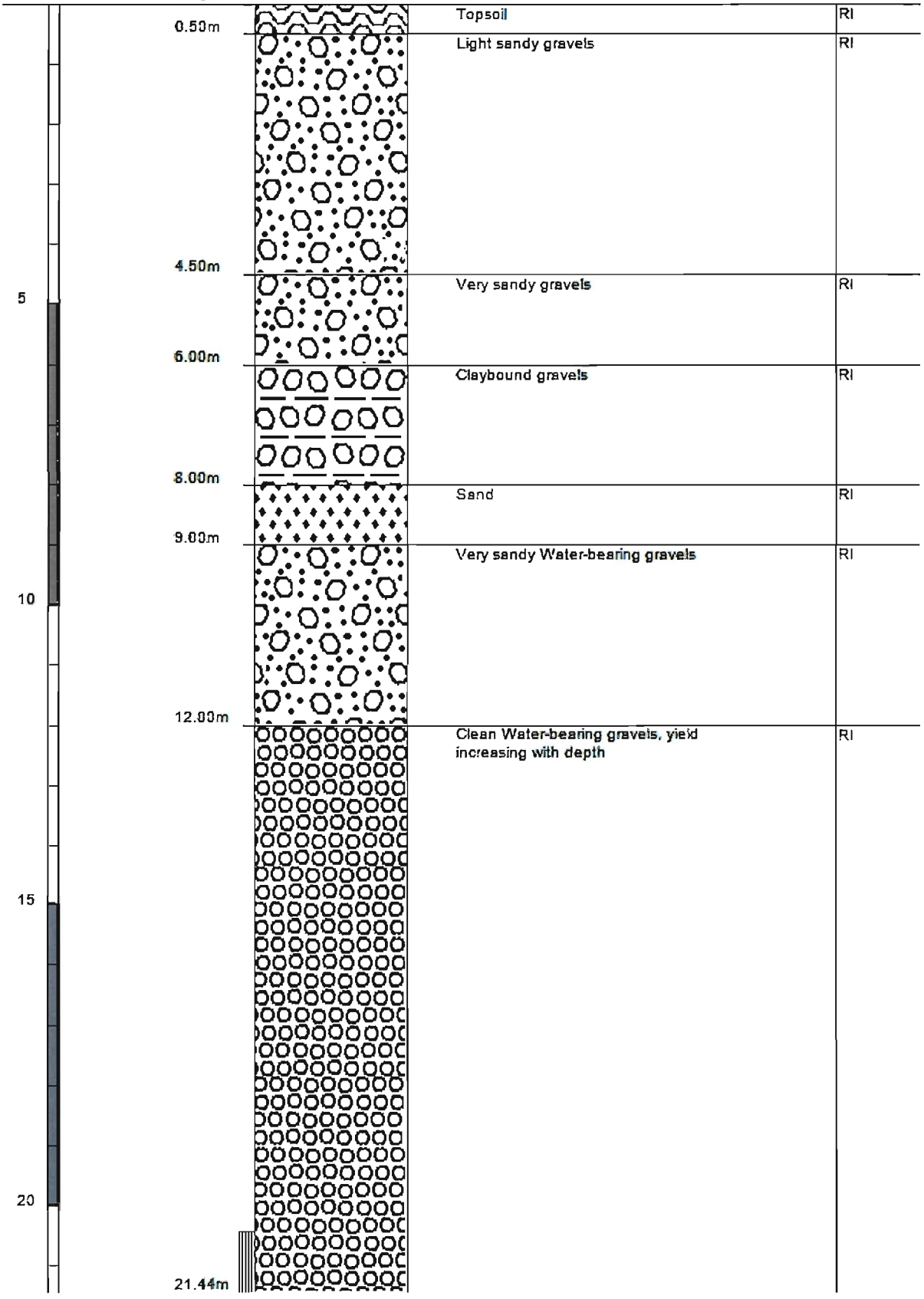

Bore or Well No	M36/5254
Well Name	SELWYN ROAD
Owner	Mr D B Irvine

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Well Number	M36/5254	File Number	CO6C/12625
Owner	Mr D B Irvine	Well Status	Active (exist, present)
Street/Road	SELWYN ROAD	NZTM Grid Reference	BX23:50467-69031
Locality	SPRINGSTON	NZTM X and Y	1550467 - 5169031
Location Description	100M FROM PROP LOT2 ETERN BOUND, 20M RD	Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Irrigation,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	--
Depth	36.00m	Water Level Count	0
Diameter	150mm	Initial Water Level	6.00m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	34.35m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	6	Calc Min 95%	6.30m below MP
Aquifer Name	Bromley Formation	Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	01 Dec 1996	Max Tested Yield	8 l/s
Driller	East Coast Drilling	Drawdown at Max Tested Yield	5 m
Drilling Method	Rotary Rig	Specific Capacity	1.65 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	34	36				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
01 Dec 1996	1	8.25	108.885017	5	2

Borelog for well M36/5254

Grid Reference (NZTM): 1550468 mE, 5169031 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 34.4 m +MSD Accuracy: < 2.5 m
Driller: East Coast Drilling
Drill Method: Rotary Rig
Borelog Depth: 36.0 m Drill Date: 01-Dec-1996

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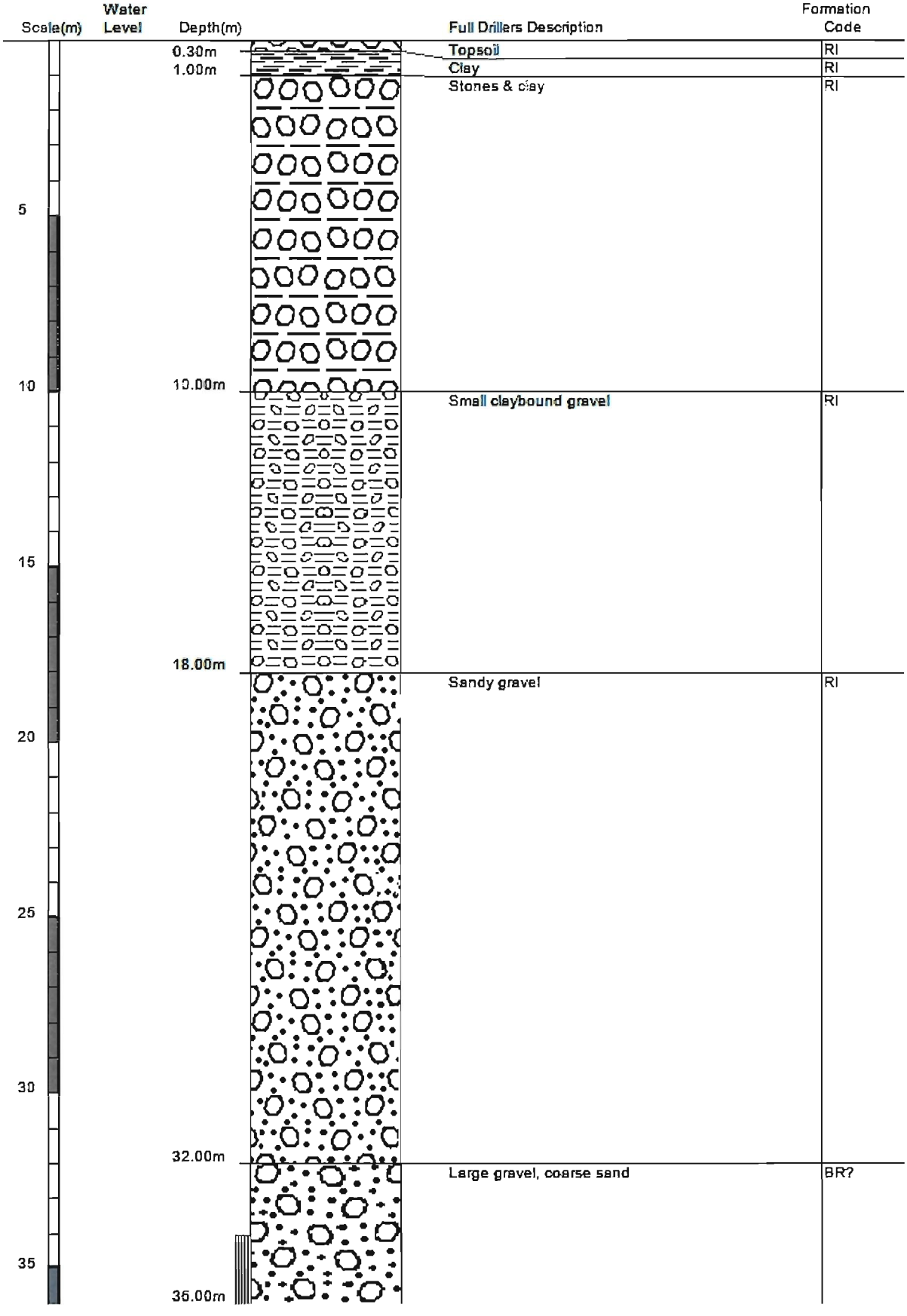
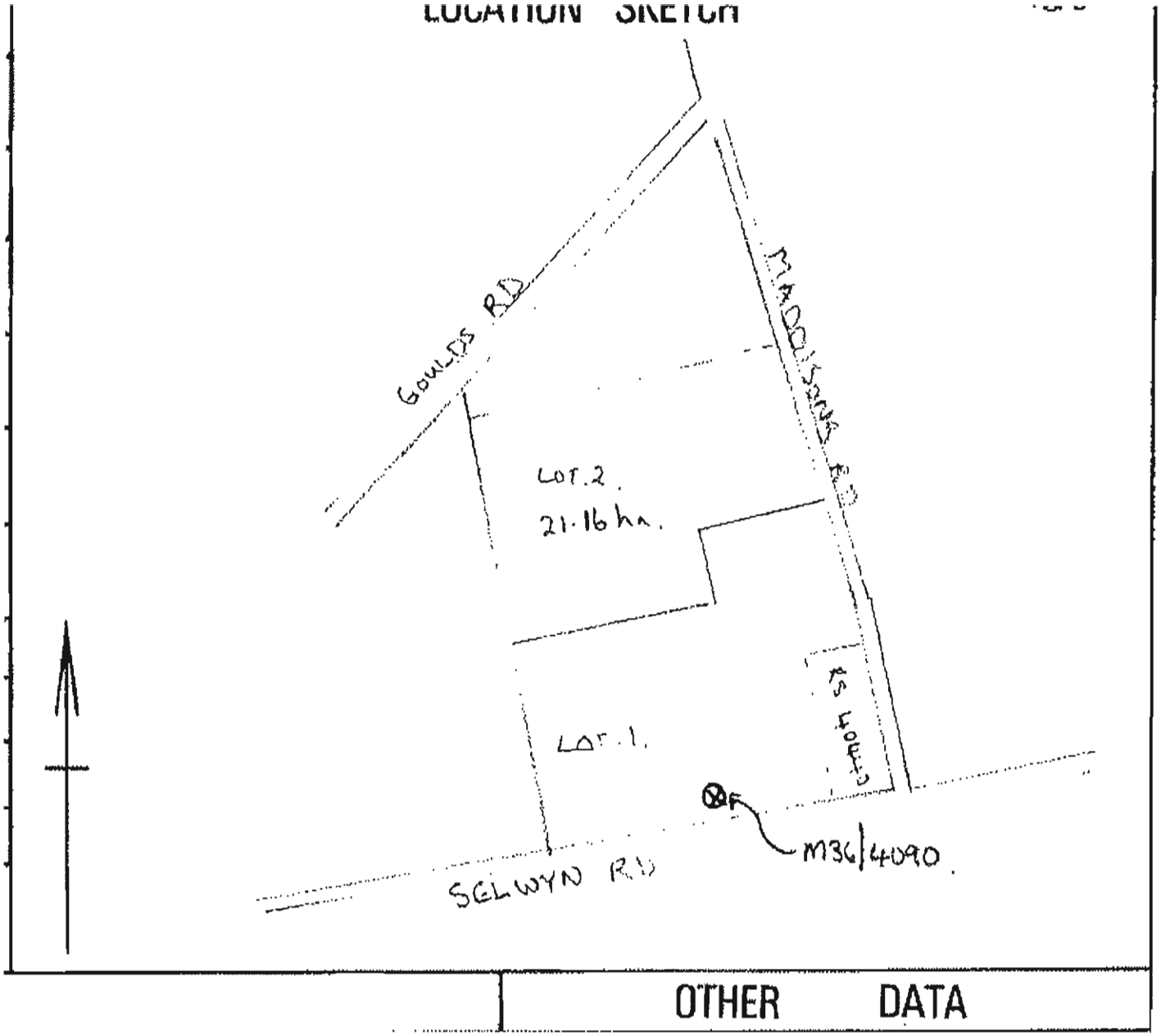


Bore or Well No	M36/4090
Well Name	SELWYN RD
Owner	DUTHIE D.J.M.

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Well Number	M36/4090	**File Number**	CO6C/00564
Owner	DUTHIE D.J.M.	**Well Status**	Active (exist, present)
Street/Road	SELWYN RD	**NZTM Grid Reference**	BX23:50747-69211
Locality	ROLLESTON	**NZTM X and Y**	1550747 - 5169211
Location Description		**Location Accuracy**	50 - 300m
CWMS Zone	Selwyn - Waihora	**Use**	Irrigation, Domestic Supply
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	18.30m	**Water Level Count**	0
Diameter	150mm	**Initial Water Level**	5.20m below MP
Measuring Point Description		**Highest Water Level**	
Measuring Point Elevation	34.90m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 2.5 m	**First reading**	
Ground Level	0.00m above MP	**Last reading**	
Strata Layers	0	**Calc Min 95%**	6.70m below MP
Aquifer Name	Riccarton Gravel	**Aquifer Tests**	0
Aquifer Type	Unknown	**Yield Drawdown Tests**	0
Drill Date	26 Oct 1989	**Max Tested Yield**	0 l/s
Driller	Weedons WellDrilling	**Drawdown at Max Tested Yield**	0 m
Drilling Method	Rotary/Percussion	**Specific Capacity**	
Casing Material	STEEL	**Last Updated**	05 Dec 1996
Pump Type	Unknown	**Last Field Check**	
Water Use Data	No		



OTHER DATA

No screen data for this well

No step tests for this well

No comments for this well

Bore or Well No	M36/7902
Well Name	SELWYN ROAD
Owner	RB & BM CHAPMAN & HAMILTON

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Well Number	M36/7902	File Number	CO6C/23254
Owner	RB & BM CHAPMAN & HAMILTON	Well Status	Active (exist, present)
Street/Road	SELWYN ROAD	NZTM Grid Reference	BX23:50407-69271
Locality	SPRINGSTON	NZTM X and Y	1550407 - 5169271
Location Description		Location Accuracy	10 - 50m
CWMS Zone	Selwyn - Waihora	Use	Domestic and Stockwater,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	--
Depth	36.00m	Water Level Count	0
Diameter	150mm	Initial Water Level	8.40m below MP
Measuring Point Description	ToC	Highest Water Level	
Measuring Point Elevation	35.00m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.30m below MP	Last reading	
Strata Layers	6	Calc Min 95%	
Aquifer Name		Aquifer Tests	0
Aquifer Type		Yield Drawdown Tests	1
Drill Date	09 Aug 2005	Max Tested Yield	4 l/s
Driller	East Coast Drilling	Drawdown at Max Tested Yield	16 m
Drilling Method	Rotary Rig	Specific Capacity	0.23 l/s/m
Casing Material	Steel	Last Updated	08 Nov 2013
Pump Type		Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	34.5	36				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
09 Aug 2005	1	3.7	48.83328	15.8	8

No comments for this well

Borelog for well M36/7902

Grid Reference (NZTM): 1550408 mE, 5169271 mN
Location Accuracy: 10 - 50m
Ground Level Altitude: 34.7 m +MSD Accuracy: < 2.5 m
Driller: East Coast Drilling
Drill Method: Rotary Rig
Borelog Depth: 36.0 m Drill Date: 09-Aug-2005

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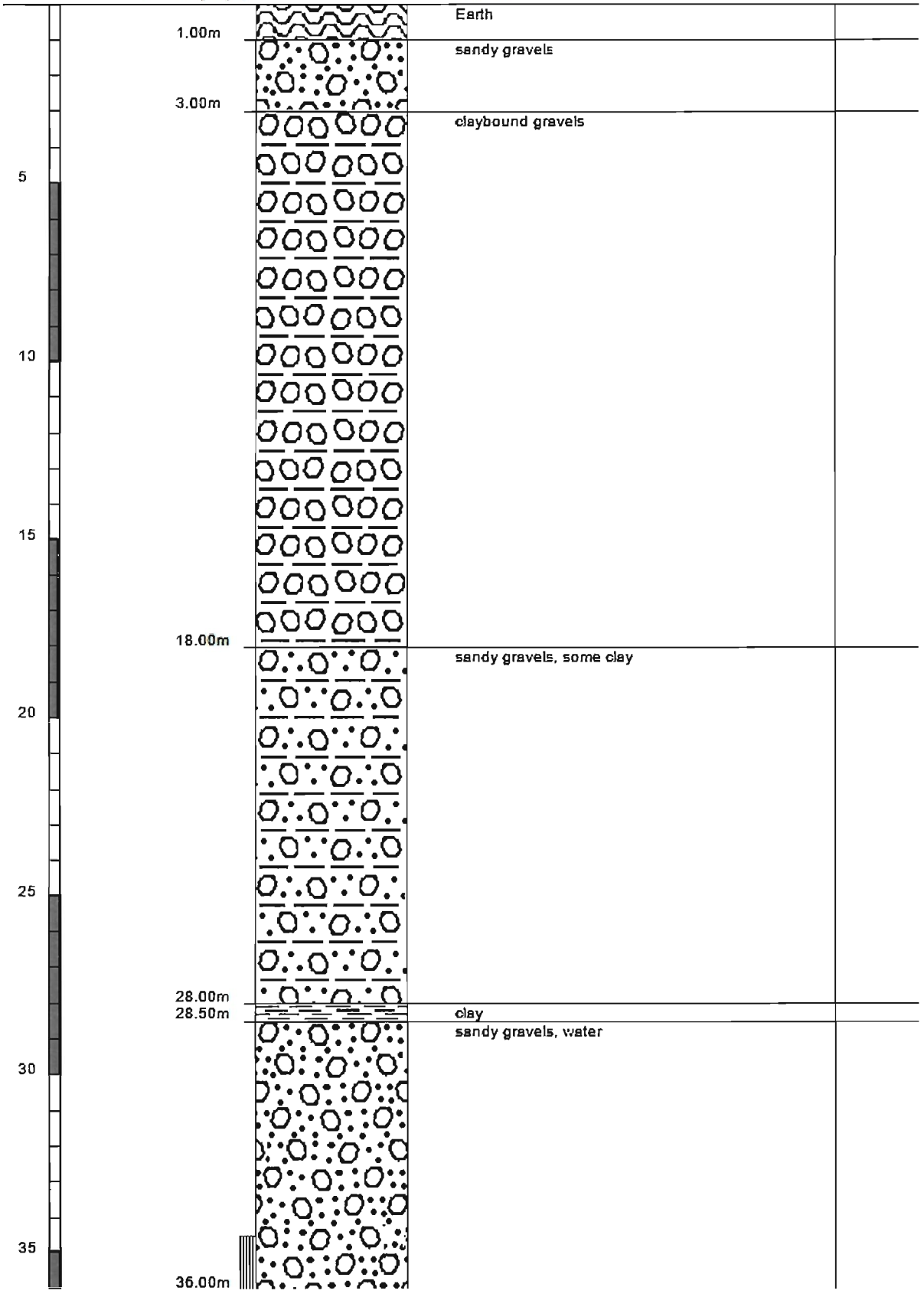
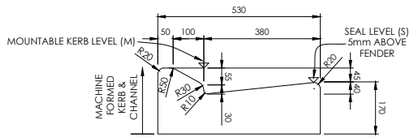


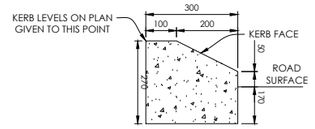
APPENDIX E

Typical Cross Sections



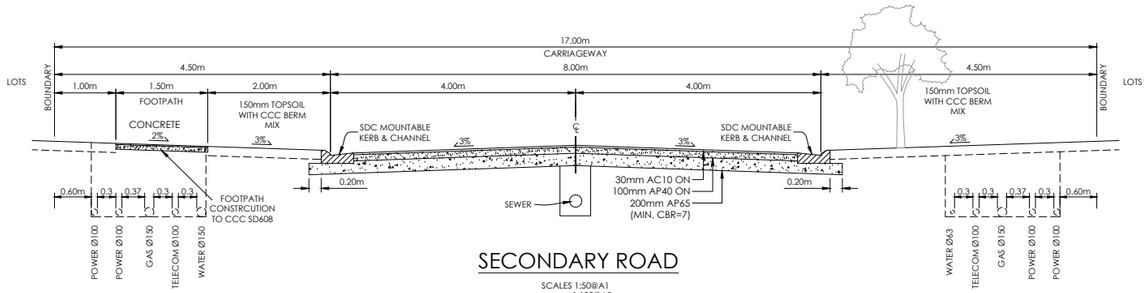
SDC MOUNTABLE KERB & CHANNEL

SCALE 1:10@A1
1:20@A3



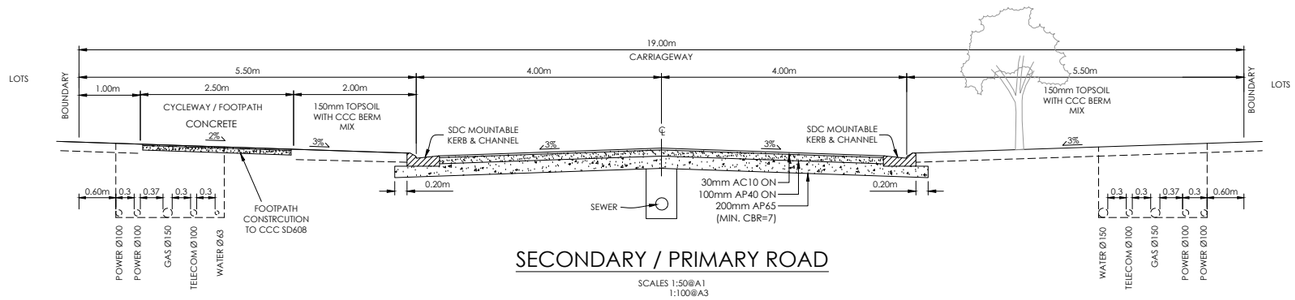
IN SITU MOUNTABLE MEDIAN KERB TO CCC SD603

SCALES 1:10@A1
1:20@A3



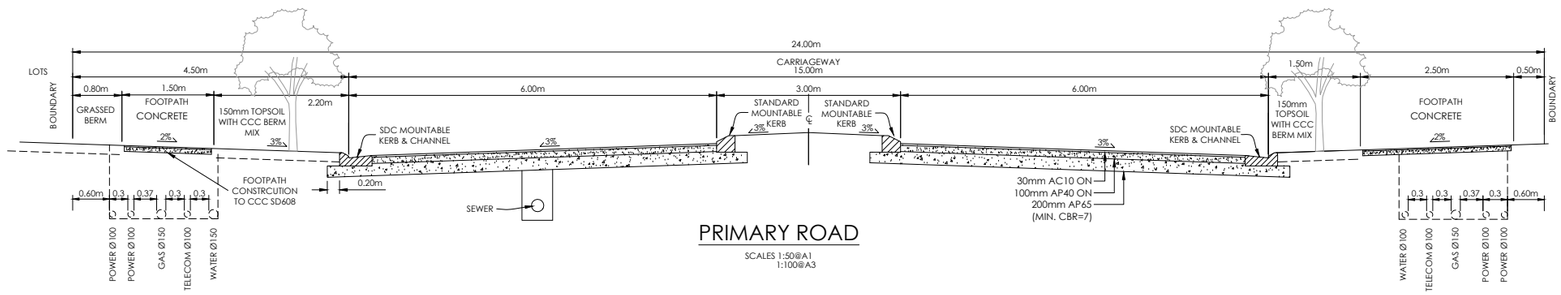
SECONDARY ROAD

SCALES 1:50@A1
1:100@A3



SECONDARY / PRIMARY ROAD

SCALES 1:50@A1
1:100@A3



PRIMARY ROAD

SCALES 1:50@A1
1:100@A3

AMENDMENTS :

AMENDMENT	DATE	DESCRIPTION

NOTES :

1) ALL WORKS IN ACCORDANCE WITH SDC CODE OF PRACTICE PARTS 1-11 STANDARDS, IF STANDARDS ARE UNSPECIFIED REFER TO CCC CSS PARTS 1-7.

2) ORIGIN OF LEVELS
LEVELS ARE IN TERMS OF MEAN SEA LEVEL (LYTTELTON VERTICAL DATUM 1937) PRIOR TO CANTERBURY EARTHQUAKES OF 2010 AND 2011.

3) METAL DEPTHS TO BE CONFIRMED OR INCREASED BY ENGINEER FOLLOWING CHECKING OF SUBGRADE CBR STRENGTH ONCE EXCAVATED.

4) ELECTRICITY & TELECOM SERVICES NOT SHOWN. REFER TO ELECTRICAL / TELECOM STREETLIGHT RETICULATION PLANS FOR RELEVANT DETAILS.

5) EXISTING SERVICES HAVE BEEN DIGITISED FROM SERVICE AUTHORITY PLANS; COMPLETENESS AND ACCURACY ARE NOT GUARANTEED. ALL SERVICES TO BE FULLY SEARCHED & PILOTED PRIOR TO TRENCHING.

6) CARRIAGEWAY & FOOTPATH ACCEPTANCE TESTING IN ACCORDANCE WITH SDC CODE OF PRACTICE PART 8, CCC CSS PART 6 & CCC IDS.

7) FOOTPATH BASECOURSE TESTING - MINIMUM CLEGG HAMMER VALUE OF 25 REQUIRED FOR FOOTPATHS & RESIDENTIAL CROSSINGS. 35 FOR COMMERCIAL CROSSINGS.

8) KERB & CHANNEL BASECOURSE TESTING - MINIMUM DRY DENSITY OF 2100kg/m³ WITH 75% EQUAL OR EXCEEDING 2150kg/m³.

9) ROAD BASECOURSE TESTING - MAXIMUM BENKELMAN BEAM DEFLECTION OF 2.0m WITH 95% OF RESULTS BELOW 1.6mm & RIGHT OF WAY 2.5m WITH 95% OF RESULT BELOW 2.0mm.

10) ALL KERB & FLAT CHANNELS TO BE TO SDC CoP; RD2.0

11) ALL AC FOOTPATHS TO CCC CSS SD607; SD608 CONCRETE.

12) DRAWINGS TO BE DISTRIBUTED AND READ AS A COMPLETE SET. ANY DISCREPANCIES ARE TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR CLARIFICATION

HUGHES
DEVELOPMENTS

LEGEND :

LEVELS

20.31	PROPOSED LOT LEVELS
M20.31	PROPOSED KERB LEVEL
B20.31	PROPOSED BOARD & BATTEN LEVEL
N20.31	PROPOSED NIB KERB LEVEL
×25.35	EXISTING LEVELS
25.35	EXISTING LOT LEVELS

EXISTING SERVICES

SANITARY SEWER — STD. MH
SANITARY SEWER — VENTED MH
STORMWATER — MH
WATER — FH — VALVE
KERB

PROPOSED SERVICES

SANITARY SEWER — STD. MH
SANITARY SEWER — VENTED MH
STORMWATER — MH
WATER — FH — VALVE
KERB

	NAME	SIGNED	DATE
DESIGNED BY	JAMIE VERSTAPPEN		
CHECKED BY	NIC BROOKER		

DAVIE LOVELL-SMITH
PLANNING SURVEYING ENGINEERING

116 Wrights Road P O Box 679 Christchurch 8140. New Zealand
Telephone: 03 379-0793 Website: www.dls.co.nz E-mail: office@dls.co.nz

JOB TITLE:

South West Rolleston

SHEET TITLE:

Roading Sections

DRAWING STATUS

For Discussion

SCALE : As Shown DATE : December 2019

CAD FILE : J:\18727\ENG Concepts\Typical Cross Sections.dwg DRAWN : GC

DRAWING No : **P18727** SHEET No: **E03.2** REVISION : **R0**