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Project Number 18991.001.001

Geotechnical Investigation

Broadfield Grange, Rolleston, Christchurch

Submitted to:
Broadfield Grange Limited
174 Hamptons Road
Prebbleton, Rd 6
Christchurch 7676

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ENGEO Document Control:

Report Title	Geotechnical Investigation - Broadfield Grange, Rolleston			
Project No.	18991.001.001	**Doc ID**	01	
Client	Broadfield Grange Limited	**Client Contact**	Brad Wilson	
Distribution (PDF)	Brad Wilson			
Date	**Revision Details / Status**	**Author**	**Reviewer**	**WP**
16/06/2022	Issued to Client	JRW	DB	BK

1 Introduction

ENGEO Ltd was requested by Broadfield Grange Limited to undertake a geotechnical investigation of the property at Broadfield Grange, Rolleston, Christchurch (herein referred to as 'the site'). This work has been carried out in accordance with our signed master agreement dated 3 June 2022 (ENGEO Ref: P2022.001.311).

The purpose of this assessment was to conceptualise a geological model of the site, assess the likely future land performance, comment on the suitability of the site for residential subdivision, address the requirements of Section 106 of the Resource Management Act (RMA), and provide recommendations for subdivision works and foundations for typical timber framed residential dwellings in support of subdivision consent.

Our scope of works included the following:

- Complete a desktop study of relevant available geotechnical and geological publications, including the NZ Geotechnical and Environment Canterbury Databases.
- Undertake a geotechnical site walkover.
- Organise service location for the proposed test locations.
- Undertake and log up to seven hand augers with Scala penetrometer tests to a maximum depth of approximately 0.9 m below ground level or practical refusal to assess the near surface material types and strength characteristics.
- Observe the excavation of up to seven test pits including geotechnical logging of the exposed soils. These pits were approximately 2.6 m deep, 3 m long and 1 m wide and loosely backfilled upon completion with the excavated soil. Recompaction was be accomplished by tamping with the excavator bucket.
- Preparation of this report outlining our findings on the ground conditions and the suitability of the site for residential subdivision including:
    - Geotechnical advice on the likely foundation Technical Category.
    - Conceptual foundation recommendations for typical timber framed residential dwellings.
    - Address likely geohazards as required by Section 106 of the RMA.
    - Provide a Statement of Professional Opinion on the Suitability of Land for Subdivision.

2 Site Description

The site comprises one property with a total area of approximately six hectares as depicted on the development plan presented in Appendix 1. ENGEO previously completed a plan change geotechnical report that included this site dated 9 December 2020, attached as Appendix 2. Our 9 December 2020 report should be read in conjunction with this report.

3 Geological Model

3.1 Regional Geology

The site has been regionally mapped by GNS (Forsyth et al., 2008) as being underlain by brownish grey river alluvium (Q2a).

3.2 Geomorphology

The site comprises relatively flat ground, with gentle undulations and depressions in some areas. As evident on aerial imagery (Canterbury Maps, 2019) and observed during our site walkover conducted on 2 June 2022, undulating and depressed ground can be attributed to paleo-channels, which traverse the site in a general northwest to southeast direction. Based on observations, sandy silt deposits with variable thickness are expected to have in-filled the paleo-channels where they have not remained as channel features.

3.3 Geohazards

3.3.1 Seismicity

There are no known or mapped faults in the immediate area of the site, however the site may be at risk of ground shaking induced by movement of proximal or distal faults.

The site is located between two recently discovered fault systems, the Greendale Fault and the Port Hills Fault, the ruptures of which initiated the ongoing Canterbury Earthquake Sequence (CES). The Greendale Fault has been mapped approximately 6 km northwest of the site and trends roughly east-west with a surface rupture length of approximately 28 km (GNS, 2015), while the Port Hills Fault remains unmapped as the fault did not rupture at the surface. Movement on the Port Hills Fault is believed to have extended to within 1 km to 2 km below ground surface.

Large regional areas of faulting (GNS, 2015) namely the Ashley Fault, Porters Pass - Amberley Fault Zone, and the Hope and Alpine Faults, are further afield but present a high seismic hazard to the Christchurch area due to the anticipated size of earthquakes generated. The largest of these faults is the Alpine Fault, which has a return period of 250 - 300 years and is expected to produce a M8 earthquake. The last rupture on the Alpine Fault is believed to have occurred in 1717 (Pettinga et al., 2001).

3.3.2 Liquefaction and Lateral Spreading

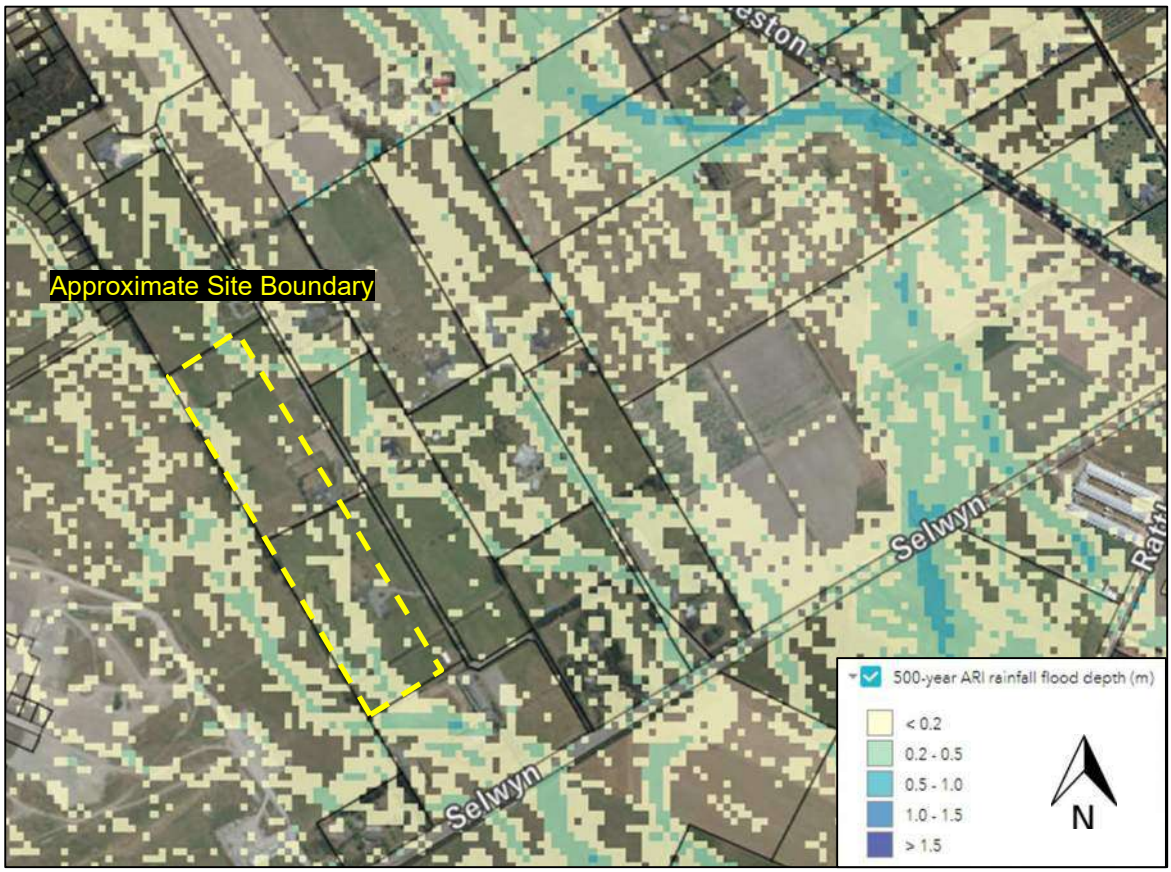
The site is located in an area mapped where “damaging liquefaction is unlikely” (NZGD Map CGD5140, 2012), and in a “zone of very low liquefaction potential” (GNS, 2006).

3.4 Flooding

The site is outside of any defined flood zones in the Selwyn District Council (SDC) Operative District Plan (SDC, 2015). The closest flood zone is the Lower Plains Flood Area which is approximately 4 km southeast of the site towards the Port Hills.

The Selwyn District Council have carried out computer-based flood modelling to predict the extent and depth of flooding that could happen during a one-in-200-year and a one-in-500-year flood. Based on this modelling, the water depth through the site may be up to 0.5 m deep but is generally less than 0.2 m (Figure 1) during the 500-year flood.

Figure 1: SDC Flooding map



From Canterbury Maps and Selwyn Council. Not to scale.

3.5 ECan Boreholes

We have reviewed deep ECan borehole logs located on the site (as shown in Figure 2) and have reviewed the monitoring well data from the monitoring wells on the site (part of the ECan Water Level Monitoring Network).

The logs for the wells located on the site, or close to the site boundary indicate the underlying soil generally comprises of gravels which extend to the bottom of the drill holes with isolated clay and silt layers at depth. The groundwater levels recorded in these wells are an average of approximately 10.6 m depth. The details for the wells are provided in Appendix 4 (including available drill logs).

Table 1: Generalised Summary of ECan Boreholes

ECan Borehole	Total Depth (m)	Initial Water Level Below Ground Level (m)	Generalised Borelog as Logged by Driller
M36_7975	37.5	10	Gravel to the maximum depth of testing with a 1 m thick silt layer from 25 m to 26 m depth.
M36_7976	36	10.2	Gravel to the maximum depth of drilling.
M36_8002	66	12.1	Gravel to the maximum depth of testing with 1 m thick clay layers from 26 m to 27 m depth and 32 m to 33 m.
M36_8009	36	11.8	Gravel to the maximum depth of drilling.
M36_8392	36	10	Gravel to the maximum depth of drilling.
Average Groundwater depth		10.8	

Figure 2: Nearby ECan Borehole Locations

Aerial photograph sourced from Canterbury Maps. Not to scale.

3.6 Groundwater

Groundwater is recorded in the surrounding ECan boreholes at approximately 10 to 11 m depth.

3.7 Site Investigation

As part of the plan change report dated December 2020, thee test pits were completed on, or near the site and an additional seven test pits and seven hand auger investigations were undertaken as part of this assessment by ENGEO on 2 June 2021. These were completed to a maximum depth of 2.6 m below ground level.

The investigations revealed subsurface conditions across the site are consistent with the published geological mapping, as summarised in Table 2. Hand auger and test pit logs are attached as Appendix 3 of this report.

Table 2: Summary of Subsurface Investigations

Soil Type	Depth to Top of Layer (m)	General Layer Thickness (m)	Density / Consistency	Additional Comments
TOPSOIL	0.0	0.25	-	-
Sandy GRAVEL	0.3	Unknown	Medium Dense to Very Dense	Tightly packed and consistent across the site. Thin (<0.4 m) silty SAND or SAND layers encountered in the initial 0.5 m (up to 0.9 m) in some test pit locations.

3.8 Site Seismic Class

In accordance with NZS 1170.5:2004, Class D applies to this particular site, defining it as a ‘deep soft soil site’.

4 Liquefaction Analysis

Owing to the nature of the subsurface materials and depth to groundwater at the site, we consider the potential for liquefaction and lateral spreading on the site to be very low.

We therefore consider future land performance to be in line with Technical Category 1 (TC1), whereby future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.

5 RMA Section 106 Requirements and Suitability to Subdivide

Section 106 of the Resource Management Act 1991 states a consent authority may refuse to grant a subdivision consent, or may grant a consent subject to specific consent conditions if it considers that:

- There is a significant risk from natural hazards; or
- Sufficient provision has not been made for legal or physical access to each allotment to be created by the subdivision.

An assessment of the risk from natural hazards as required by the RMA includes the following:

- The likelihood of natural hazards occurring (whether individually or in combination);
- The material damage to land in respect of which the consent is sought, other land, or structures that would result from natural hazards; and
- Any likely subsequent use of the land in respect of which the consent is sought that would accelerate, worsen, or result in material damage of the kind referred to in paragraph (b).

We have assessed the risk of natural hazards at the site in accordance with Section 106 of the Resource Management Act (RMA) and considered the risk to the site from rockfall, inundation (debris), slope stability, subsidence, flooding and tsunami. Based on our observations and the nature of the site, its performance during the Canterbury Earthquake Sequence (CES), and the site's distance from the nearest significant watercourse, we consider it is unlikely for the site to be subject to natural hazards such as rockfall, inundation (debris), slope stability, subsidence and tsunami. As discussed in Section 3.4, we recommend that inundation hazard is considered during subdivision design. As such, the site is considered suitable for subdivision from a geotechnical perspective.

6 Geotechnical Recommendations

6.1 Earthworks

Earthworks carried out for the subdivision shall be in accordance with NZS 4404:2010, Land Development and Subdivision Infrastructure and NZS 4431:1989, Code of Practice for Earth filling for Residential Development. In particular, any areas to receive fill should be stripped of all vegetation, topsoil, non-engineered fill, soft or organic soils prior to fill placement.

Fill may comprise clean native sandy gravel or silty soils, or clean imported soils and / or granular fill, compacted to achieve no less than 95% of maximum dry density. Fill faces steeper than 2H:1V and higher than 600 mm should be retained and referred back to ENGEO. Although unlikely, where any springs or groundwater seeps are encountered, they should be intercepted with suitable drainage and discharged to a Council approved outlet.

All unretained batters of pond and stormwater drains constructed with the native sandy gravel material should be at an inclination no steeper than 1V:3H, with protection schemes in place to control erosion of the formed batters within the waterways.

A comprehensive earthworks specification should be provided to the earthworks contractor prior to starting excavations and an inspection / testing regime agreed, along with a robust erosion and sediment control plan.

6.2 Subdivision Roading

Vegetation, any organic or deleterious material, topsoil and non-engineered fill should be removed from under pavement areas prior to aggregate placement. Based on our observations during testing, we consider the native ground below the topsoil at the site should provide an adequate subgrade for the proposed pavement areas.

6.3 Stormwater Control

Concentrated stormwater flows from all impermeable areas must be collected and carried in sealed pipes to the Council system or an alternative disposal point subject to approval from Council. Uncontrolled stormwater must not be allowed to saturate the ground as this will potentially affect future foundation performance both statically and during future seismic activity.

6.4 Foundations

Foundations for future proposed residential dwellings within the subdivision may comprise shallow pad, strip, or slab foundations designed in accordance with the provisions of NZS 3604 Timber Framed Buildings.

Site specific testing will be required for Building Consent, to confirm the bearing materials and capacity. For preliminary design, we anticipate that a geotechnical Ultimate Bearing Capacity of 300 kPa may be assumed for foundations bearing on sandy gravel or engineered fill, below any topsoil. All topsoil shall be stripped from within building footprints; we anticipate this to be typically below 0.3 m depth based on our subsurface investigations.

7 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Broadfield Grange Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ / ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by

Jed Watts

Engineering Geologist

Report reviewed by

Don Bruggers, CMEngNZ (CPEng)

Principal Engineer

8 References

Canterbury Maps, Groundwater. Retrieved June 2022 from http://canterburymaps.govt.nz/Viewer.

Forsyth, P., Barrell, D. J., & Jongens, R. (2008). Sheet 16 - Geology of the Christchurch Area 1:250,000. Lower Hutt: Institute of Geological and Nuclear Sciences.

New Zealand Geotechnical Database (NZGD). Retrieved June 2022 from https://www.nzgd.org.nz/

Selwyn District Council (2015), Selwyn District Council Operative District Plan. Retrieved December 2020, from http://www.selwyn.govt.nz/services/planning/district-plan.

Selwyn District Council (2015), Property Search. Retrieved June 2022, from https://www.selwyn.govt.nz/my-property/rates/search-properties.

The Ministry of Business, Innovation, and Employment. (2012). Guidance-Repairing and rebuilding houses affected by the Canterbury earthquakes. Christchurch: The Ministry of Business, Innovation, and Employment.

We also acknowledge the New Zealand GeoNet project and its sponsors EQC, GNS Science and LINZ, for providing data used in this report.

APPENDIX 1:

Development Plan

AMENDMENTS :		
AMENDMENT	DATE	DESCRIPTION

NOTES :

1. Areas and dimensions are approximate only and are subject to final survey and deposit of plans.
2. Service easements to be created as required.
3. This plan has been prepared for consent purposes only. No liability is accepted if the plan is used for any other purposes.

NORTH

STAGE 1

STAGE 2

STAGE 3

1000 0.3876 ha Road to Vest in SDC

2000 2.0690 ha BALANCE LOT

200 259m² Recreation Reserve to vest in SDC

1001 0.9116 ha Road to Vest in SDC

LADY ISSAC DRIVE

TE KANAWA LANE

LOVELOCK AVENUE

Proposed Memorandum of Easements

Nature	Servient Tenement (Burdened Land) Lot No	Shown	Dominant Tenement (Benefited Land)
Right of way, rights to drain water & sewage & rights to convey gas, water, electricity & telecommunications.	61	A	LOTS 62 - 66
	62	B	LOTS 61, 63 - 66
	63	C	LOTS 61, 62, 64 - 66
	64	D	LOTS 61 - 63, 65, 66
	65	E	LOTS 61 - 64, 66
	66	F	LOTS 61 - 65
	85	G	LOT 84
	84	H	LOT 85
	38	I	LOT 39
	39	J	LOT 38
	101	K	LOT 100
	100	L	LOT 101
	97	M	LOT 96
	96	N	LOT 97

Total Area : 5.9484ha

Comprised in: RT's 155851 & 155853

Schedule of Areas

Description	Area
Residential Lots - (Lots 1-7, 20-46, 53-66, 79-105)	4.6233ha
Balance Lot - (Lot 2000)	2.069ha
Recreation Reserve to vest in selwyn District Council - (Lot 200)	259m²
Road to vest in Selwyn District Council - (Lots 1000-1001)	1.2992ha

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:
Broadfield Grange Limited
East Rolleston PHASE I

SHEET TITLE:
Proposed Subdivision of Lot 2 & 4 DP 337894

DRAWING STATUS
For Consent Purposes

SCALE : 1:750@A1 1:1500@A3 DATE : May 2022

CAD FILE : J:\20654\SUBCON\E20654_STG 1-3_Subcon R0.dwg DRAWN : JS

DRAWING No : **E20654** SHEET No: 1 OF 1 REVISION : **R0**

APPENDIX 2:

ENGEO Southeast Rolleston Geotechnical Investigation

ENGEO

Celebrating 10 YEARS IN NZ

Geotechnical Investigation

Multiple Sites

Southeast Rolleston

Submitted to:

Urban Estates Ltd
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City Centre
Christchurch 8144

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09.12.2020
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Appendix 3: Ecan Boreholes

ENGEO Document Control:

Report Title	Geotechnical Investigation - Multiple Sites, Southeast Rolleston			
Project No.	18113.000.001	Doc ID	03	
Client	Urban Estates Ltd	Client Contact	Justin McDonald, Brad Wilson (Urban Estates)	
Distribution (PDF)	Justin McDonald, Brad Wilson (Urban Estates)			
Date	Revision Details/Status	WP	Author	Reviewer
09/12/2020	Issued to Client	DF	JRW	NC

1 Introduction

ENGEO Ltd was requested by Urban Estates Ltd to undertake a geotechnical investigation of several properties (herein referred to as 'the site'). This work has been carried out in accordance with our signed agreement dated 18 August 2020.

We understand that you propose to apply for a plan change for this site to allow proposed zone change from general rural zone to general residential zone with an approximate density of 12 lots per hectare. Our scope of works at this stage will support your Resource Consent application for the plan change only. We can complete additional testing to support a subdivision consent application at a later date.

Our scope of works included the following:

- Review of published geotechnical and geological information relevant to the site;
- Site assessment by an experienced ground engineering professional;
- Coordinate local buried services location contractor;
- Shallow subsurface testing, consisting of approximately 0.3 tests (test pits) per hectare*, with a total of approximately 18 test pits; These pits will be up to approximately 2 m deep, 3 m long and 1 m wide. We will loosely backfill the test pits upon completion with the excavated soil. Re-compaction will be accomplished by tamping with the excavator bucket.
- Assess the liquefaction potential for the site based on our site investigations and published literature;
- Prepare a report outlining our findings on the ground conditions and the suitability of the site for residential subdivision. This will include:
    - Foundation recommendations for typical timber framed residential dwellings.
    - Seismic Subsoil category;
    - Address likely geohazards that may affect the site; and
    - Provide general geotechnical recommendations related to the proposed development.

Our scope of works does not include geotechnical recommendations to a level suitable for subdivision consent, foundation design or Building Consent.

2 Site Description

The 63 ha site is located on a relatively flat area in Rolleston and made up of the following addresses (Appendix 1):

- 127 Lincoln Rolleston Road
- 391 Lincoln Rolleston Road
- 548 Selwyn Road

- 2/554 Selwyn Road
- 3/554 Selwyn Road
- 1/554 Selwyn Road
- 1/572 Selwyn Road (Lot 2 DP 337894)
- 2/572 Selwyn Road (Lot 3 DP 337894)
- 4/572 Selwyn Road (Lot 4 DP 337894)
- 5/572 Selwyn Road (Lot 5 DP 337894)
- 6/572 Selwyn Road (Lot 6 DP 337894)
- 582 Selwyn Road (Lot 1 DP 337894)

The site is currently lifestyle blocks mostly used for light grazing. There are various existing dwellings and sheds on-site.

3 Geological Model

3.1 Regional Geology

The site has been regionally mapped by GNS (Forsyth et al., 2008) as being underlain by brownish grey river alluvium (Q2a).

3.2 Geomorphology

The site comprises relatively flat ground, with gentle undulations and depressions in some areas. As evident on aerial imagery (Canterbury Maps, 2020) and observed during our site walkover conducted on 2 December 2020, a number of areas of undulating and depressed ground can be attributed to paleo-channels, which traverse the site in a general northwest to southeast direction. Based on observations, sandy silt deposits with variable thickness are expected to have in-filled the paleo-channels where they have not remained as channel features.

3.3 Geohazards

3.3.1 Seismicity

There are no known or mapped faults in the immediate area of the site, however, the site may be at risk of ground shaking induced by movement of other faults.

The site is located between two recently discovered fault systems, the Greendale Fault and the Port Hills Fault, the ruptures of which initiated the ongoing Canterbury Earthquake Sequence (CES). The Greendale Fault has been mapped approximately 6 km northwest of the site and trends roughly east-west with a surface rupture of approximately 28 km (GNS, 2015), while the Port Hills Fault remains unmapped as the fault did not rupture the surface. Movement on the Port Hills Fault is believed to have occurred at a depth of 1 km to 2 km below the ground surface.

Large regional areas of faulting (GNS, 2015) namely the Ashley Fault, Porters Pass-Amberley Fault Zone, and the Hope and Alpine Faults, are further afield but present a high seismic hazard to the Christchurch area due to the anticipated size of earthquakes generated. The largest of these faults is the Alpine Fault, which has a return period of 250-300 years and is expected to produce a M8 earthquake. The last rupture on the Alpine Fault is believed to have occurred in 1717 (Pettinga et al., 2001).

3.3.2 Liquefaction and Lateral Spreading

The site is located in an area mapped where “damaging liquefaction is unlikely” (NZGD Map CGD5140, 2012), and a “zone of very low liquefaction potential” (GNS, 2006).

3.4 Flooding

The site is outside of any defined flood zones in the Selwyn District Council (SDC) Operative District Plan (SDC, 2015). The closest flood zone is the Lower Plains Flood Area which is approximately 4 km southeast of the site towards the Port Hills.

The Selwyn District Council have carried out computer-based flood modelling to predict the extent and depth of flooding that could happen during a one-in-200-year and a one-in-500-year flood. Based on this modelling, the water depth through the site may be up to 0.8 m deep in the existing channel feature (Figure 1) during the 500 year flood.

Figure 1: SDC Flooding map

From Canterbury Maps and Selwyn Council. Not to scale.

3.5 ECan Boreholes

We have reviewed deep ECan borehole logs located on the site (as shown in *Excluded from the average as an outlier.

Figure 2), and have reviewed the monitoring well data from the monitoring wells on the site (part of the ECan Water Level Monitoring Network).

The logs for the wells located on the site, or close to the site boundary indicate the underlying soil generally comprises of gravels which extend to the bottom of the drill holes with isolated clay and silt layers at depth. The groundwater levels recorded in these wells are an average of approximately 10.6 m depth. The details for the wells are provided in Appendix 3 (including available drill logs).

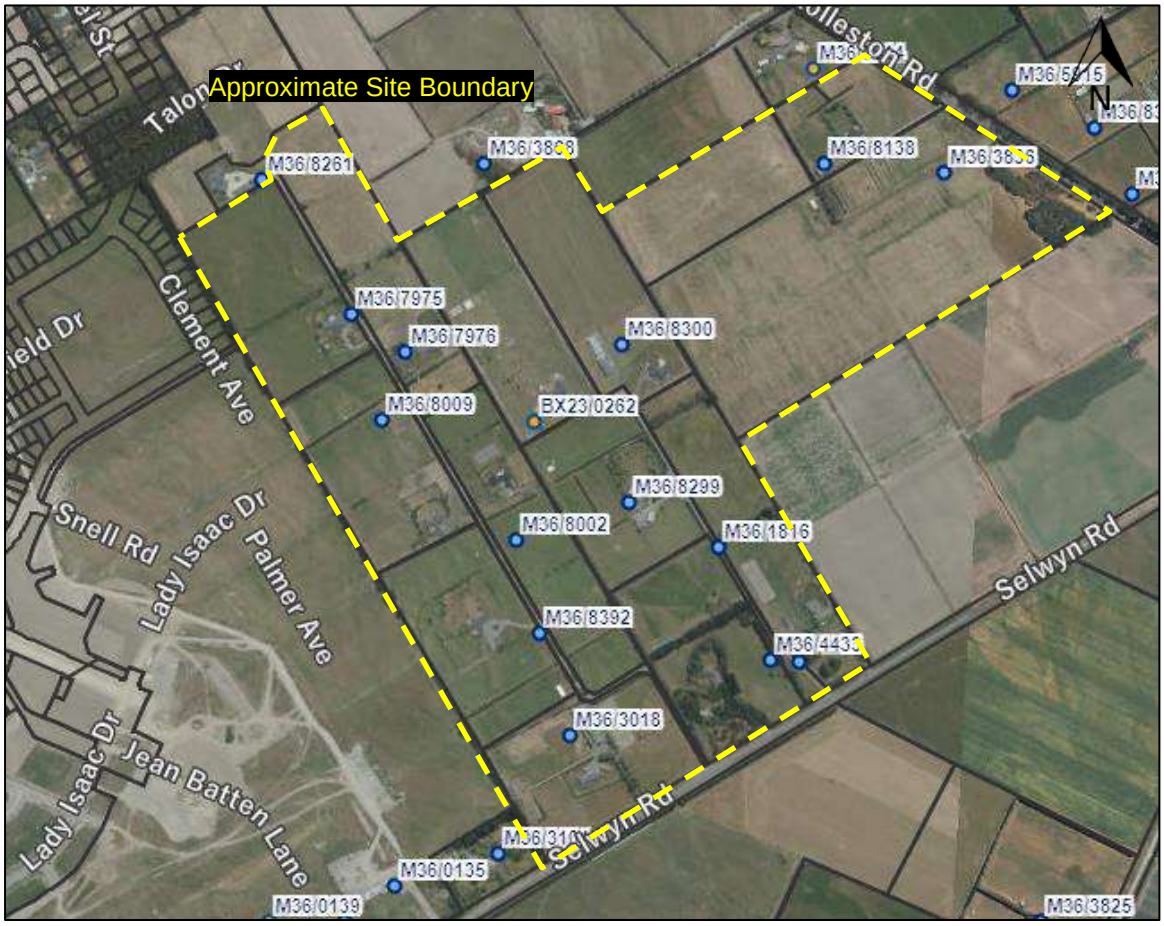
Table 1: Generalised Summary of ECan Boreholes

ECan Borehole	Total Depth (m)	Initial Water Level Below Ground Level (m)	Generalised Borelog as Logged by Driller
M36/4015	28	10.5	Gravel to 28.3 m depth.
M36/7850	42	12.2	Gravel to 42 m depth.
BX23_0262	42	7.3	Gravel to the maximum depth of testing with a 3 m thick clay layer from 26 m to 29 m depth.
M36_1816	13.67	7.64	No data available.
M36_2996	59.4	9.6	No data available.
M26_3018	65.7	9.32	Not logged up to 39 m depth. Gravel from 39 m to 65.7 m depth.
M36_3836	56.6	10.7	Gravel to the maximum depth of drilling.
M36_4433	30	9.7	Gravel to the maximum depth of testing with a 1 m thick clay layer from 26 m to 27 m depth.
M36_7975	37.5	10	Gravel to the maximum depth of testing with a 1 m thick silt layer from 25 m to 26 m depth.
M36_7976	36	10.2	Gravel to the maximum depth of drilling.
M36_8002	66	12.1	Gravel to the maximum depth of testing with 1 m thick clay layers from 26 m to 27 m depth and 32 m to 33 m.
M36_8009	36	11.8	Gravel to the maximum depth of drilling.

ECan Borehole	Total Depth (m)	Initial Water Level Below Ground Level (m)	Generalised Borelog as Logged by Driller
M36_8138	36	14.2	Gravel to the maximum depth of drilling.
M36_8299	90	20.4*	Gravel to the maximum depth of drilling with a 6 m layer of river sands with some clay from 8 m to 14 m depth.
M36_8300	42	13.4	Gravel to the maximum depth of drilling.
M36_8392	36	10	Gravel to the maximum depth of drilling
Average Groundwater depth		10.6	

*Excluded from the average as an outlier.

Figure 2: Nearby ECan Borehole Locations



Aerial photograph sourced from Canterbury Maps. Not to scale.

3.6 Site Seismic Class

In accordance with NZS 1170.5:2004, Class D applies to this particular site, defining it as a 'deep soft soil site'.

4 Site Investigation

4.1 Site Investigation

Site investigations to assess the shallow subsurface material types and strength characteristics were undertaken by ENGEO on 3 and 4 December 2020. Eighteen test pits with associated Scala penetrometer tests were completed to a maximum depth of 2.2 m below ground level.

The investigations revealed subsurface conditions across the site are consistent with the published geological mapping, as summarised in Table 2. Hand auger and test pit logs are attached as Appendix 2 of this report.

Table 2: Summary of Subsurface Investigations

Soil Type	Depth to Top of Layer (m)	General Layer Thickness (m)	Density / Consistency	Additional Comments
TOPSOIL	0.0	0.3	-	-
SILT / SAND*	0.3	0.5**	Very Stiff to Hard / Medium Dense	-
Sandy GRAVEL	0.3	Unknown	Medium Dense to Very Dense	Tightly packed and consistent across the site. Deep roots observed up to 2 m depth.

*Not observed in all test pit locations.

**Thickness varies.

5 Geotechnical Assessment

5.1 Site Seismic Class

For the purpose of seismic design, we consider the soil classification in line with NZS 1170.5:2004 to be 'Class D – Deep or soft soil sites'

5.2 Liquefaction Assessment

Owing to the nature of the subsurface materials and depth to groundwater at the site, we consider the potential for liquefaction and lateral spreading on the site to be very low.

We therefore consider future land performance to be in line with Technical Category 1 (TC1), whereby future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.

5.3 Foundations

Foundations for future one or two storey residential dwellings within the subdivision are likely to comprise pad, strip or slab foundations designed in accordance with the provisions of NZS 3604 Timber Framed Buildings. In areas where native gravel is < 400 mm of the surface, it is likely that standard 3604 foundations will be suitable. In areas where foundations are native on alluvial silt or sand, standard foundations will likely be suitable however engineering judgement may be required to design the foundations to accommodate for a reduced bearing capacity. This should be confirmed by lot specific reporting completed during the building consent process.

6 RMA Section 106 Assessment

Section 106 of the Resource Management Act 1991 states a consent authority may refuse to grant subdivision consent, or may grant a consent subject to specific consent conditions if the land is likely to be subject to the following:

- Erosion, including surface and subsurface erosion, associated with water and wind;
- Falling debris, including rockfall that could impact the site from upslope sources;
- Subsidence, which involves the removal of underlying support by natural or artificial means;
- Slippage, which is defined as the downslope transfer of materials by sliding and / or flowage; and
- Inundation, which may be sourced from streams, coastal processes or excess precipitation.

Based on our observations and the nature of the site, and the site's distance from the nearest significant watercourse, we consider it unlikely for the site to be subject to any of the above hazards and, as such, the site is considered suitable for a plan change from a geotechnical perspective. As discussed in Section 3.3 of this report, we recommend that flooding hazard is considered during subdivision design.

7 References

Canterbury Maps, Groundwater. Retrieved December 2020 from http://canterburymaps.govt.nz/Viewer.

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We also acknowledge the New Zealand GeoNet project and its sponsors EQC, GNS Science and LINZ, for providing data used in this report.

8 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Urban Estates Ltd, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by

Jed Watts

Engineering Geologist

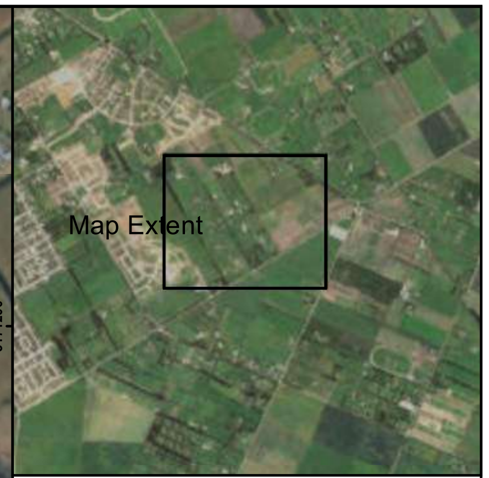
Report reviewed by

Neil Charters, CMEngNZ (CPEng)

Principal Geotechnical Engineer

APPENDIX 1:

Site Plan



Legend

- Test Pit
- Site boundary

Aerial: LINZ and Eagle Technology, CC BY 4.0.
Map image: Eagle Technology.

0 50 100 Metres

PROJECTION: NZGD 2000 New Zealand Transverse Mercator

ENGEO

Christchurch Office
124 Montreal Street Sydenham, Christchurch 8023
Tel: 03 328 9012, www.engeo.co.nz

Title: Geotech Location Plan		
Client: Urban Estates Limited		Figure No: 2
Project: Site 2 Rolleston	Designed: NF Drawn: RS Checked: JRW Date: Dec 20	Size: A3
Proj No: 18113.00.001	Scale: 1:4,000	Revision: A

ORIGINAL FIGURE PRINTED IN COLOUR

DATE PLOTTED: 09 December 2020 9:39:33 AM BY: rsweetapple

APPENDIX 2:

TP Logs

LOG OF TEST PIT TP01

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 3/12/2020
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No :
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.611992
Longitude : 172.408565

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand is fine to medium [TOPSOIL].				D	N/A		
0.5	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with minor cobbles and trace rootlets; greyish brown. Well graded. Gravel subangular to subrounded. Sand fine to coarse, well graded. Rootlets were not observed from 0.8 m.				M	D Tightly Packed		
1.0											
1.5											
2.0				Depth of Excavation: 2 m Termination Condition: Target depth							

Test pit met target depth at 2 m.
Scala Penetrometer met practical refusal at 0.5 m depth.
Standing groundwater was not encountered

LOG OF TEST PIT TP02

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 3/12/2020
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No :
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.610429
Longitude : 172.408787

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand is fine to medium [TOPSOIL].					N/A		
			ML	SILT with minor sand and rootlets; light brown with orange mottles. Sand is fine. Low plasticity.				D	H VSt		
0.5	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded. Gravel subangular to subrounded. Sand fine to coarse, well graded.				M	D Tightly Packed		
1.0											
1.5											
2.0				Depth of Excavation: 2 m Termination Condition: Target depth				W			

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>> at 0.6 m)

Test pit met target depth at 2 m.
Scala Penetrometer met practical refusal at 0.6 m depth.
Standing groundwater was not encountered

LOG OF TEST PIT TP03

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 3/12/2020
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No :
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.613335
Longitude : 172.408111

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand is fine to medium [TOPSOIL].				D	N/A		
0.4	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with minor cobbles and rootlets; greyish brown. Well graded. Gravel subangular to subrounded. Sand fine to coarse, well graded. Rootlets were not observed from 0.55 m.				D	D		
2.2				Depth of Excavation: 2.2 m Termination Condition: Target depth				M	Tightly Packed		

Test pit met target depth at 2.2 m.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

LOG OF TEST PIT TP04

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 3/12/2020
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No :
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.613667
Longitude : 172.411393

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand is fine to medium [TOPSOIL].					N/A		
0.3			ML	SILT with minor sand and rootlets; light brown with orange mottles. Sand is fine to medium. Low plasticity.				D	VSt H		
0.5	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with minor cobbles and trace rootlets; greyish brown. Well graded. Gravel subangular to subrounded. Sand fine to coarse, well graded. Rootlets were not observed from 1.1 m.				M	Tightly Packed		
2.0				Depth of Excavation: 2 m Termination Condition: Target depth							

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12; >>

Test pit met target depth at 2 m.
Scala Penetrometer met practical refusal at 0.6 m depth.
Standing groundwater was not encountered

LOG OF TEST PIT TP05

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 3/12/2020
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No :
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.614262
Longitude : 172.410054

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand is fine to medium [TOPSOIL].				D	N/A		4, 6, 8, >>
0.5	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded. Gravel subangular to subrounded. Sand fine to coarse, well graded.				M	Tightly Packed		
1.0				Rootlets were not observed from 1.2 m.							
1.5				Gravel becomes fine to medium from 1.7 m depth.							
2.0				Depth of Excavation: 2.2 m Termination Condition: Target depth							

Test pit met target depth at 2.2 m.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

LOG OF TEST PIT TP06

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 3/12/2020
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No :
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.616713
Longitude : 172.411568

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand is fine to medium [TOPSOIL].					N/A		
0.3	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with minor cobbles and trace rootlets; greyish brown. Well graded. Gravel subangular to subrounded. Sand fine to coarse, well graded.				D	D		
0.5				No rootlets from 0.8 m to 1.6 m.							
1.0									Tightly Packed		
1.5				Minor rootlets encountered from 1.6 m depth.				M			
2.0				Depth of Excavation: 2.2 m Termination Condition: Target depth							

Test pit met target depth at 2.2 m.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

GEOTECH TEST PIT LOG ROLLESTON MEGASITE - TP01 - 09.GPJ NZ MASTER DATA TEMPLATE.GDT 7/12/20

LOG OF TEST PIT TP07

ENGEO

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

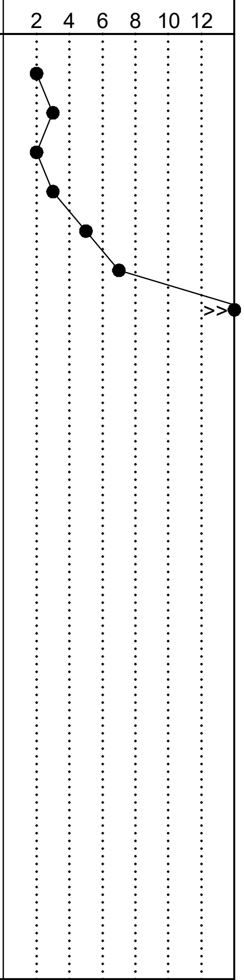
Client : Urban Estates
Date : 3/12/2020
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No :
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.617708
Longitude : 172.41176

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)
0.0 – 0.2	TOPSOIL		ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand is fine to medium [TOPSOIL].				D	N/A	
0.2 – 0.65	ALLUVIUM		ML	SILT with some sand and trace rootlets; light brown. Sand is fine to medium. Low plasticity.				D	F; St - VSt	
0.65 – 2.0	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with minor cobbles and trace rootlets; greyish brown. Well graded. Gravel subangular to subrounded. Sand fine to coarse, well graded. Rootlets were not observed from 0.75 m.				D; M	D; Tightly Packed	
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Scala Penetrometer

Blows per 100mm



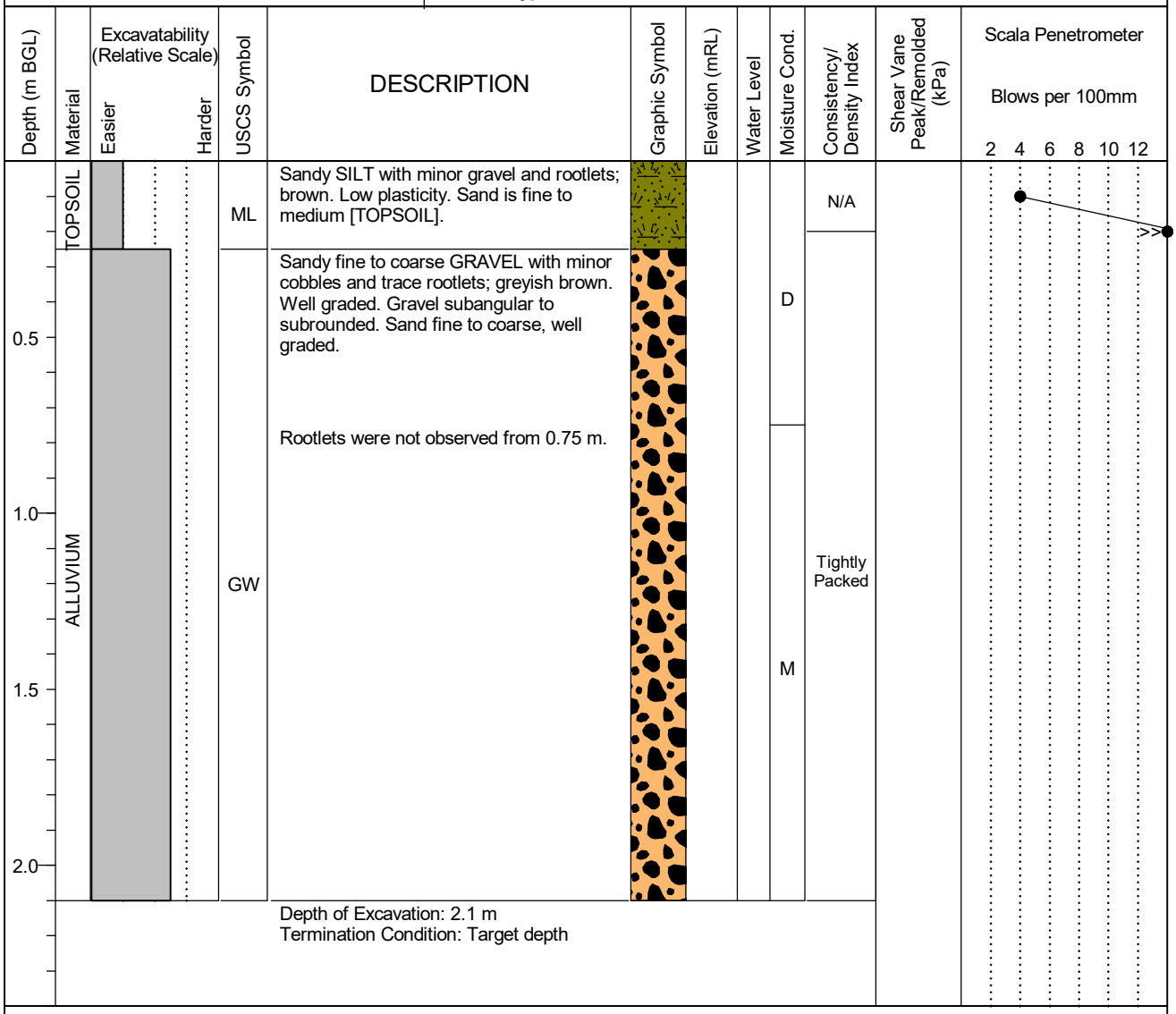
Test pit met target depth at 2 m.
Scala Penetrometer met practical refusal at 0.7 m depth.
Standing groundwater was not encountered

LOG OF TEST PIT TP08

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 3/12/2020
Max Test Pit Depth : 2.1 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No :
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.61702
Longitude : 172.414053



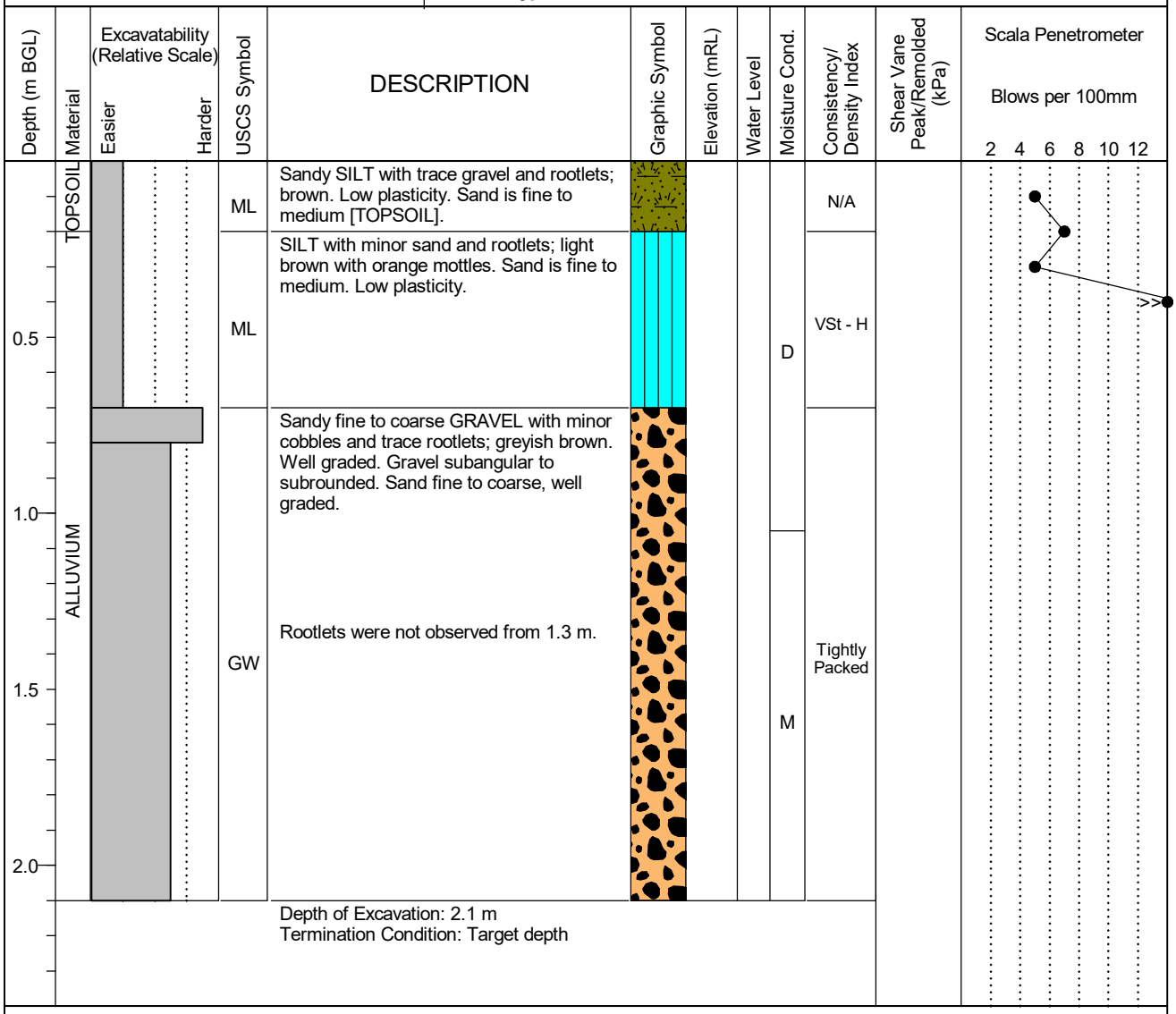
Test pit met target depth at 2.1 m.
Scala Penetrometer met practical refusal at 0.2 m depth.
Standing groundwater was not encountered

LOG OF TEST PIT TP09

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 3/12/2020
Max Test Pit Depth : 2.1 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No :
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.611618
Longitude : 172.410134



Test pit met target depth at 2.1 m.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

LOG OF TEST PIT TP10

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 03/12/2020
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No : N/A
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.614022
Longitude : 172.411991

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	Sandy SILT with trace rootlets; brown. Low plasticity. Sand fine to medium [TOPSOIL].					N/A		
	ALLUVIUM		ML	SILT with some fine to medium sand and trace rootlets; light brown. Low plasticity.					St - VSt		
0.5									VSt - H		
			GW	Sandy fine to coarse GRAVEL with minor cobbles and trace rootlets; greyish brown. Well graded, rounded to sub-angular. Sand fine to coarse, well graded. Trace rootlets no longer present at 0.9 m depth.				D	Tightly Packed		
1.0											
1.5								M			
2.0				Depth of Excavation: 2 m Termination Condition: Target depth							

Test pit reached target depth at 2 m.
Scala Penetrometer met practical refusal at 0.5 m depth.
Standing groundwater was not encountered

GEOTECH TEST PIT LOG ROLLESTON_TP_10_TO_18.GPJ NZ MASTER DATA TEMPLATE.GDT 7/12/20

LOG OF TEST PIT TP11

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 03/12/2020
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No : N/A
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.612378
Longitude : 172.413979

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	Sandy SILT with trace rootlets; brown. Low plasticity. Sand fine to medium [TOPSOIL].					N/A		
0.3	ALLUVIUM		ML	SILT with some fine to medium sand and trace rootlets; light brown. Low plasticity.				M	St - VSt		
0.7			GW	Sandy fine to coarse GRAVEL with minor cobbles and trace rootlets; greyish brown. Well graded, rounded to sub-angular. Sand fine to coarse, well graded. Trace rootlets no longer present at 1.0 m depth.				W	D / Tightly Packed		
2.0				Depth of Excavation: 2 m Termination Condition: Target depth							

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test pit reached target depth at 2 m.
Scala Penetrometer met practical refusal at 0.8 m depth.
Standing groundwater was not encountered

LOG OF TEST PIT TP12

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 03/12/2020
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No : N/A
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.615236
Longitude : 172.412995

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	Sandy SILT with trace rootlets; brown. Low plasticity. Sand fine to medium [TOPSOIL].					N/A		
	ALLUVIUM		ML	SILT with some fine to medium sand and trace rootlets; light brown. Low plasticity.					VSt - H		
0.5				Sandy fine to coarse GRAVEL with minor cobbles and trace rootlets; greyish brown. Well graded, rounded to sub-angular. Sand fine to coarse, well graded.				D			
1.0			GW						Tightly Packed		
1.5				Trace rootlets no longer present at 1.4 m depth.				M			
2.0				Depth of Excavation: 2 m Termination Condition: Target depth							

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>>)

Test pit reached target depth at 2 m.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

GEOTECH TEST PIT LOG ROLLESTON_TP_10_TO_18.GPJ NZ MASTER DATA TEMPLATE.GDT 7/12/20

LOG OF TEST PIT TP13

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 03/12/2020
Max Test Pit Depth : 1.8 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No : N/A
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.616271
Longitude : 172.416113

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0.0	TS		ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand fine to medium [TOPSOIL].					N/A		
0.5	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with minor cobbles and trace rootlets; greyish brown. Well graded, rounded to sub-angular. Sand fine to coarse, well graded.				D	Tightly Packed		
1.0				Trace rootlets no longer present at 0.85 m depth.				M			
1.5											
2.0				Depth of Excavation: 1.8 m Termination Condition: Target depth							

Test pit reached target depth at 1.8 m.
Scala Penetrometer met practical refusal at 0.2 m depth.
Standing groundwater was not encountered

GEOTECH TEST PIT LOG ROLLESTON_TP_10_TO_18.GPJ NZ MASTER DATA TEMPLATE.GDT 7/12/20

LOG OF TEST PIT TP14

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 04/12/2020
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No : N/A
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.610817
Longitude : 172.41651

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	Sandy SILT with trace rootlets; brown. Low plasticity. Sand fine to medium [TOPSOIL].					N/A		6 → >>
0.5	ALLUVIUM		ML	SILT with some fine to medium sand and trace rootlets; light brown. Low plasticity.					VSt - H		
			SW	Fine to coarse SAND with trace rootlets; brown. Well graded.					Loosely Packed		
1.0			GW	Sandy fine to coarse GRAVEL with trace cobbles and rootlets; greyish brown. Well graded, rounded to sub-angular. Sand fine to coarse, well graded.				D	Loosely Packed		
1.5				Trace rootlets no longer present at 1.6 m depth.							
2.0				Depth of Excavation: 2 m Termination Condition: Target depth							

Test pit reached target depth at 2 m.
Scala Penetrometer met practical refusal at 0.3 m depth.
Standing groundwater was not encountered

GEOTECH TEST PIT LOG ROLLESTON_TP_10_TO_18.GPJ NZ MASTER DATA TEMPLATE.GDT 7/12/20

LOG OF TEST PIT TP15

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 04/12/2020
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No : N/A
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.611312
Longitude : 172.413467

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	Sandy SILT with trace rootlets; brown. Low plasticity. Sand fine to medium [TOPSOIL].					N/A		
0.3			ML	SILT with some fine to medium sand and trace rootlets; light brown. Low plasticity.				D	H		
0.5	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with minor cobbles, trace silt and rootlets; greyish brown. Well graded, rounded to sub-angular. Sand fine to coarse, well graded.				M	Tightly Packed		
1.0				Trace rootlets no longer present at 1.0 m depth.							
1.5								W			
2.0				Depth of Excavation: 2 m Termination Condition: Target depth							

Test pit reached target depth at 2 m.
Scala Penetrometer met practical refusal at 0.5 m depth.
Standing groundwater was not encountered

LOG OF TEST PIT TP16

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 04/12/2020
Max Test Pit Depth : 2.2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No : N/A
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.613861
Longitude : 172.415625

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	Sandy SILT with trace rootlets; dark brown. Low plasticity. Sand fine to medium [TOPSOIL].					N/A		
0.3	ALLUVIUM		ML	SILT with some fine to medium sand and trace rootlets; light brown. Low plasticity.					VSt - H		
0.5			GW	Sandy fine to coarse GRAVEL with minor cobbles and trace rootlets; greyish brown. Well graded, rounded to sub-angular. Sand fine to coarse, well graded.				M	D		
1.3				Trace rootlets no longer present at 1.3 m depth.					Tightly Packed		
2.2				Depth of Excavation: 2.2 m Termination Condition: Target depth				W			

Test pit reached target depth at 2.2 m.
Scala Penetrometer met practical refusal at 0.6 m depth.
Standing groundwater was not encountered

GEOTECH TEST PIT LOG ROLLESTON_TP_10_TO_18.GPJ NZ MASTER DATA TEMPLATE.GDT 7/12/20

LOG OF TEST PIT TP17

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 04/12/2020
Max Test Pit Depth : 2.1 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No : N/A
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.612026
Longitude : 172.417754

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	Sandy SILT with trace rootlets; light brown with dark brown mottles. Low plasticity. Sand fine to medium [TOPSOIL/FILL].					N/A		
0.5	ALLUVIUM		ML	SILT with some fine to medium sand and trace rootlets; light brown. Low plasticity.					VSt - H		
			SP	Fine to medium SAND with some silt and trace rootlets; light brown with orange mottles. Poorly graded.					MD		
1.0			GW	Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, rounded to sub-angular. Sand fine to coarse, well graded.				M	D		
1.5									Tightly Packed		
2.0								W			
				Depth of Excavation: 2.1 m Termination Condition: Target depth							

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>> at 2.1 m)

Test pit reached target depth at 2.1 m.
Scala Penetrometer met practical refusal at 1 m depth.
Standing groundwater was not encountered

GEOTECH TEST PIT LOG ROLLESTON_TP_10_TO_18.GPJ NZ MASTER DATA TEMPLATE.GDT 7/12/20

LOG OF TEST PIT TP18

Geotechnical Investigation
548-572 Selwyn Road
Southwest Rolleston
18113.000.001

Client : Urban Estates
Date : 04/12/2020
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator / 5 tonne
Bucket Type/Size : Toothed / 400 mm

Shear Vane No : N/A
Logged By : DD/DKi
Reviewed By : JRW
Latitude : -43.610613
Longitude : 172.419367

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	Sandy SILT with trace rootlets; brown. Low plasticity. Sand fine to medium [TOPSOIL].					N/A		
0.5	ALLUVIUM		ML	SILT with some fine to medium sand and trace rootlets; light brown. Low plasticity.				D	VSt - H		
1.0			GW	Sandy fine to coarse GRAVEL with minor cobbles and rootlets; greyish brown. Well graded, rounded to sub-angular. Sand fine to coarse, well graded. Trace rootlets no longer present at 1.2 m depth.				M	Tightly Packed		
1.5											
2.0				Depth of Excavation: 2 m Termination Condition: Target depth							

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>>)

Test pit reached target depth at 2 m.
Scala Penetrometer met practical refusal at 0.6 m depth.
Standing groundwater was not encountered

GEOTECH TEST PIT LOG ROLLESTON_TP_10_TO_18.GPJ NZ MASTER DATA TEMPLATE.GDT 7/12/20

APPENDIX 3:

Ecan Boreholes

Bore or Well No	BX23/0262
Well Name	Selwyn Road
Owner	MR & MRS J E & A T HEYL

Well Number	BX23/0262	**File Number**	CRC141970
Owner	MR & MRS J E & A T HEYL	**Well Status**	Active (exist, present)
Street/Road	Selwyn Road	**NZTM Grid Reference**	BX23:52560-70858
Locality	ROLLESTON	**NZTM X and Y**	1552560 - 5170858
Location Description		**Location Accuracy**	10 - 50m
CWMS Zone	Selwyn - Waihora	**Use**	Domestic Supply, Stock Supply
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	42.00m	**Water Level Count**	1
Diameter	150mm	**Initial Water Level**	7.80m below MP
Measuring Point Description	Top of Casing	**Highest Water Level**	7.80m below MP
Measuring Point Elevation		**Lowest Water Level**	7.80m below MP
Elevation Accuracy		**First reading**	05 Nov 2013
Ground Level	0.50m below MP	**Last reading**	05 Nov 2013
Strata Layers	9	**Calc Min 80%**	
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	1
Drill Date	05 Nov 2013	**Max Tested Yield**	
Driller	McMillan Drilling Ltd	**Drawdown at Max Tested Yield**	
Drilling Method	Rotary/Percussion	**Specific Capacity**	0.28 l/s/m
Casing Material	Steel	**Last Updated**	29 Nov 2013
Pump Type		**Last Field Check**	05 Nov 2013
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	40.48	42	2.5		125	

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
05 Nov 2013	1	1.67	22.040966	5.93	1.25

Comments

Comment Date	Comment
14 Nov 2013	NZMG Map Reference updated from: M36:62523-32589 shifted 124m
14 Nov 2013	Driller confirms

Bore Log

Borelog for well BX23/0262

Grid Reference (NZTM): 1552561 mE, 5170859 mN
Location Accuracy: 10 - 50m
Ground Level Altitude: m +MSD Accuracy:
Driller: McMillan Drilling Ltd
Drill Method: Rotary/Percussion
Borelog Depth: 42.0 m Drill Date: 05-Nov-2013

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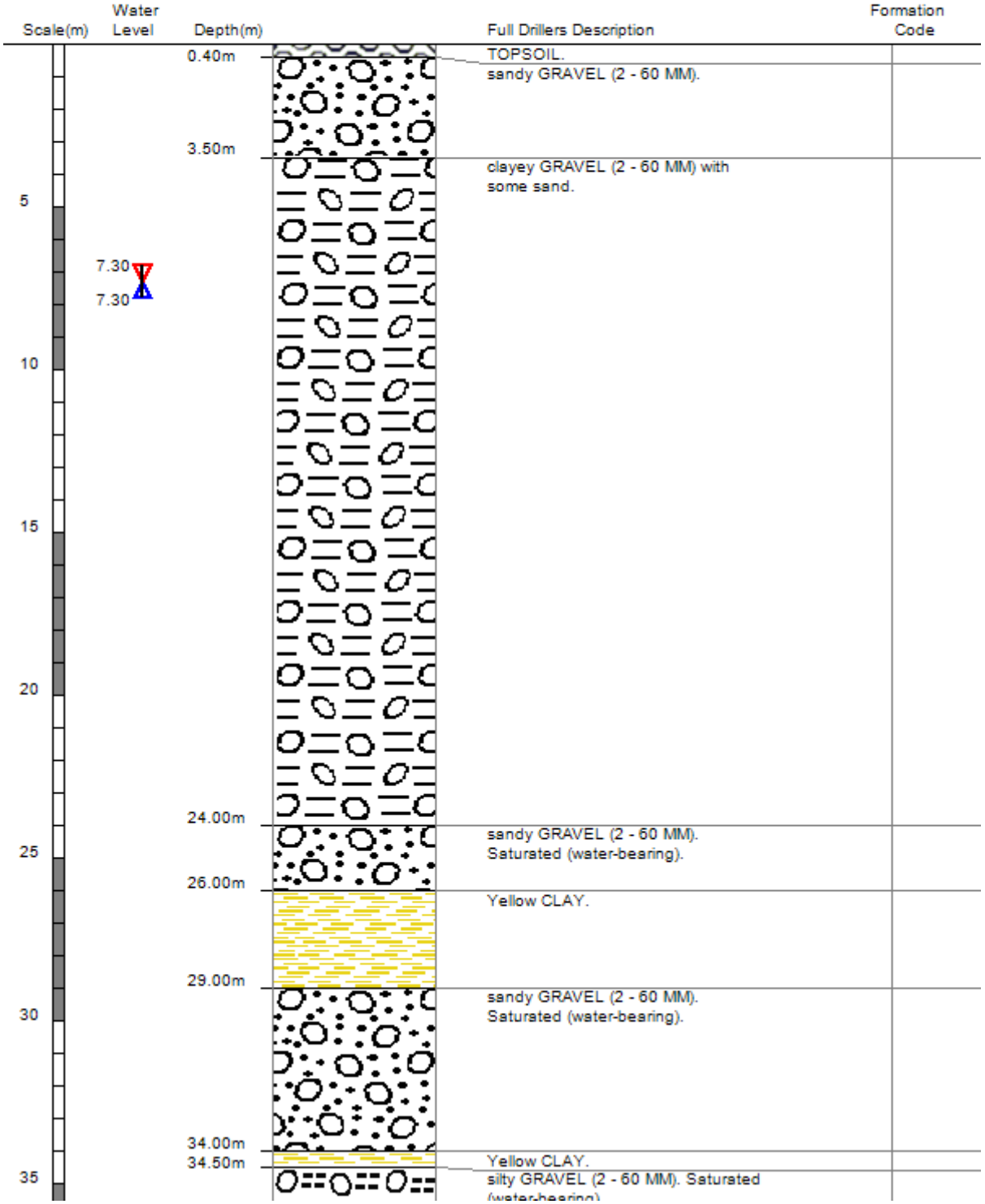

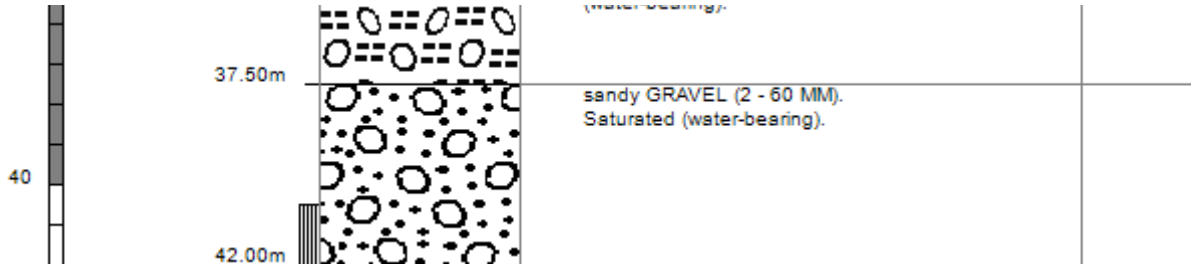
40
37.50m
42.00m
sandy GRAVEL (2 - 60 MM).
Saturated (water-bearing).

Bore or Well No	M36/1816
Well Name	SELWYN RD
Owner	MCLAUGHLAN

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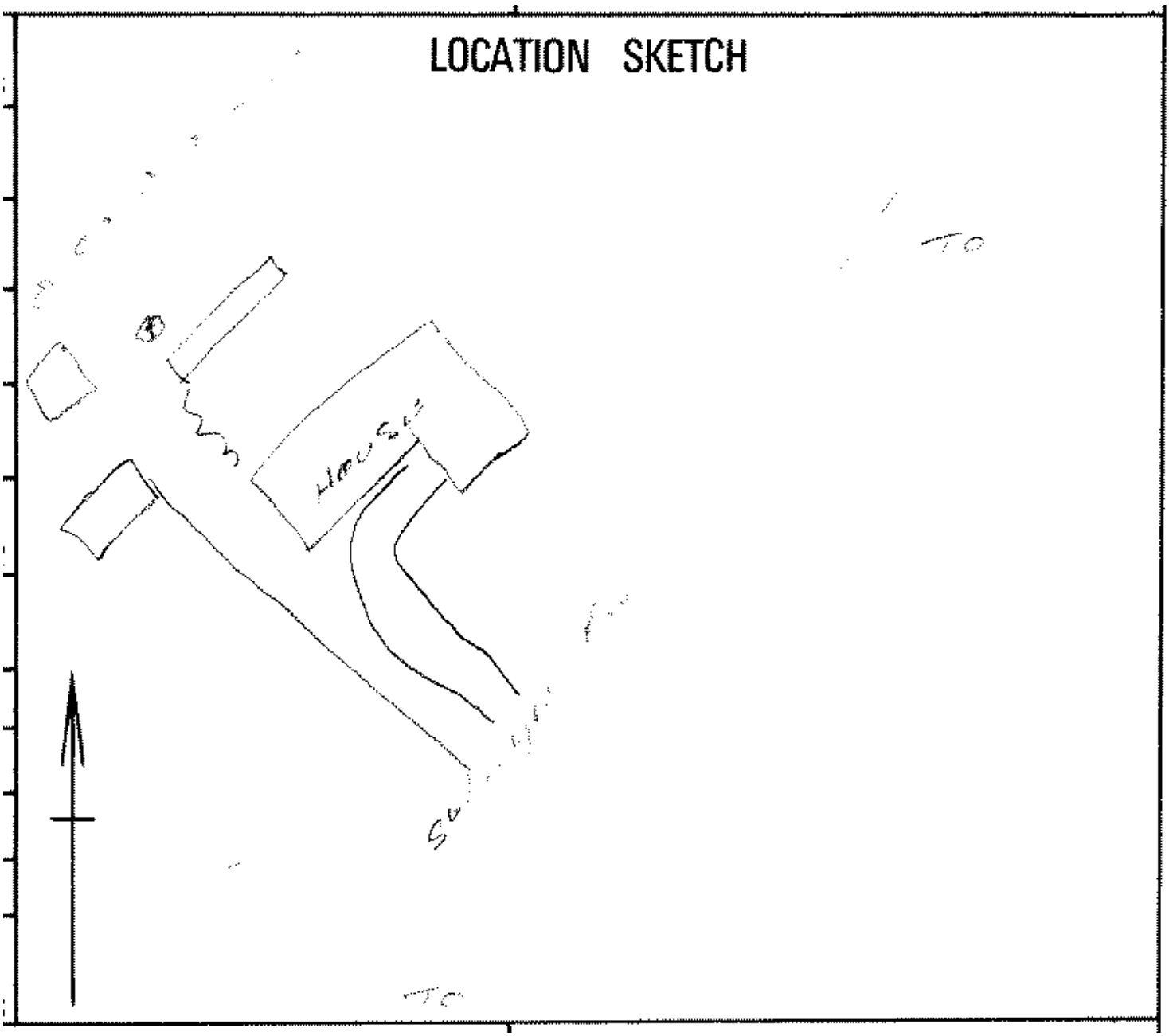
Well Number	M36/1816	**File Number**	
Owner	MCLAUGHLAN	**Well Status**	Not Used
Street/Road	SELWYN RD	**NZTM Grid Reference**	BX23:52806-70690
Locality	ROLLESTON	**NZTM X and Y**	1552806 - 5170690
Location Description		**Location Accuracy**	< 50m
CWMS Zone	Selwyn - Waihora	**Use**	,
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	13.67m	**Water Level Count**	0
Diameter	150mm	**Initial Water Level**	7.64m below MP
Measuring Point Description		**Highest Water Level**	
Measuring Point Elevation	35.80m 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 80%**	9.27m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type	Unknown	**Yield Drawdown Tests**	0
Drill Date		**Max Tested Yield**	
Driller	McMillan Drilling Ltd	**Drawdown at Max Tested Yield**	
Drilling Method	Cable Tool	**Specific Capacity**	
Casing Material	STEEL	**Last Updated**	29 Jan 2007
Pump Type	Unknown	**Last Field Check**	
Water Use Data	No		



No screen data for this well

No step tests for this well

No comments for this well

Bore or Well No	M36/2996
Well Name	SELWYN ROAD
Owner	NISBET, NA & EM

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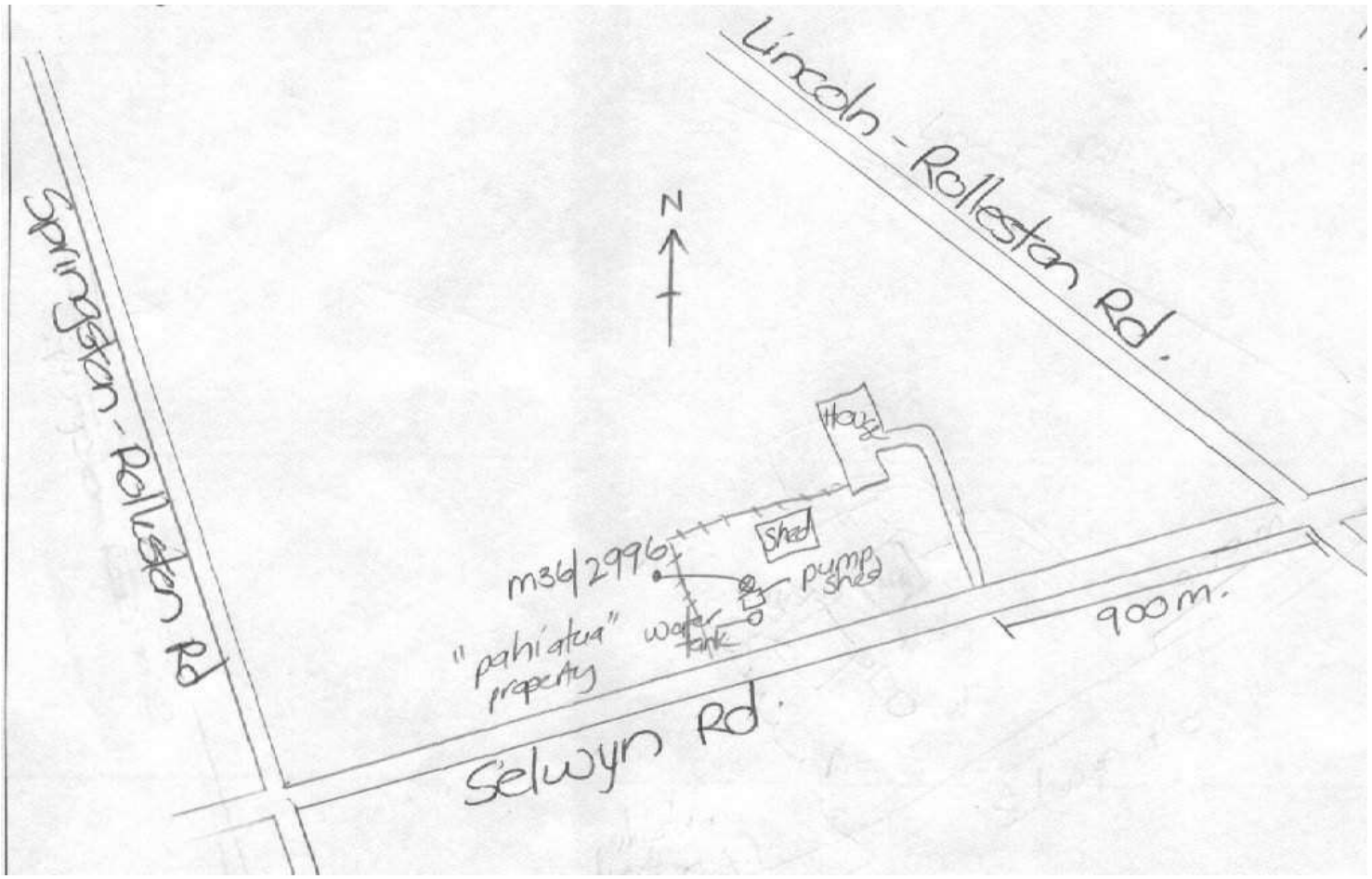
Well Number	M36/2996	**File Number**	CO6C/01455
Owner	NISBET, NA & EM	**Well Status**	Active (exist, present)
Street/Road	SELWYN ROAD	**NZTM Grid Reference**	BX23:52913-70536
Locality	ROLLESTON	**NZTM X and Y**	1552913 - 5170536
Location Description	NEAR HAYSHED	**Location Accuracy**	2 - 15m
CWMS Zone	Selwyn - Waihora	**Use**	Irrigation, Domestic Supply
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	59.40m	**Water Level Count**	0
Diameter	200mm	**Initial Water Level**	9.60m below MP
Measuring Point Description		**Highest Water Level**	
Measuring Point Elevation	35.67m 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 80%**	11.50m below MP (Estimated)
Aquifer Name	Linwood Gravel	**Aquifer Tests**	0
Aquifer Type	Unknown	**Yield Drawdown Tests**	1
Drill Date	15 Oct 1984	**Max Tested Yield**	11 l/s
Driller	McMillan Drilling Ltd	**Drawdown at Max Tested Yield**	14 m
Drilling Method	Rotary Rig	**Specific Capacity**	0.84 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	55.7	59.4				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
15 Oct 1984	1	11.4	150.45929	13.6	18

Comments

Comment Date	Comment
	NO LOG EXISTS. SCREENED IN MEDIUM STAINED GRAVELS.

Bore or Well No	M36/3018
Well Name	SELWYN RD
Owner	BOWDEN M.L.

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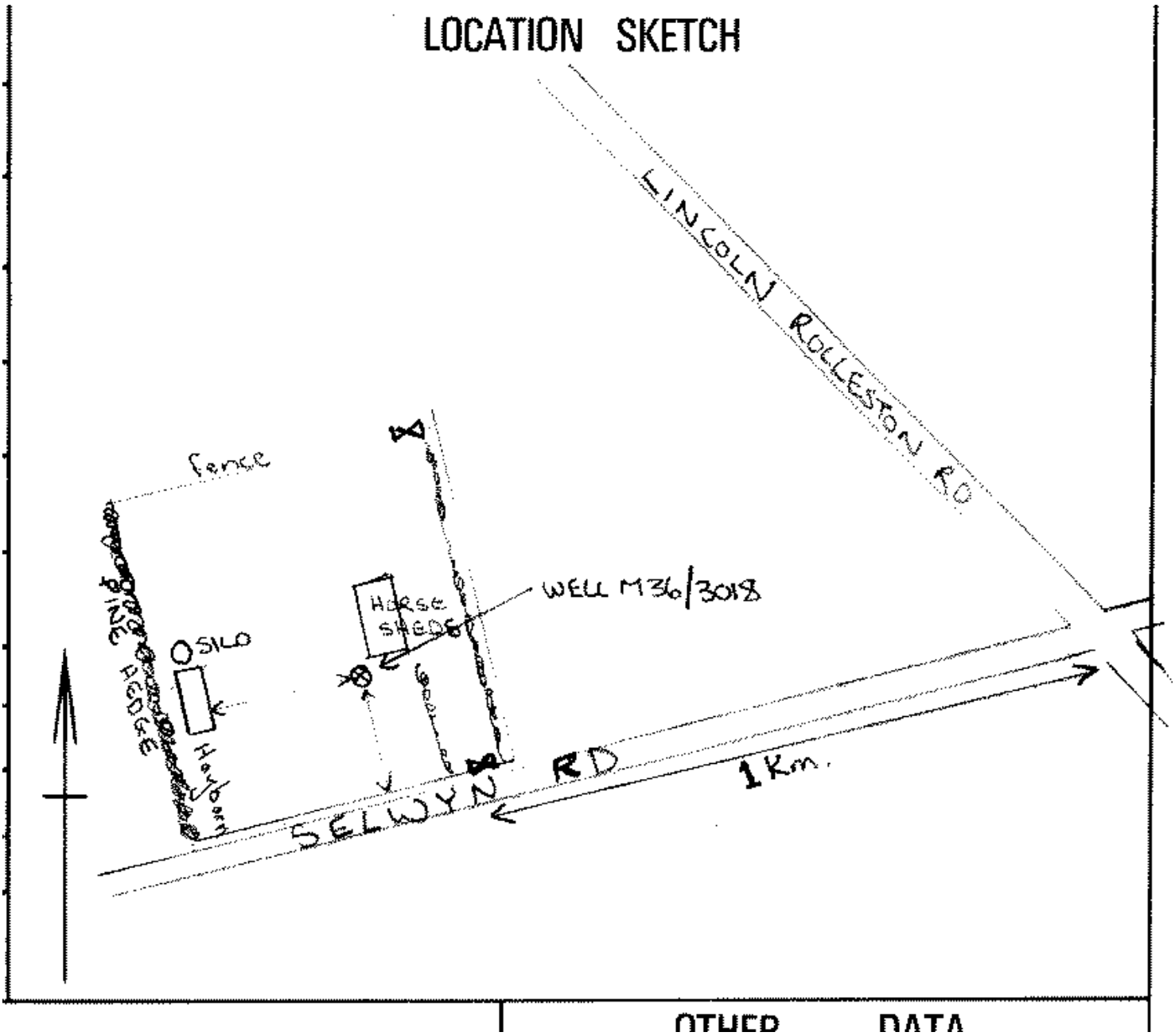
Well Number	M36/3018	**File Number**	
Owner	BOWDEN M.L.	**Well Status**	Active (exist, present)
Street/Road	SELWYN RD	**NZTM Grid Reference**	BX23:52606-70440
Locality	ROLLESTON	**NZTM X and Y**	1552606 - 5170440
Location Description	NEAR STABLES	**Location Accuracy**	50 - 300m
CWMS Zone	Selwyn - Waihora	**Use**	Irrigation, Domestic and Stockwater
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	65.70m	**Water Level Count**	0
Diameter	200mm	**Initial Water Level**	9.32m below MP
Measuring Point Description		**Highest Water Level**	
Measuring Point Elevation	34.95m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 2.5 m	**First reading**	
Ground Level	0.00m above MP	**Last reading**	
Strata Layers	9	**Calc Min 80%**	11.68m below MP (Estimated)
Aquifer Name	Linwood Gravel	**Aquifer Tests**	0
Aquifer Type	Unknown	**Yield Drawdown Tests**	1
Drill Date	13 Jan 1986	**Max Tested Yield**	16 l/s
Driller	McMillan Drilling Ltd	**Drawdown at Max Tested Yield**	22 m
Drilling Method	Rotary/Percussion	**Specific Capacity**	0.75 l/s/m
Casing Material	STEEL	**Last Updated**	08 Nov 2013
Pump Type	Submersible	**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	58.4	61.3				
2	Stainless steel	63.3	65.4				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
13 Jan 1986	1	16.3	215.130386	21.7	14

Comments

Comment Date	Comment
	DRILLED TO 42M IN 1985.11.4l/s 23M DD

Bore Log

Borelog for well M36/3018

Grid Reference (NZTM): 1552607 mE, 5170441 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 35.0 m +MSD Accuracy: < 2.5 m
Driller: McMillan Drilling Ltd
Drill Method: Rotary/Percussion
Borelog Depth: 65.7 m Drill Date: 13-Jan-1986

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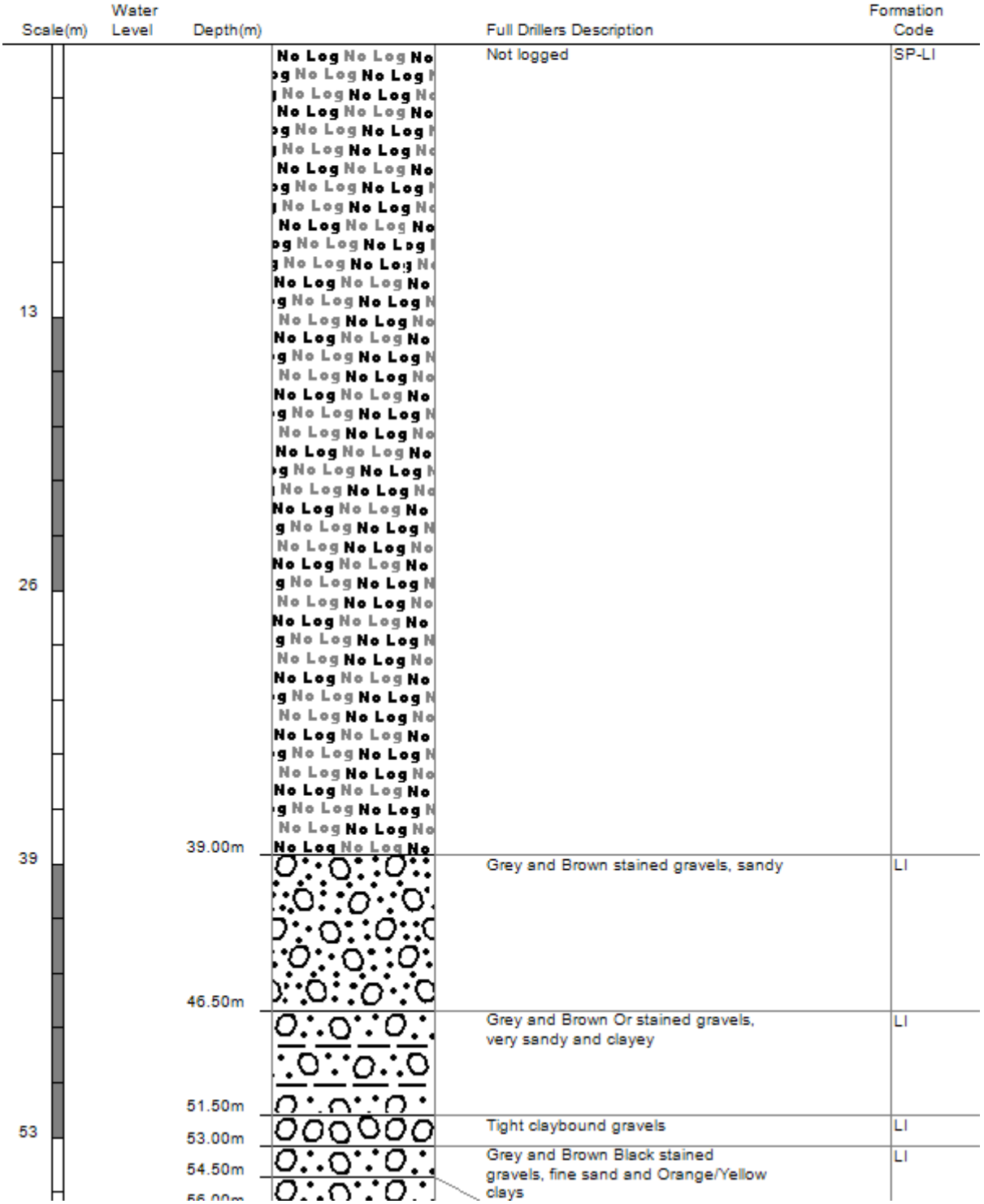

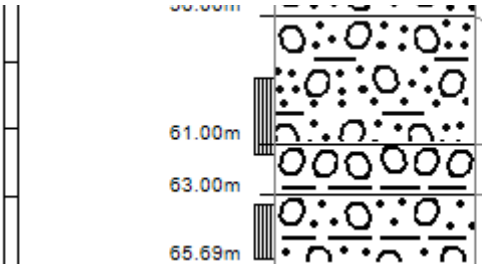

Very hard claybound gravels, very fine sand	LI
Free Brown and Grey stained gravels, some clay and very sandy	LI
Hard claybound gravels	LI
Grey and Brown stained gravels, sandy and clayey	LI

Bore or Well No	M36/3836
Well Name	LINCOLN ROLLESTON RD
Owner	Mr & Mrs K M & J A Saulsbury

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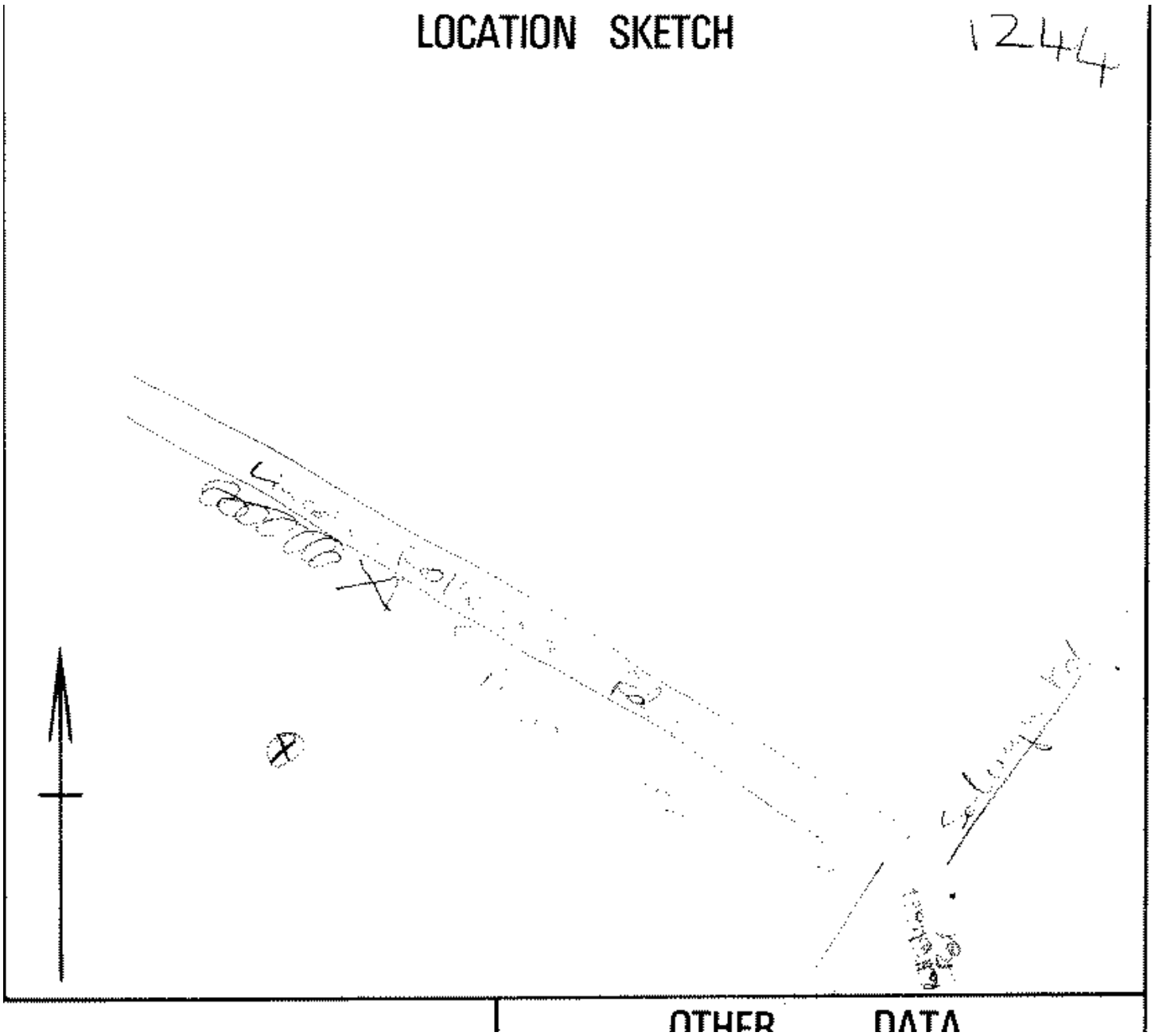
Well Number	M36/3836	**File Number**	CO6C/02068
Owner	Mr & Mrs K M & J A Saulsbury	**Well Status**	Active (exist, present)
Street/Road	LINCOLN ROLLESTON RD	**NZTM Grid Reference**	BX23:53106-71190
Locality	BROADFIELD	**NZTM X and Y**	1553106 - 5171190
Location Description		**Location Accuracy**	50 - 300m
CWMS Zone	Selwyn - Waihora	**Use**	Irrigation,
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	56.60m	**Water Level Count**	0
Diameter	220mm	**Initial Water Level**	10.70m below MP
Measuring Point Description		**Highest Water Level**	
Measuring Point Elevation	37.24m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 2.5 m	**First reading**	
Ground Level	0.00m above MP	**Last reading**	
Strata Layers	8	**Calc Min 80%**	11.88m below MP (Estimated)
Aquifer Name	Linwood Gravel	**Aquifer Tests**	0
Aquifer Type	Unknown	**Yield Drawdown Tests**	1
Drill Date	01 Nov 1987	**Max Tested Yield**	11 l/s
Driller	McMillan Drilling Ltd	**Drawdown at Max Tested Yield**	14 m
Drilling Method	Cable Tool	**Specific Capacity**	0.83 l/s/m
Casing Material	STEEL	**Last Updated**	08 Nov 2013
Pump Type	Submersible	**Last Field Check**	
Water Use Data	Yes		



Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	53.6	56.6				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
01 Nov 1987	1	11.4	150.45929	13.7	4

Comments

Comment Date	Comment
21 Jul 2011	Previous owner VAN DE KLUNDERT A.W.

Bore Log

Borelog for well M36/3836

Grid Reference (NZTM): 1553107 mE, 5171191 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 37.2 m +MSD Accuracy: < 2.5 m
Driller: McMillan Drilling Ltd
Drill Method: Cable Tool
Borelog Depth: 56.6 m Drill Date: 01-Nov-1987

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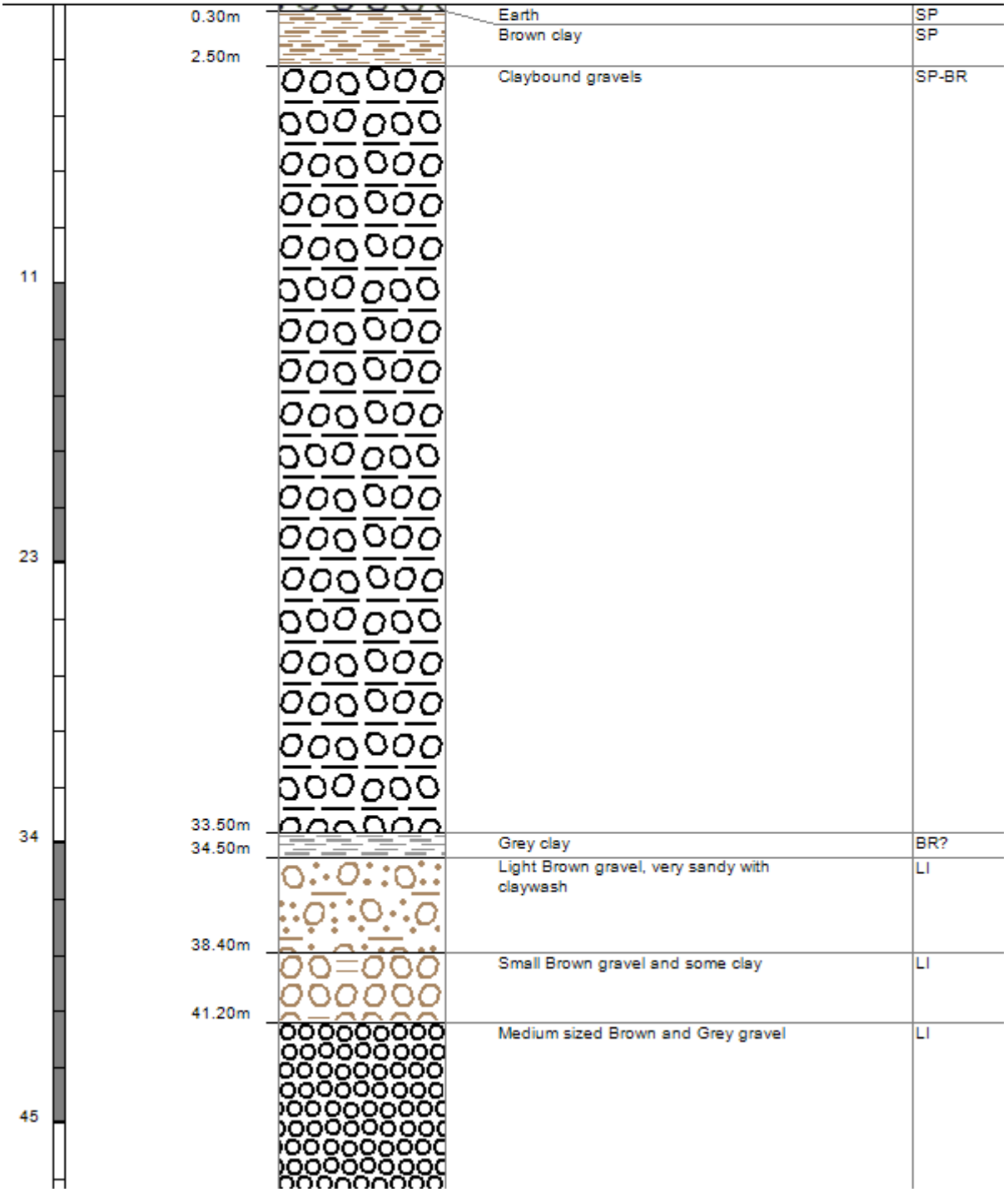
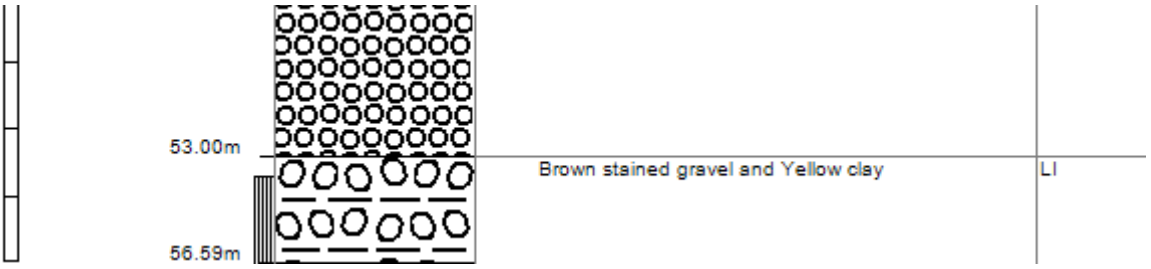
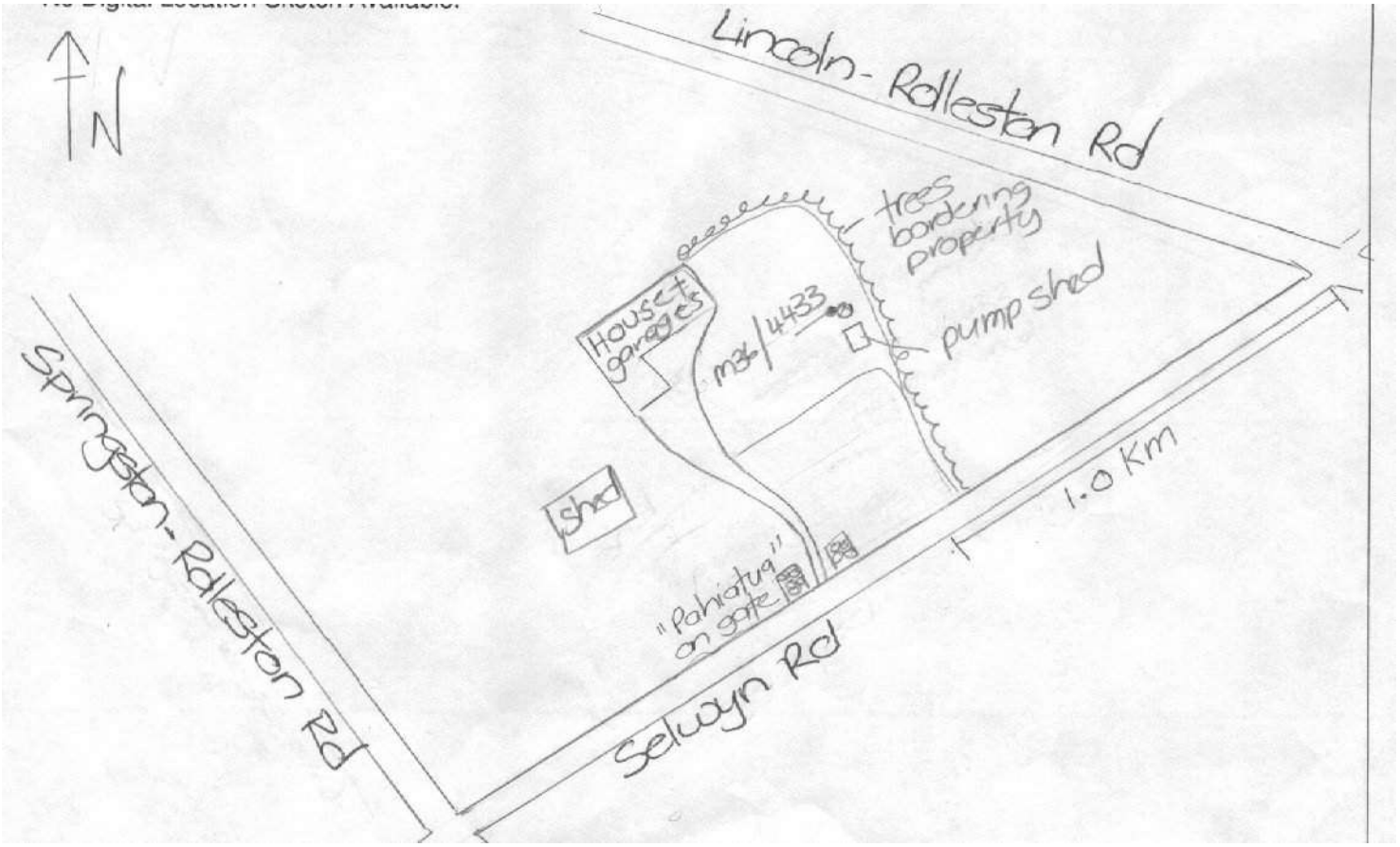



53.00m
56.59m
Brown stained gravel and Yellow clay
LI

Bore or Well No	M36/4433
Well Name	SELWYN ROAD
Owner	Mr & Mrs H J & D P Bates

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Well Number	M36/4433	**File Number**	CO6C/02646
Owner	Mr & Mrs H J & D P Bates	**Well Status**	Active (exist, present)
Street/Road	SELWYN ROAD	**NZTM Grid Reference**	BX23:52875-70540
Locality	ROLLESTON	**NZTM X and Y**	1552875 - 5170540
Location Description		**Location Accuracy**	2 - 15m
CWMS Zone	Selwyn - Waihora	**Use**	Irrigation, Domestic Supply
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	30.00m	**Water Level Count**	0
Diameter	150mm	**Initial Water Level**	9.70m below MP
Measuring Point Description		**Highest Water Level**	
Measuring Point Elevation	35.61m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 2.5 m	**First reading**	
Ground Level	0.00m above MP	**Last reading**	
Strata Layers	10	**Calc Min 80%**	12.08m below MP (Estimated)
Aquifer Name	Bromley Formation	**Aquifer Tests**	0
Aquifer Type	Unknown	**Yield Drawdown Tests**	1
Drill Date	20 Dec 1991	**Max Tested Yield**	2 l/s
Driller	Smiths Welldrilling	**Drawdown at Max Tested Yield**	4 m
Drilling Method	Cable Tool	**Specific Capacity**	0.52 l/s/m
Casing Material		**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	28	30				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
20 Dec 1991	1	2.2	29.036005	4.2	2

Comments

Comment Date	Comment
	Previous owner S Matheson.

Bore Log

Borelog for well M36/4433

Grid Reference (NZTM): 1552876 mE, 5170541 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 35.6 m +MSD Accuracy: < 2.5 m
Driller: Smiths Welldrilling
Drill Method: Cable Tool
Borelog Depth: 30.0 m Drill Date: 20-Dec-1991

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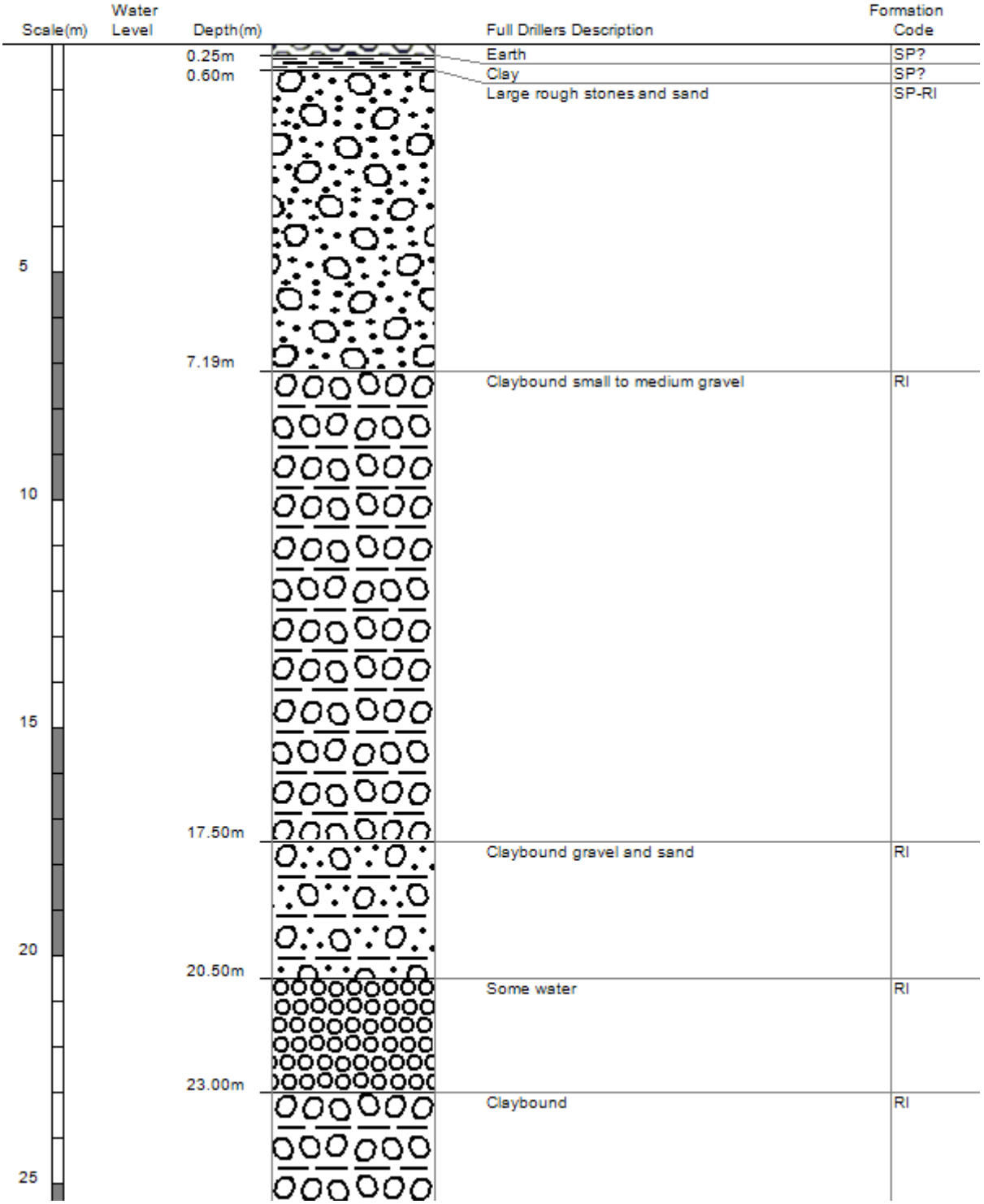


26.00m
27.00m
29.00m
30.00m
Patch Yellow clay
BR?
Free sandy gravel
BR?
Small Black/purple free gravel, sandy
BR?

Bore or Well No	M36/7975
Well Name	SELWYN ROAD
Owner	MR & MS SH & EL LOEFFLER & HUISMANS

Well Number	M36/7975	**File Number**	CO6C/23830
Owner	MR & MS SH & EL LOEFFLER & HUISMANS	**Well Status**	Active (exist, present)
Street/Road	SELWYN ROAD	**NZTM Grid Reference**	BX23:52316-71000
Locality	ROLLESTON	**NZTM X and Y**	1552316 - 5171000
Location Description		**Location Accuracy**	50 - 300m
CWMS Zone	Selwyn - Waihora	**Use**	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	37.50m	**Water Level Count**	0
Diameter	150mm	**Initial Water Level**	10.00m below MP
Measuring Point Description	ToC	**Highest Water Level**	
Measuring Point Elevation	38.00m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 2.5 m	**First reading**	
Ground Level	0.30m below MP	**Last reading**	
Strata Layers	12	**Calc Min 80%**	12.03m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	3
Drill Date	05 Sep 2005	**Max Tested Yield**	6 l/s
Driller	Dynes Road Drilling	**Drawdown at Max Tested Yield**	17 m
Drilling Method	Cable Tool	**Specific Capacity**	0.43 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	35	37.5				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
05 Sep 2005	1	3.636864	48	8.5	1
05 Sep 2005	2	5.379528	71	12.2	1

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
05 Sep 2005	3	6.364512	84	17.3	2

No comments for this well

Bore Log

Borelog for well M36/7975

Grid Reference (NZTM): 1552317 mE, 5171001 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 37.7 m +MSD Accuracy: < 2.5 m
Driller: Dynes Road Drilling
Drill Method: Cable Tool
Borelog Depth: 37.5 m Drill Date: 05-Sep-2005

Environment Canterbury Regional Council
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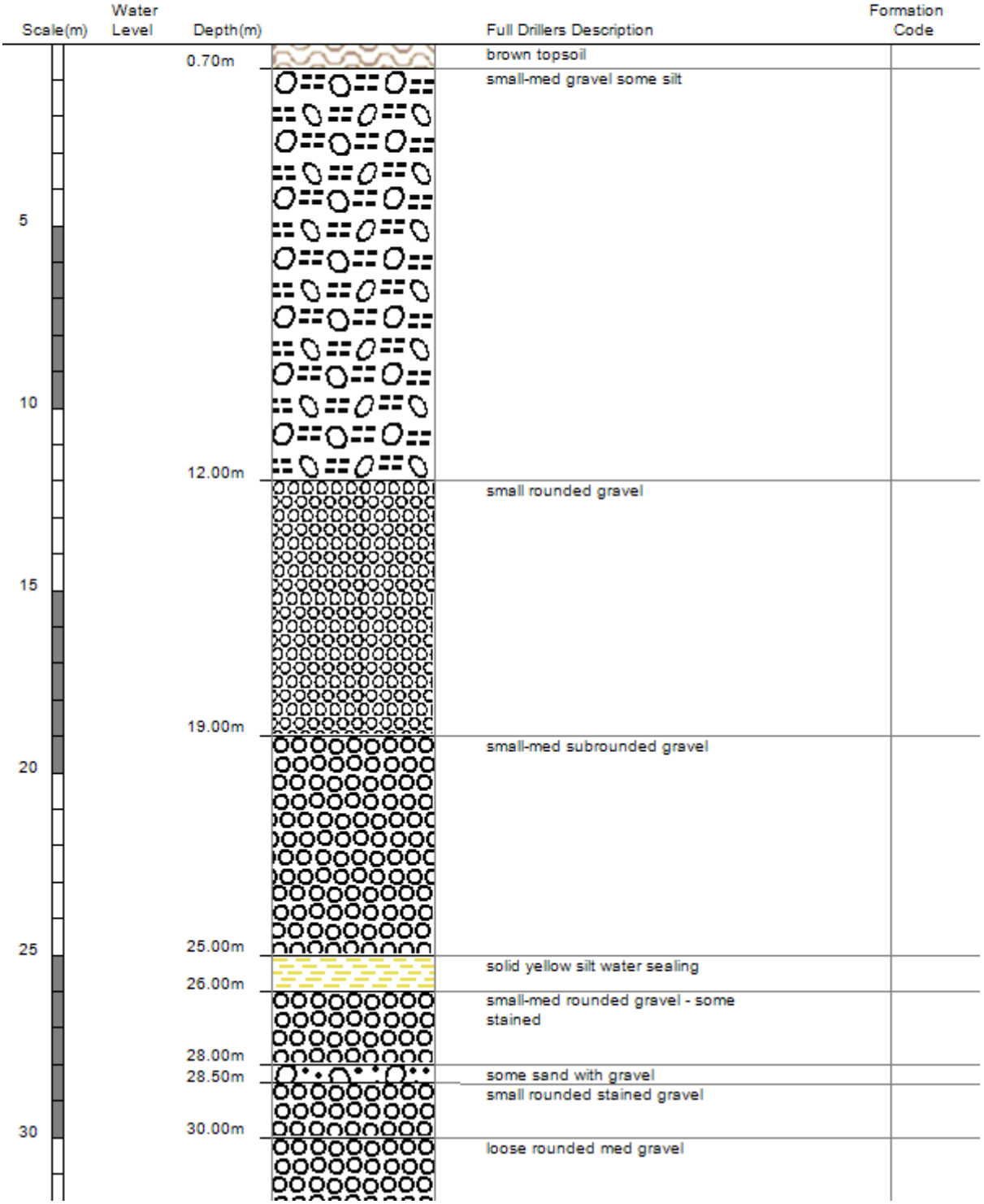

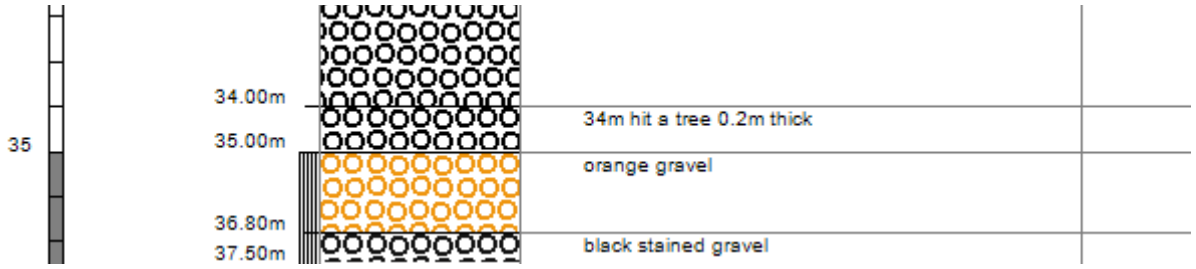
35
34.00m
35.00m
36.80m
37.50m
34m hit a tree 0.2m thick
orange gravel
black stained gravel

Bore or Well No	M36/7976
Well Name	SELWYN ROAD
Owner	WEATHERBY ESTATE LIMITED

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Well Number	M36/7976	**File Number**	CO6C/23897
Owner	WEATHERBY ESTATE LIMITED	**Well Status**	Active (exist, present)
Street/Road	SELWYN ROAD	**NZTM Grid Reference**	BX23:52386-70950
Locality	BROADFIELD	**NZTM X and Y**	1552386 - 5170950
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**	10.60m below MP
Measuring Point Description	ToC	**Highest Water Level**	
Measuring Point Elevation	37.00m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 2.5 m	**First reading**	
Ground Level	0.40m below MP	**Last reading**	
Strata Layers	11	**Calc Min 80%**	12.04m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	1
Drill Date	24 Aug 2005	**Max Tested Yield**	2 l/s
Driller	Daly Water Wells Ltd	**Drawdown at Max Tested Yield**	3 m
Drilling Method	Rotary Rig	**Specific Capacity**	0.63 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	36				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
24 Aug 2005	1	2	26.396368	3.2	4

Comments

Comment Date	Comment
28 Mar 2006	Gridref changed from: M36:6233-3268

Bore Log

Borelog for well M36/7976

Grid Reference (NZTM): 1552387 mE, 5170951 mN
Location Accuracy: 10 - 50m
Ground Level Altitude: 36.6 m +MSD Accuracy: < 2.5 m
Driller: Daly Water Wells Ltd
Drill Method: Rotary Rig
Borelog Depth: 36.0 m Drill Date: 24-Aug-2005

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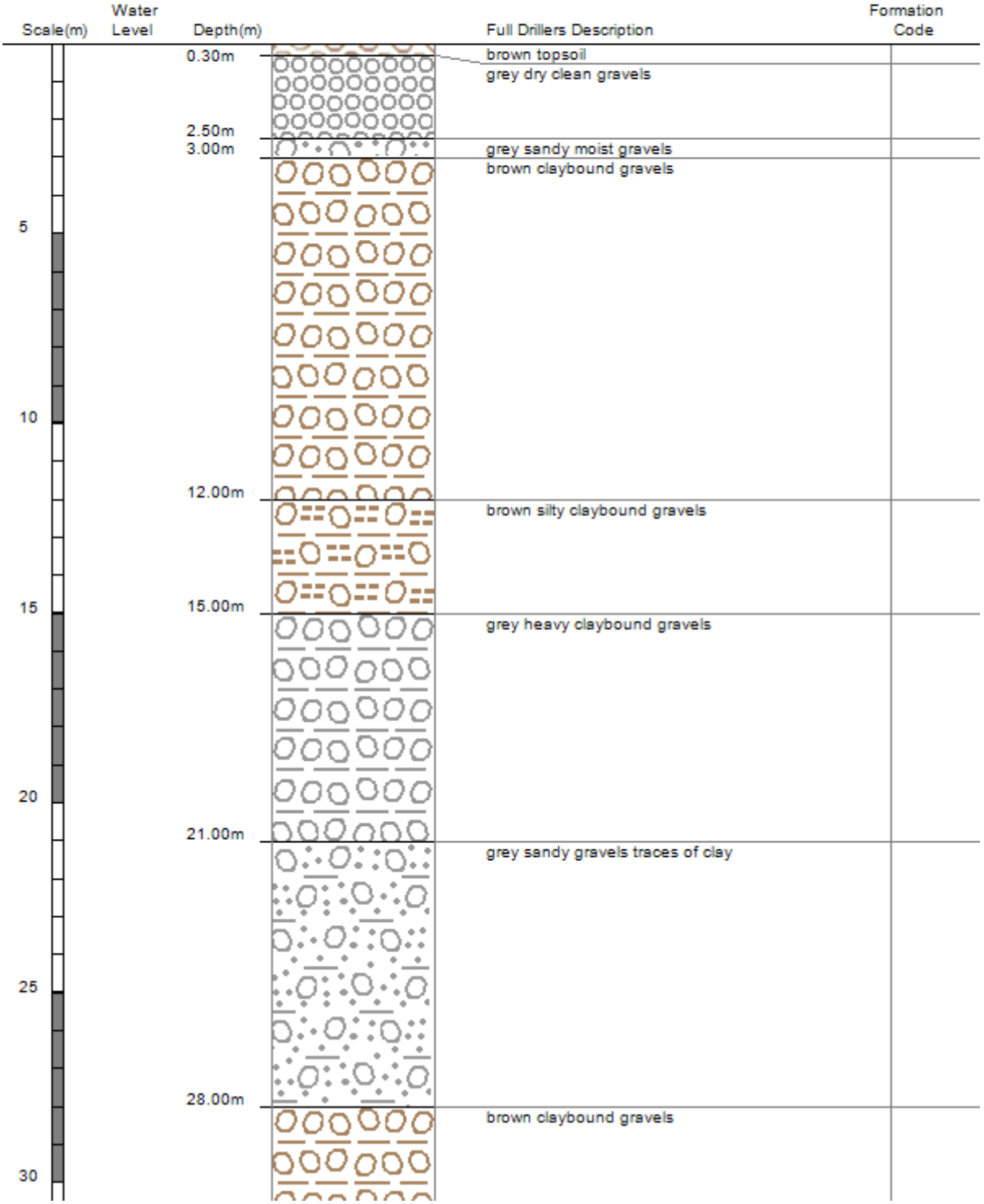
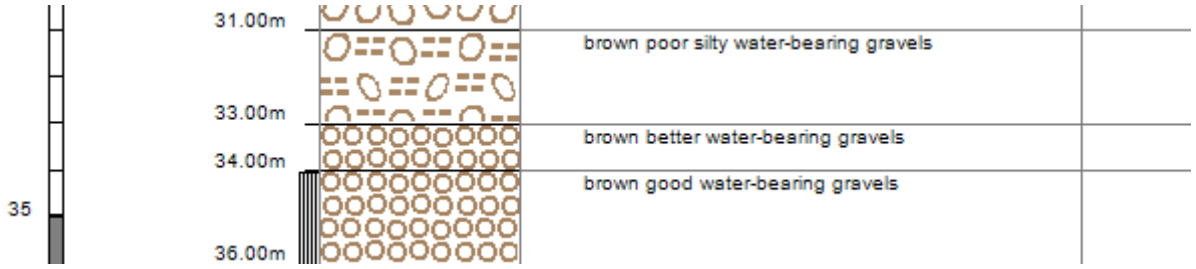



31.00m
brown poor silty water-bearing gravels
33.00m
brown better water-bearing gravels
34.00m
brown good water-bearing gravels
35
36.00m

Bore or Well No	M36/8002
Well Name	SELWYN ROAD
Owner	MR & MRS AT & JM MULCAY

Well Number	M36/8002	**File Number**	CO6C/24021
Owner	MR & MRS AT & JM MULCAY	**Well Status**	Active (exist, present)
Street/Road	SELWYN ROAD	**NZTM Grid Reference**	BX23:52536-70700
Locality	ROLLESTON	**NZTM X and Y**	1552536 - 5170700
Location Description		**Location Accuracy**	50 - 300m
CWMS Zone	Selwyn - Waihora	**Use**	Domestic and Stockwater,
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	66.00m	**Water Level Count**	0
Diameter	150mm	**Initial Water Level**	12.40m below MP
Measuring Point Description	ToC	**Highest Water Level**	
Measuring Point Elevation	36.00m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 2.5 m	**First reading**	
Ground Level	0.30m below MP	**Last reading**	
Strata Layers	13	**Calc Min 80%**	11.96m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	1
Drill Date	28 Oct 2005	**Max Tested Yield**	4 l/s
Driller	Smiths Welldrilling	**Drawdown at Max Tested Yield**	11 m
Drilling Method	Rotary/Percussion	**Specific Capacity**	0.37 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	64.5	66				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
30 Oct 2005	1	4.06	53.5846252	11	2

Comments

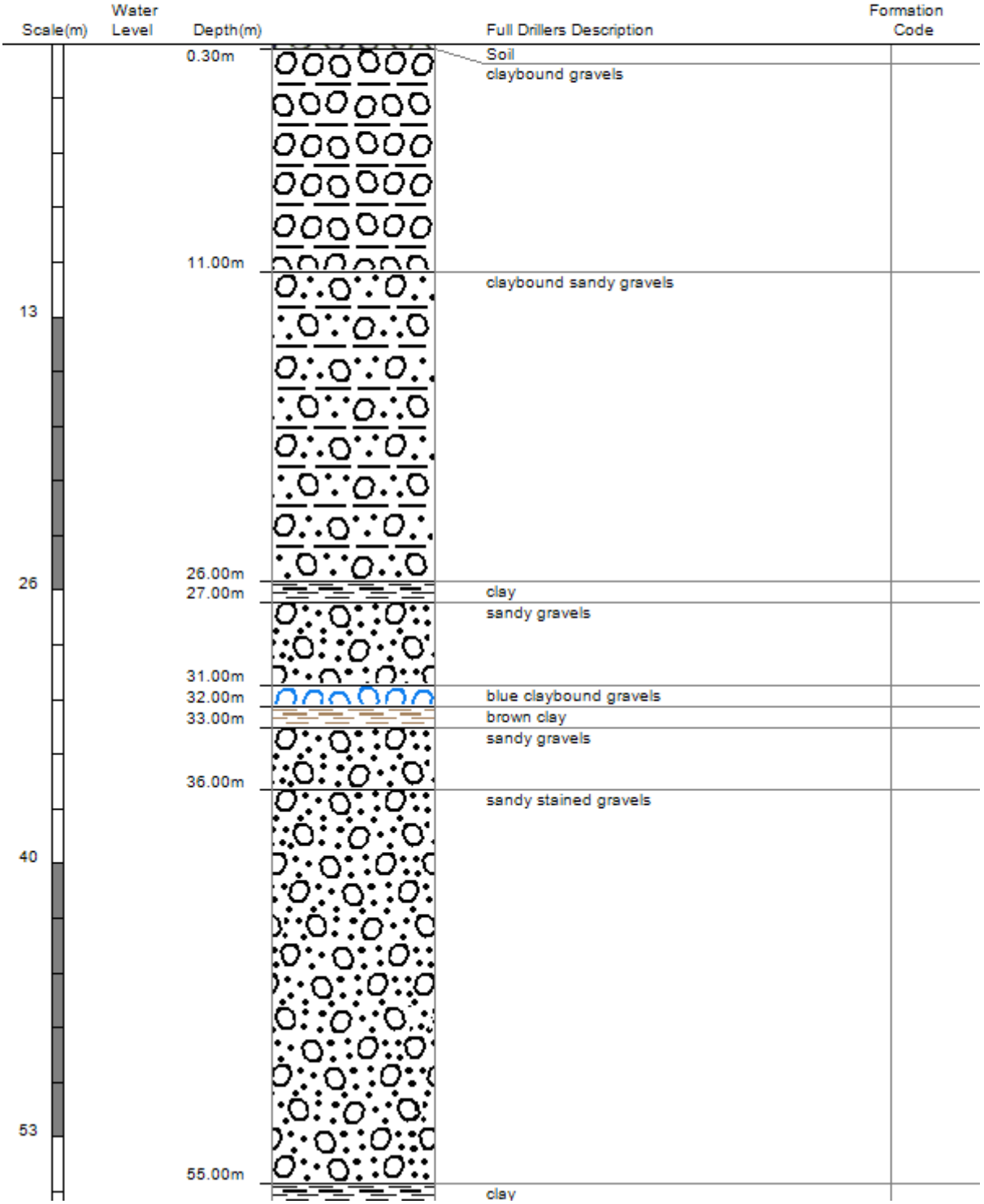
Comment Date	Comment
04 May 2007	Gridref changed from: M36:6249-3232, original gridref incorrect (on road) still waiting for BCR

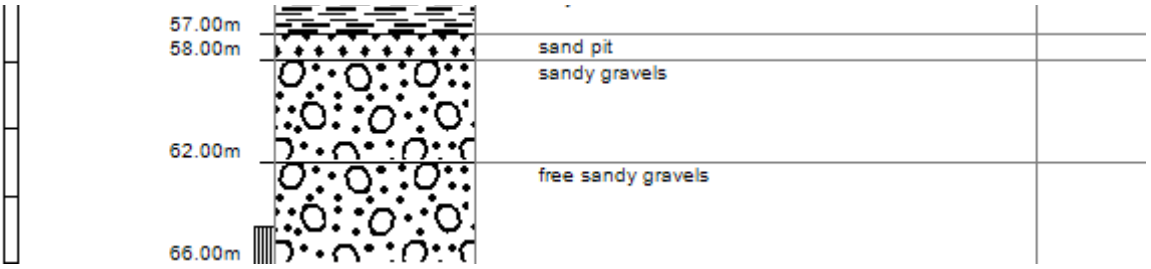
Bore Log

Borelog for well M36/8002

Grid Reference (NZTM): 1552537 mE, 5170701 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 35.7 m +MSD Accuracy: < 2.5 m
Driller: Smiths Welldrilling
Drill Method: Rotary/Percussion
Borelog Depth: 66.0 m Drill Date: 28-Oct-2005

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha




57.00m
58.00m
sand pit
sandy gravels
62.00m
free sandy gravels
66.00m

Bore or Well No	M36/8009
Well Name	SELWYN ROAD
Owner	MR & MRS GC & PM MORGAN

Well Number	M36/8009	**File Number**	CO6C/24231
Owner	MR & MRS GC & PM MORGAN	**Well Status**	Active (exist, present)
Street/Road	SELWYN ROAD	**NZTM Grid Reference**	BX23:52356-70860
Locality	BROADFIELD	**NZTM X and Y**	1552356 - 5170860
Location Description		**Location Accuracy**	50 - 300m
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**	12.20m below MP
Measuring Point Description	ToC	**Highest Water Level**	
Measuring Point Elevation	36.18m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 5 m	**First reading**	
Ground Level	0.40m below MP	**Last reading**	
Strata Layers	10	**Calc Min 80%**	11.92m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	1
Drill Date	01 Nov 2005	**Max Tested Yield**	2 l/s
Driller	Daly Water Wells Ltd	**Drawdown at Max Tested Yield**	3 m
Drilling Method	Rotary Rig	**Specific Capacity**	0.63 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	Slotted PVC	34	36				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
01 Nov 2006	1	2	26.396368	3.2	3

No comments for this well

Bore Log

Borelog for well M36/8009 page 1 of 2

Grid Reference (NZTM): 1552357 mE, 5170861 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 35.8 m +MSD Accuracy: < 0.5 m
Driller: Daly Water Wells Ltd
Drill Method: Rotary Rig
Borelog Depth: 36.0 m Drill Date: 01-Nov-2005

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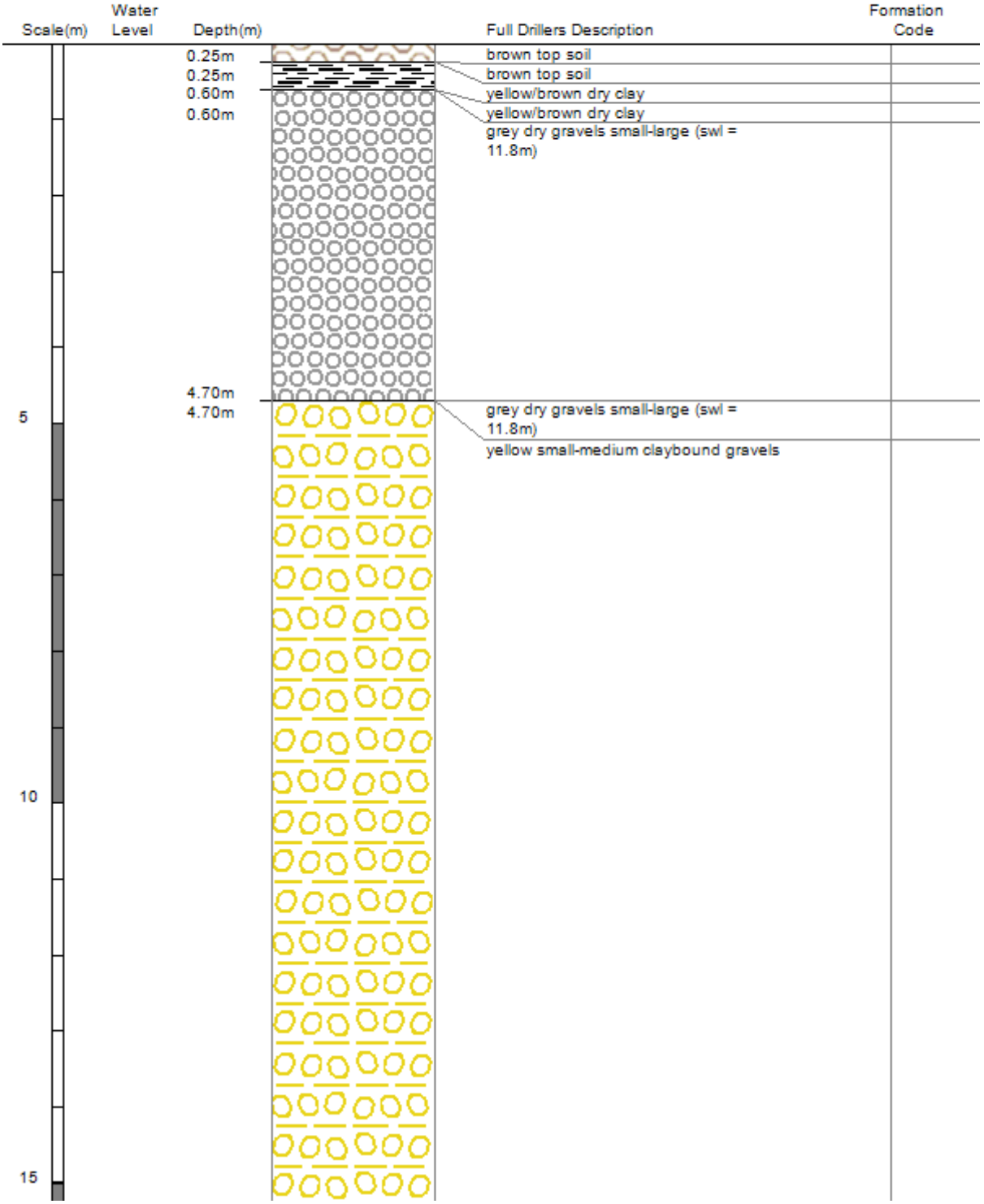

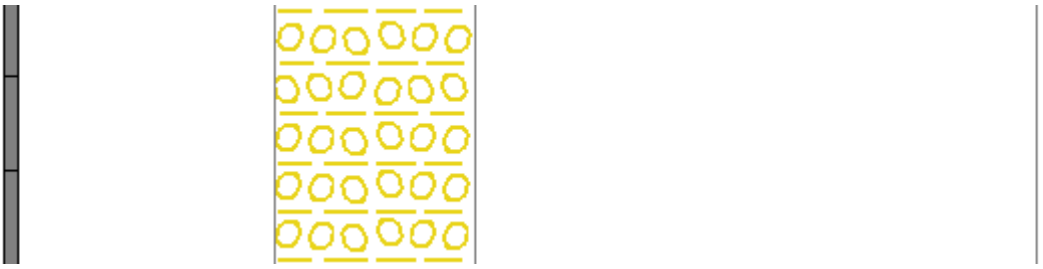

Bore or Well No	M36/8138
Well Name	LINCOLN ROLLESTON ROAD
Owner	MR & MRS RG & VA HUBBARD

Well Number	M36/8138	**File Number**	CO6C/24642
Owner	MR & MRS RG & VA HUBBARD	**Well Status**	Active (exist, present)
Street/Road	LINCOLN ROLLESTON ROAD	**NZTM Grid Reference**	BX23:52946-71200
Locality	ROLLESTON	**NZTM X and Y**	1552946 - 5171200
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**	14.60m below MP
Measuring Point Description	ToC	**Highest Water Level**	
Measuring Point Elevation	35.69m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 5 m	**First reading**	
Ground Level	0.40m below MP	**Last reading**	
Strata Layers	5	**Calc Min 80%**	12.83m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	1
Drill Date	16 Jan 2006	**Max Tested Yield**	2 l/s
Driller	Daly Water Wells Ltd	**Drawdown at Max Tested Yield**	4 m
Drilling Method	Rotary Rig	**Specific Capacity**	0.51 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	36				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
16 Jan 2006	1	2	26.396368	3.9	0

Comments

Comment Date	Comment
27 May 2008	Gridref changed from: M36:6294-3282 (BCP received)

Bore Log

Borelog for well M36/8138

Grid Reference (NZTM): 1552947 mE, 5171201 mN
Location Accuracy: 10 - 50m
Ground Level Altitude: 35.3 m +MSD Accuracy: < 0.5 m
Driller: Daly Water Wells Ltd
Drill Method: Rotary Rig
Borelog Depth: 36.0 m Drill Date: 16-Jan-2006

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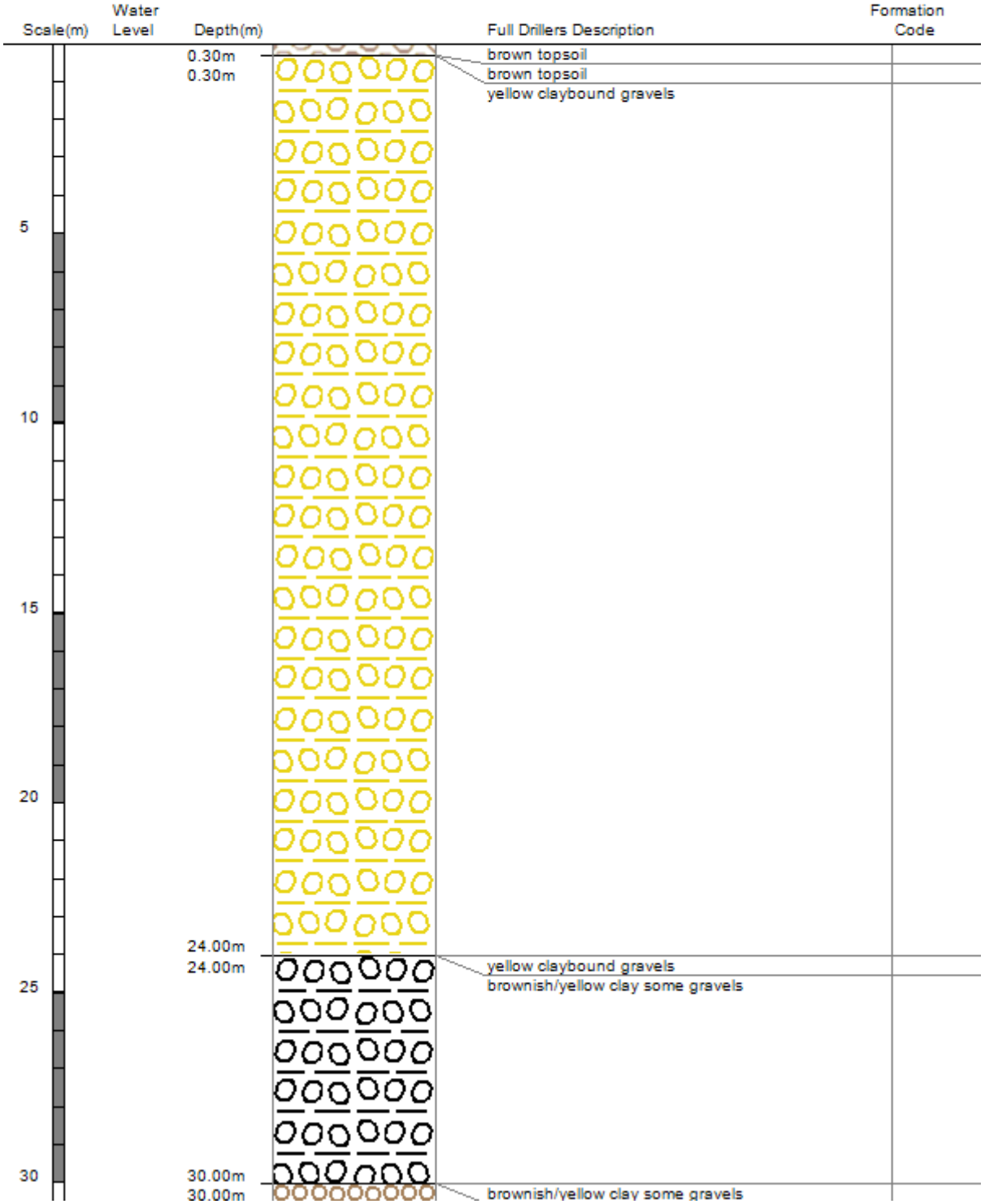

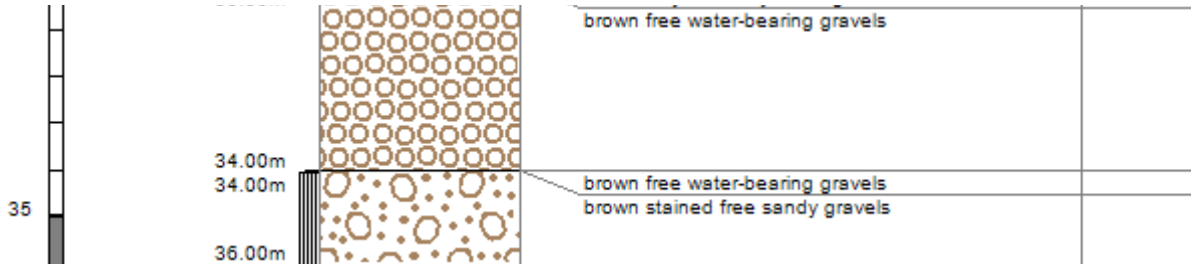
brown free water-bearing gravels
34.00m
34.00m
brown free water-bearing gravels
brown stained free sandy gravels
35
36.00m

Bore or Well No	M36/8299
Well Name	SELWYN ROAD
Owner	MR GJ & MRS BA SCURR

Well Number	M36/8299	**File Number**	CO6C/24910
Owner	MR GJ & MRS BA SCURR	**Well Status**	Active (exist, present)
Street/Road	SELWYN ROAD	**NZTM Grid Reference**	BX23:52686-70750
Locality	BROADFIELDS	**NZTM X and Y**	1552686 - 5170750
Location Description		**Location Accuracy**	10 - 50m
CWMS Zone	Selwyn - Waihora	**Use**	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	90.00m	**Water Level Count**	0
Diameter	150mm	**Initial Water Level**	21.00m below MP
Measuring Point Description	ToC	**Highest Water Level**	
Measuring Point Elevation	34.56m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 5 m	**First reading**	
Ground Level	0.60m below MP	**Last reading**	
Strata Layers	7	**Calc Min 80%**	11.87m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	0
Drill Date	20 Feb 2008	**Max Tested Yield**	
Driller	Giltrap Drilling	**Drawdown at Max Tested Yield**	
Drilling Method	Rotary Rig	**Specific Capacity**	
Casing Material	Steel	**Last Updated**	19 Mar 2010
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	88.5	90				

No step tests for this well

Comments

Comment Date	Comment
19 Mar 2010	Gridref changed from: M36:6266-3237 to M36:6268-3236 BCP confirms

Bore Log

Borelog for well M36/8299

Grid Reference (NZTM): 1552687 mE, 5170751 mN
Location Accuracy: 10 - 50m
Ground Level Altitude: 34.0 m +MSD Accuracy: < 0.5 m
Driller: Giltrap Drilling
Drill Method: Rotary Rig
Borelog Depth: 90.0 m Drill Date: 20-Feb-2008

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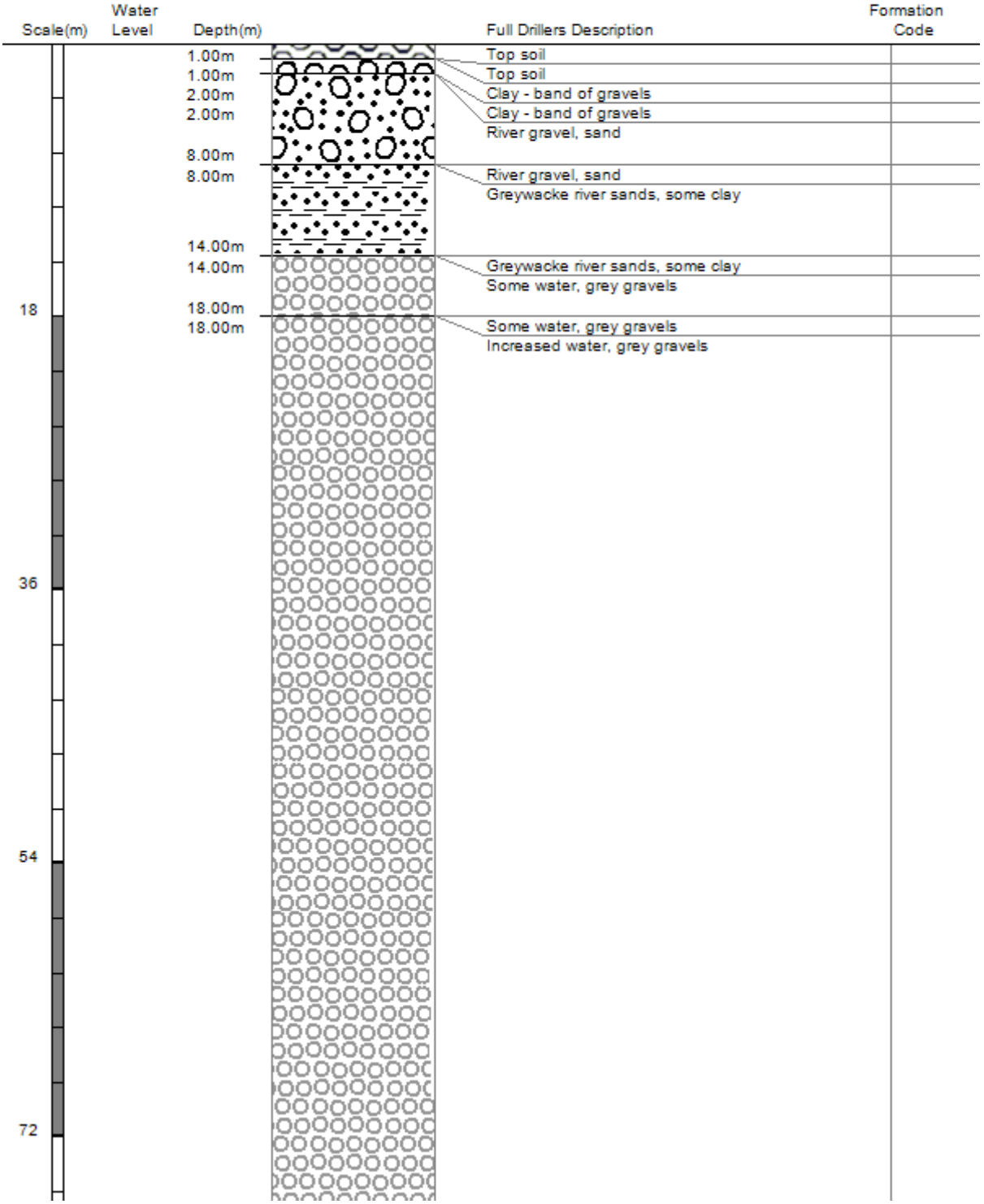

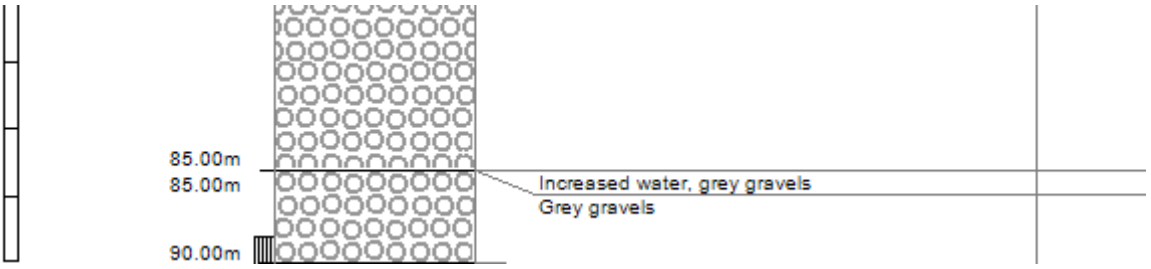
85.00m
85.00m
90.00m
Increased water, grey gravels
Grey gravels

Bore or Well No	M36/8300
Well Name	SELWYN ROAD
Owner	Mr & Mrs G J & B A Scurr

Well Number	M36/8300	**File Number**	CO6C/24910
Owner	Mr & Mrs G J & B A Scurr	**Well Status**	Active (exist, present)
Street/Road	SELWYN ROAD	**NZTM Grid Reference**	BX23:52676-70960
Locality	BROADFIELDS	**NZTM X and Y**	1552676 - 5170960
Location Description		**Location Accuracy**	10 - 50m
CWMS Zone	Selwyn - Waihora	**Use**	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	42.00m	**Water Level Count**	0
Diameter	150mm	**Initial Water Level**	14.00m below MP
Measuring Point Description	ToC	**Highest Water Level**	
Measuring Point Elevation	35.29m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 5 m	**First reading**	
Ground Level	0.60m below MP	**Last reading**	
Strata Layers	5	**Calc Min 80%**	12.33m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	0
Drill Date	25 Feb 2008	**Max Tested Yield**	
Driller	Giltrap Drilling	**Drawdown at Max Tested Yield**	
Drilling Method	Rotary Rig	**Specific Capacity**	
Casing Material	Steel	**Last Updated**	19 May 2010
Pump Type		**Last Field Check**	
Water Use Data	Yes		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	39	40.5				

No step tests for this well

Comments

Comment Date	Comment
19 Mar 2010	Gridref changed from: M36:6262-3256 to M36:6267-3257 BCP confirms

Bore Log

Borelog for well M36/8300

Grid Reference (NZTM): 1552677 mE, 5170961 mN
Location Accuracy: 10 - 50m
Ground Level Altitude: 34.7 m +MSD Accuracy: < 0.5 m
Driller: Giltrap Drilling
Drill Method: Rotary Rig
Borelog Depth: 42.0 m Drill Date: 25-Feb-2008

Environment Canterbury Regional Council
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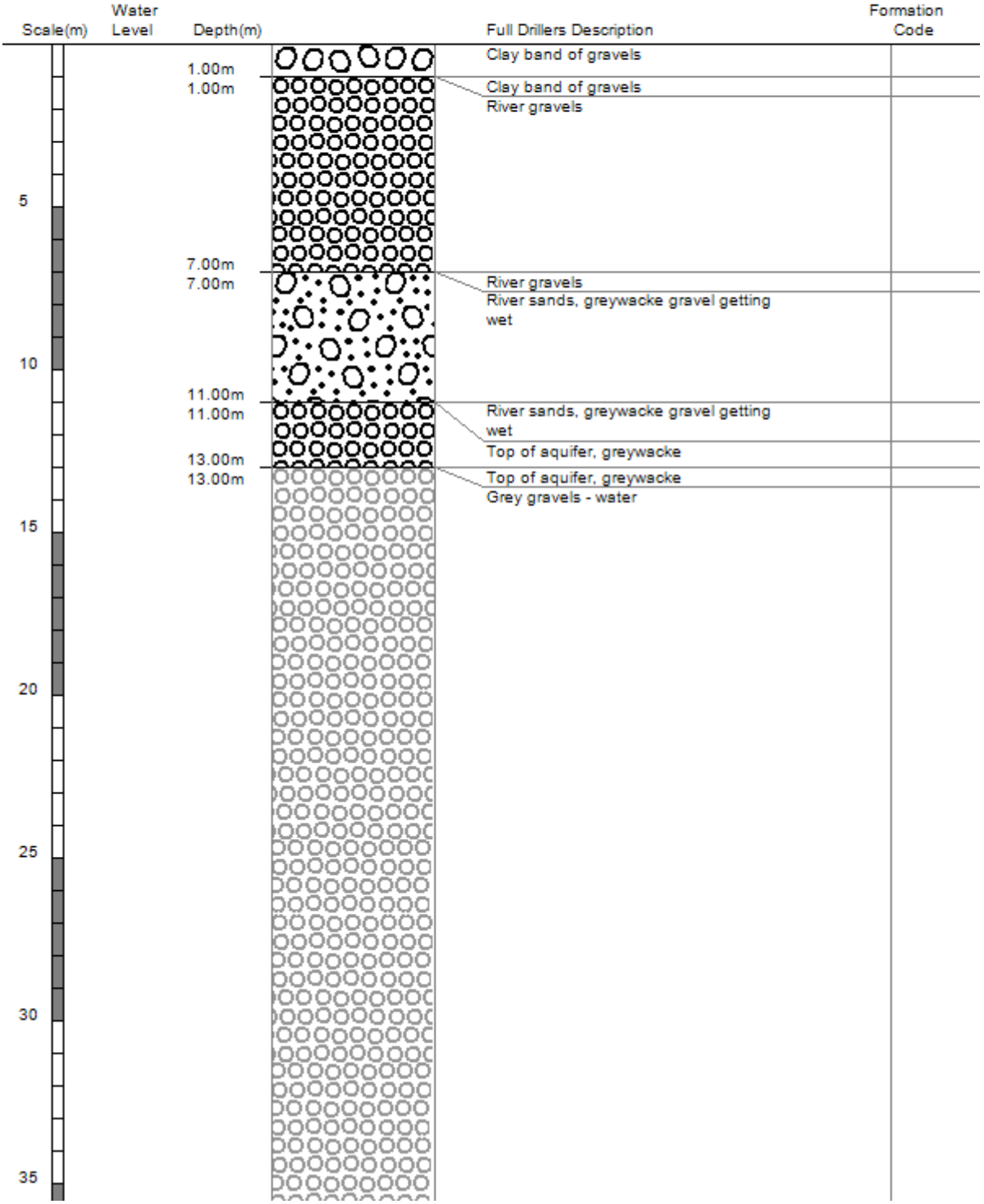



40
42.00m

Bore or Well No	M36/8392
Well Name	572 SELWYN ROAD
Owner	A J LLOYD

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Well Number	M36/8392	**File Number**	CO6C/26653
Owner	A J LLOYD	**Well Status**	Active (exist, present)
Street/Road	572 SELWYN ROAD	**NZTM Grid Reference**	BX23:52567-70574
Locality	SPRINGSTON	**NZTM X and Y**	1552567 - 5170574
Location Description		**Location Accuracy**	2 - 15m
CWMS Zone	Selwyn - Waihora	**Use**	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	36.00m	**Water Level Count**	0
Diameter	150mm	**Initial Water Level**	10.00m below MP
Measuring Point Description		**Highest Water Level**	
Measuring Point Elevation	34.26m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 5 m	**First reading**	
Ground Level	0.00m above MP	**Last reading**	
Strata Layers	5	**Calc Min 80%**	11.83m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	1
Drill Date	12 Jun 2007	**Max Tested Yield**	2 l/s
Driller	Daly Water Wells Ltd	**Drawdown at Max Tested Yield**	11 m
Drilling Method	Rotary Rig	**Specific Capacity**	0.18 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	36				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
12 Jun 2007	1	2	26.396368	11	0

Comments

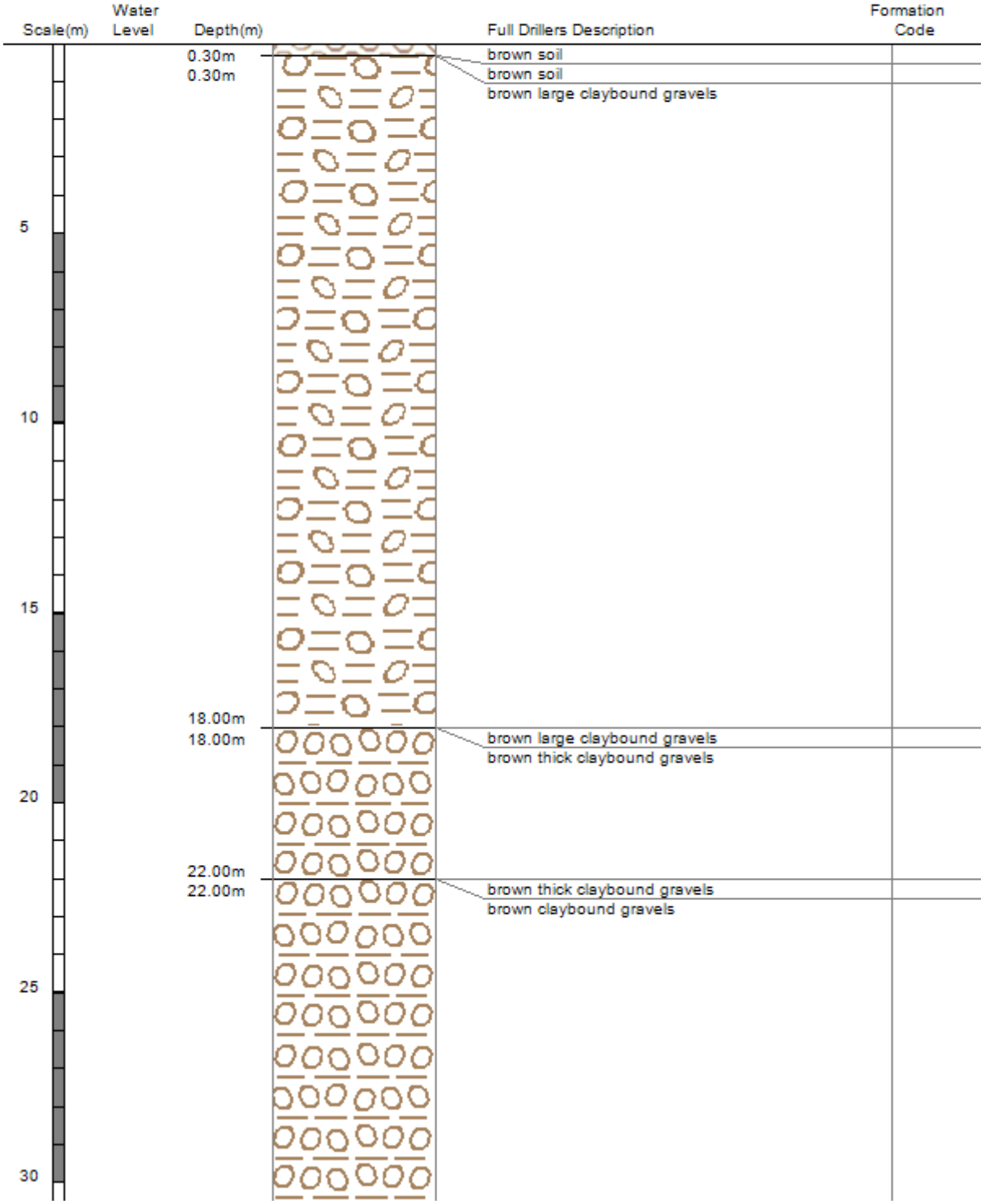
Comment Date	Comment
20 Sep 2007	Gridref changed from: M36:6247-3217, BCR confirms
12 Nov 2007	Gridref changed from: M36:6255-3216. New gridref from plan in BCR
09 Jun 2009	Gridref changed from: M36:62572-32149 - Site visit 5 June 09, location GPS'd

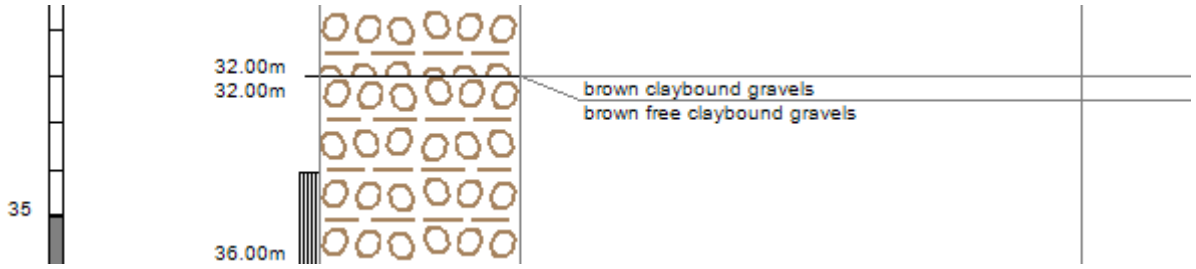
Bore Log

Borelog for well M36/8392

Grid Reference (NZTM): 1552568 mE, 5170575 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 34.3 m +MSD Accuracy: < 0.5 m
Driller: Daly Water Wells Ltd
Drill Method: Rotary Rig
Borelog Depth: 36.0 m Drill Date: 12-Jun-2007

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha




35
32.00m
32.00m
36.00m
brown claybound gravels
brown free claybound gravels

APPENDIX 3:

Site Plan and Subsurface Investigation

Legend

- Site Boundary
- 2020 Plan Change Testing (ENGEO)
- 2022 Test Pit Excavations
- 2022 Hand Auger Tests

0 50 m 100 m

© Nearmaps

ENGEO

Produced by Datamesh.earth

Title: Site Plan and Investigation Locations		
Client: Urban Estates		
Project: Broadfield Grange	Drawn: JRW	Figure No: 1
Date: 15-06-2022	Checked: DEB	Size: A4
Proj No: 18991.000.001_4	Scale: 1:3000	Version: draft

LOG OF TEST PIT TP01

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Date : 02/06/2022
Max Test Pit Depth : 2.3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 400 mm

Shear Vane No :
Logged By : Cw/JC
Reviewed By : JRW
Latitude : -43.61701940326
Longitude : 172.41185556437

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0.0	TS		SM	Silty fine to medium SAND and trace rootlets; brown. Poorly graded [TOPSOIL].				D	-		
	ALLUVIUM		SM	Silty fine to medium SAND with trace gravel; light brown. Poorly graded.					MD		
0.5				Sandy fine to coarse GRAVEL with trace cobbles; brownish grey. Well graded. Subrounded to subangular. Sand, fine to coarse. Well graded.							
1.0											
1.5			GW					M	Tightly Packed		
2.0											
2.3				Depth of Excavation: 2.3 m Termination Condition: met target depth							
2.5											

Borehole met target depth at 2.3 m depth .
met practical refusal
Standing groundwater was not encountered
TS=TOPSOIL

TS=TOPSOIL

LOG OF TEST PIT TP02

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Date : 02/06/2022
Max Test Pit Depth : 2.4 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 400 mm

Shear Vane No :
Logged By : JC/CW
Reviewed By : JRW
Latitude : -43.616459647077
Longitude : 172.41047406583

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0	TS		SM	Silty fine to medium SAND with trace gravel; brown. Poorly graded [TOPSOIL].				D	-		
	ALLUVIUM		SM	Silty fine to medium SAND with trace gravel; light brown. Poorly graded.					MD		
0.5				Sandy fine to coarse GRAVEL with trace cobbles; brownish grey. Well graded. Subrounded to subangular. Sand, fine to coarse. Well graded.							
1.0											
1.5			GW					M	Tightly Packed		
2.0											
2.5				Depth of Excavation: 2.4 m Termination Condition: met target depth							

undefined met target depth at 2.4 m depth .
met practical refusal
Standing groundwater was not encountered
TS=TOPSOIL

TS=TOPSOIL

LOG OF TEST PIT TP03

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Date : 02/06/2022
Max Test Pit Depth : 2.6 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 400 mm

Shear Vane No :
Logged By : CW/JC
Reviewed By : JRW
Latitude : -43.615517788612
Longitude : 172.4108900288

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand, fine to medium. Poorly graded [TOPSOIL].					-		
	ALLUVIUM		SM	Silty fine to medium SAND with trace gravel; light brown. Poorly graded.					MD		
0.5			GW	Sandy fine to coarse GRAVEL with trace cobbles; brownish grey. Well graded. Subrounded to subangular. Sand, fine to coarse. Well graded.				M	Tightly Packed		
1.0											
1.5											
2.0											
2.5				Depth of Excavation: 2.6 m Termination Condition: met target depth							

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 >>

undefined met target depth at 2.6 m depth .
met practical refusal
Standing groundwater was not encountered
TS=TOPSOIL

TS=TOPSOIL

LOG OF TEST PIT TP04

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Date : 02/06/2022
Max Test Pit Depth : 2.3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 400 mm

Shear Vane No :
Logged By : CW/JC
Reviewed By : JRW
Latitude : -43.61536401997
Longitude : 172.40958556749

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0.0	TS		SM	Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL]				D	-		
0.5	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with minor cobbles; brownish grey. Well graded. Subrounded to subangular. Sand, fine to coarse. Well graded. Cobbles, subrounded to subangular.					Tightly Packed		
1.0											
1.5											
2.0											
2.5				Depth of Excavation: 2.3 m Termination Condition: met target depth				M			

undefined met target depth at 2.3 m depth .
met practical refusal
Standing groundwater was not encountered
TS=TOPSOIL

TS=TOPSOIL

LOG OF TEST PIT TP05

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Date : 02/06/2022
Max Test Pit Depth : 2.5 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 400 mm

Shear Vane No :
Logged By : CW/ JC
Reviewed By : JRW
Latitude : -43.614830032536
Longitude : 172.40905809273

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TS		SM	Silty fine to medium SAND with trace rootlets; brown. Poorly graded [TOPSOIL]					-		
0.3	ALLUVIUM		SM	Silty fine to medium SAND with trace rootlets; light brown. Poorly graded.					MD		
0.5			GW	Sandy fine to coarse GRAVEL with minor cobbles; brownish grey. Well graded. Subrounded to subangular , fine to coarse. Well graded. Cobbles, subrounded to subangular.				M	Tightly Packed		
2.5				Depth of Excavation: 2.5 m Termination Condition: met target depth							

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 >>

undefined met target depth at 2.5 m depth .
met practical refusal
Standing groundwater was not encountered
TS=TOPSOIL

TS=TOPSOIL

LOG OF TEST PIT TP06

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Date : 02/06/2022
Max Test Pit Depth : 2.55 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 400 mm

Shear Vane No :
Logged By : JC/CW
Reviewed By : JRW
Latitude : -43.613871542206
Longitude : 172.40920213943

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0	TS		SM	Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL].				D	-		
	ALLUVIUM		SM	Silty fine to medium SAND with trace gravel and rootlets; light brown. Poorly graded.					MD		
0.5			GW	Sandy fine to coarse GRAVEL with minor cobbles; brownish grey. Well graded. Subrounded to subangular. Sand, fine to coarse. Well graded. Cobbles, subrounded to subangular.				M	Tightly Packed		
1.0											
1.5											
2.0											
2.5				Depth of Excavation: 2.55 m Termination Condition: met target depth							

undefined met target depth at 2.55 m depth .
met practical refusal
Standing groundwater was not encountered
TS=TOPSOIL

TS=TOPSOIL

LOG OF TEST PIT TP07

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Date : 02/06/2022
Max Test Pit Depth : 2.3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size : 400 mm

Shear Vane No :
Logged By : CW
Reviewed By : JRW
Latitude : -43.61330885747
Longitude : 172.40898696182

Depth (m BGL)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		SM	Silty fine to medium SAND with trace rootlets; brown. Poorly graded [TOPSOIL].					-		
0.5	ALLUVIUM		SM	Silty fine to medium SAND with trace rootlets; light brown with orange mottles. Poorly graded. Rootlets no longer encountered					MD		
1.0			GW	Sandy fine to coarse GRAVEL with minor cobbles and trace boulders; brownish grey. Well graded. Subrounded to subangular. Sand, fine to coarse. Well graded. Cobbles, subrounded to subangular. Less fines for 200mm.				M	Tightly Packed		
1.5				Less fines for 200mm Trace silt encountered from 1.8 m depth							
2.0											
2.5				Depth of Excavation: 2.3 m Termination Condition: met practical refusal							

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>>)

undefined met practical refusal at 2.3 m depth due to hole collapse.

Standing groundwater was not encountered

TS=TOPSOIL

TS=TOPSOIL

LOG OF AUGER HA01

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Client Ref. : N/A
Date : 02/06/2022
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : JC/CW
Reviewed By : JRW
Latitude : -43.617111258606
Longitude : 172.41084747451

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	SM	Silty fine to medium SAND with trace rootlets; brown. Poorly graded [TOPSOIL].				D	-	
	ALLUVIUM	SM	Silty fine to medium SAND; light brown. Poorly graded.					MD	
			End of Hole Depth: 0.3 m Termination Condition: met practical refusal						

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

0.5

1.0

Hand Auger met practical refusal at 0.3 m depth on inferred gravel.
met practical refusal
Standing groundwater was not encountered

GEOTECH HAND AUGER HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 16/6/22

LOG OF AUGER HA02

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Client Ref. : N/A
Date : 02/06/2022
Hole Depth : 0.9 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : JC/CW
Reviewed By : JRW
Latitude : -43.616021774451
Longitude : 172.41145793982

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand, fine to medium. Poorly graded [TOPSOIL].					-	
0.5	ALLUVIUM	SM	Silty fine to medium SAND; light brown with orange mottles. Poorly graded.				M	L - MD	
			Becomes wet and light brown from 0.8 m depth				W		
1.0			End of Hole Depth: 0.9 m Termination Condition: met practical refusal						

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

Hand Auger met practical refusal at 0.9 m depth on inferred gravel.
met practical refusal
Standing groundwater was not encountered

GEOTECH HAND AUGER HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 16/6/22

LOG OF AUGER HA03

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Client Ref. : N/A
Date : 02/06/2022
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : JC/CW
Reviewed By : JRW
Latitude : -43.615261941016
Longitude : 172.41044617985

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	Sandy SILT with minor rootlets; brown. Low plasticity. Sand, fine to medium. Poorly graded [TOPSOIL].				M	-	
	ALLUVIUM	SM	Silty fine to medium SAND with trace gravel; light brown. Poorly graded.					MD	
			End of Hole Depth: 0.3 m Termination Condition: met practical refusal						

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

0.5

1.0

Hand Auger met practical refusal at 0.3 m depth on inferred fill.

Standing groundwater was not encountered

GEOTECH HAND AUGER HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 16/6/22

LOG OF AUGER HA04

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Client Ref. : N/A
Date : 02/06/2022
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : JC/CW
Reviewed By : JRW
Latitude : -43.61593406284
Longitude : 172.41049599847

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
0	TOPSOIL	ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand, fine to medium. Poorly graded [TOPSOIL].				M	-	
			End of Hole Depth: 0.3 m Termination Condition: met practical refusal						
0.5									
1.0									

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

Hand Auger met practical refusal at 0.3 m depth on inferred gravel.
met practical refusal
Standing groundwater was not encountered

GEOTECH HAND AUGER HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 16/6/22

LOG OF AUGER HA05

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Client Ref. : N/A
Date : 02/06/2022
Hole Depth : 0.25 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : CW/JC
Reviewed By : JRW
Latitude : -43.614766221441
Longitude : 172.40984995261

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	SM	Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL].				M	-	
	A	SM	Silty fine to medium SAND with trace gravel; light brown. Poorly graded.					MD	
			End of Hole Depth: 0.25 m Termination Condition: met practical refusal						

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

0.5

1.0

Hand Auger met practical refusal at 0.25 m depth on inferred gravel.
met practical refusal
Standing groundwater was not encountered
A = ALLUVIUM

GEOTECH HAND AUGER HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 16/6/22

LOG OF AUGER HA06

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Client Ref. : N/A
Date : 02/06/2022
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : CW/JC
Reviewed By : JRW
Latitude : -43.6143765184
Longitude : 172.40931126242

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	SM	Silty fine to medium SAND with trace rootlets; brown. Poorly graded [TOPSOIL].				D	-	
	ALLUVIUM	SM	Silty fine to medium SAND with trace gravel; light brown. Poorly graded.					MD	
			End of Hole Depth: 0.3 m Termination Condition: met practical refusal						

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

0.5

1.0

Hand Auger met practical refusal at 0.3 m depth on inferred gravel.
met practical refusal
Standing groundwater was not encountered

GEOTECH HAND AUGER HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 16/6/22

LOG OF AUGER HA07

Geotechnical Investigation
Broadfield Grange
572 Selwyn Road, Rolleston
18991.001.001

Client : Broadfield Grange LTD
Client Ref. : N/A
Date : 02/06/2022
Hole Depth : 0.25 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : CW/JC
Reviewed By : JRW
Latitude : -43.613871735403
Longitude : 172.40832743601

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
0	TOPSOIL	SM	Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL].				M	-		2 4 6 8 10 12
			End of Hole Depth: 0.25 m Termination Condition: met practical refusal							>>
0.5										
1.0										

Hand Auger met practical refusal at 0.25 m depth on inferred gravel.
met practical refusal
Standing groundwater was not encountered

APPENDIX 4:

ECan Boreholes

Bore or Well No	M36/7976
Well Name	SELWYN ROAD
Owner	WEATHERBY ESTATE LIMITED

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Well Number	M36/7976	**File Number**	CO6C/23897
Owner	WEATHERBY ESTATE LIMITED	**Well Status**	Active (exist, present)
Street/Road	SELWYN ROAD	**NZTM Grid Reference**	BX23:52386-70950
Locality	BROADFIELD	**NZTM X and Y**	1552386 - 5170950
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**	10.60m below MP
Measuring Point Description	ToC	**Highest Water Level**	
Measuring Point Elevation	37.00m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 2.5 m	**First reading**	
Ground Level	0.40m below MP	**Last reading**	
Strata Layers	11	**Calc Min 80%**	12.04m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	1
Drill Date	24 Aug 2005	**Max Tested Yield**	2 l/s
Driller	Daly Water Wells Ltd	**Drawdown at Max Tested Yield**	3 m
Drilling Method	Rotary Rig	**Specific Capacity**	0.63 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	36				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
24 Aug 2005	1	2	26.396368	3.2	4

Comments

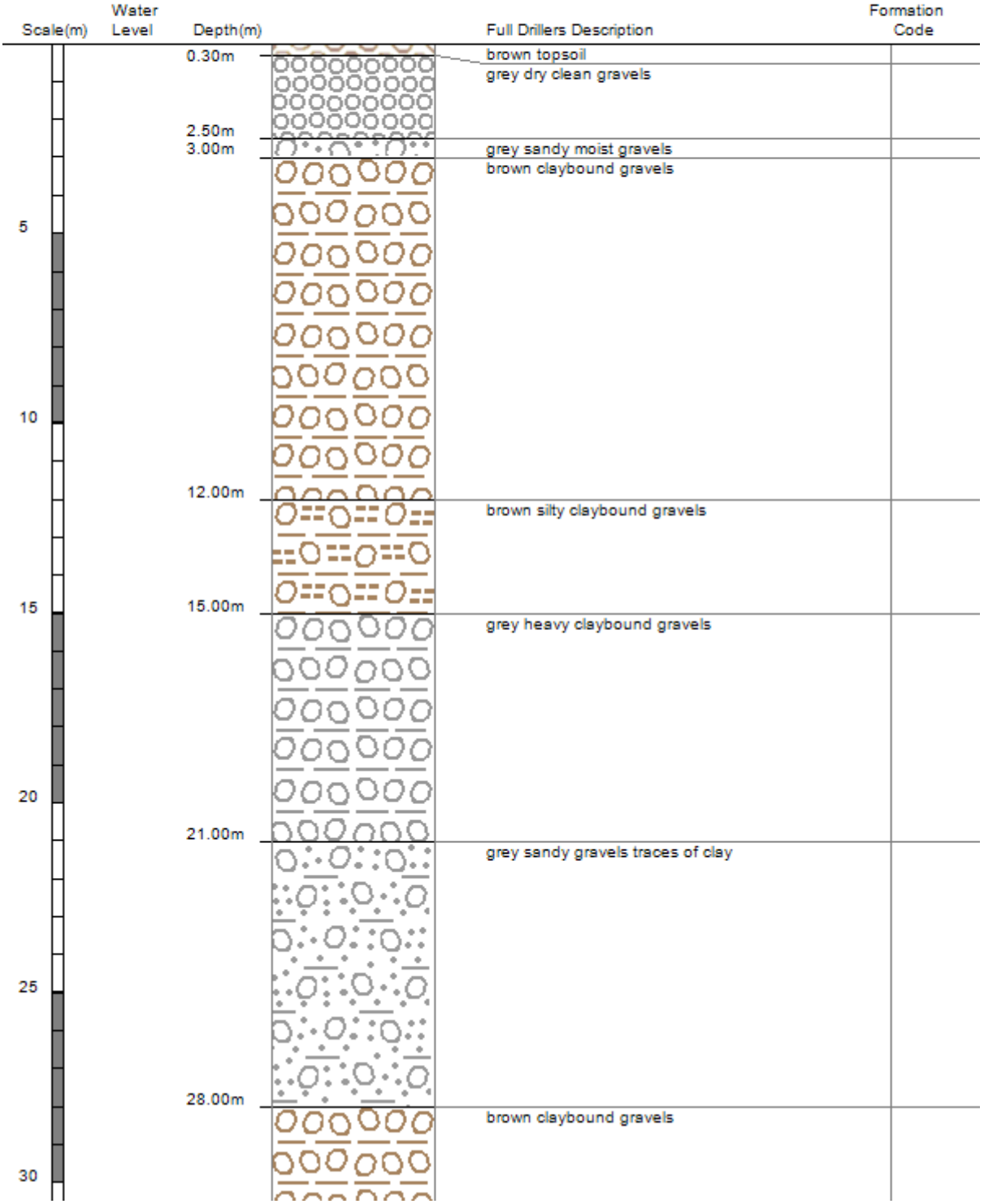
Comment Date	Comment
28 Mar 2006	Gridref changed from: M36:6233-3268

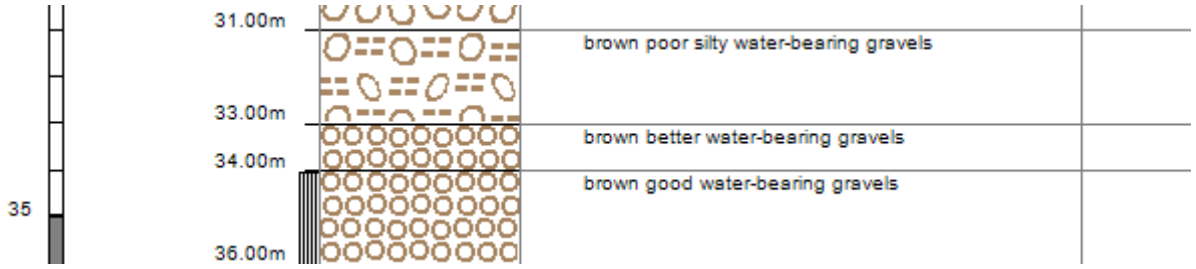
Bore Log

Borelog for well M36/7976

Grid Reference (NZTM): 1552387 mE, 5170951 mN
Location Accuracy: 10 - 50m
Ground Level Altitude: 36.6 m +MSD Accuracy: < 2.5 m
Driller: Daly Water Wells Ltd
Drill Method: Rotary Rig
Borelog Depth: 36.0 m Drill Date: 24-Aug-2005

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha




31.00m
brown poor silty water-bearing gravels
33.00m
brown better water-bearing gravels
34.00m
brown good water-bearing gravels
35
36.00m

Bore or Well No	M36/8002
Well Name	SELWYN ROAD
Owner	MR & MRS AT & JM MULCAY

Well Number	M36/8002	**File Number**	CO6C/24021
Owner	MR & MRS AT & JM MULCAY	**Well Status**	Active (exist, present)
Street/Road	SELWYN ROAD	**NZTM Grid Reference**	BX23:52536-70700
Locality	ROLLESTON	**NZTM X and Y**	1552536 - 5170700
Location Description		**Location Accuracy**	50 - 300m
CWMS Zone	Selwyn - Waihora	**Use**	Domestic and Stockwater,
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	66.00m	**Water Level Count**	0
Diameter	150mm	**Initial Water Level**	12.40m below MP
Measuring Point Description	ToC	**Highest Water Level**	
Measuring Point Elevation	36.00m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 2.5 m	**First reading**	
Ground Level	0.30m below MP	**Last reading**	
Strata Layers	13	**Calc Min 80%**	11.96m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	1
Drill Date	28 Oct 2005	**Max Tested Yield**	4 l/s
Driller	Smiths Welldrilling	**Drawdown at Max Tested Yield**	11 m
Drilling Method	Rotary/Percussion	**Specific Capacity**	0.37 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	64.5	66				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
30 Oct 2005	1	4.06	53.5846252	11	2

Comments

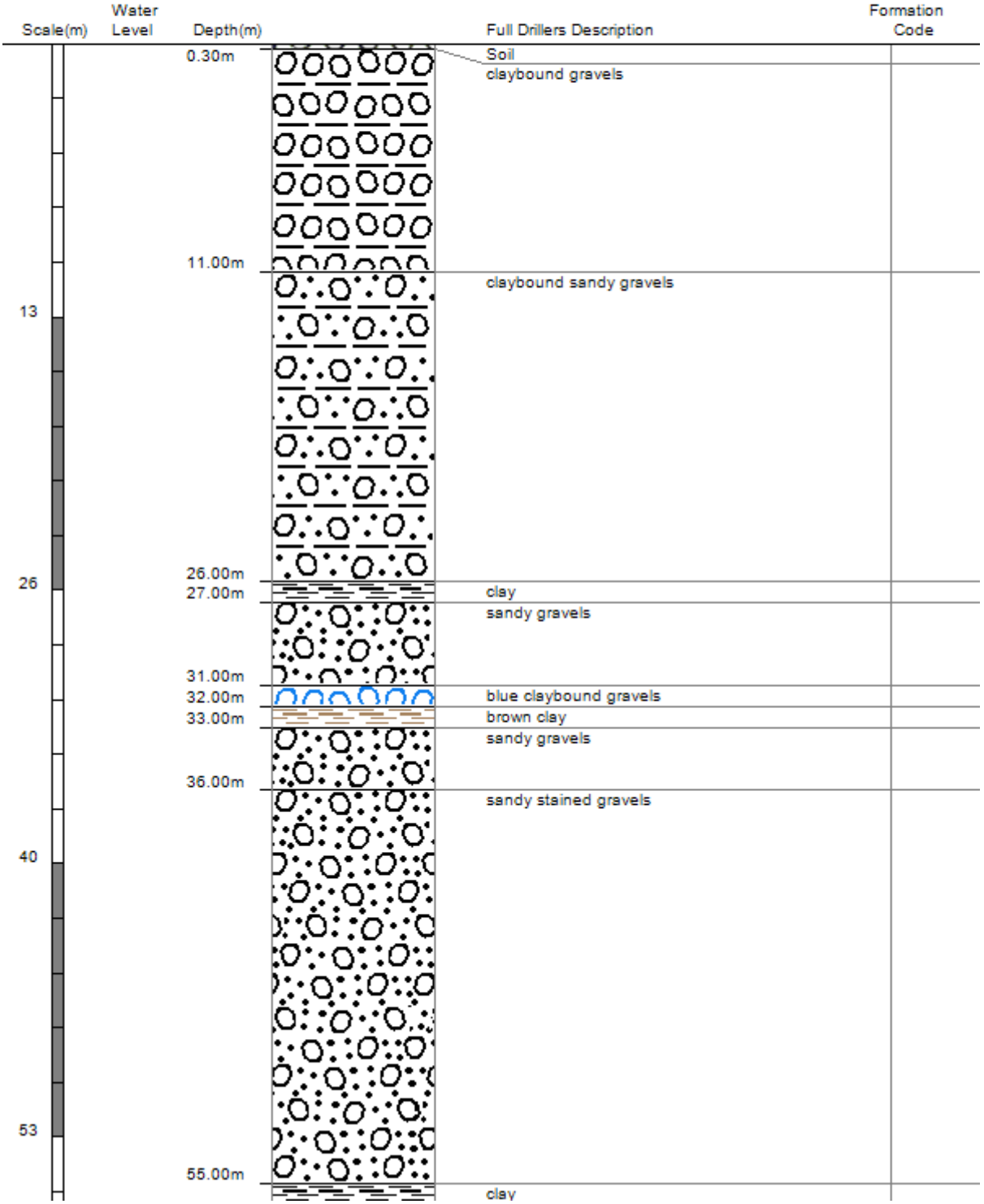
Comment Date	Comment
04 May 2007	Gridref changed from: M36:6249-3232, original gridref incorrect (on road) still waiting for BCR

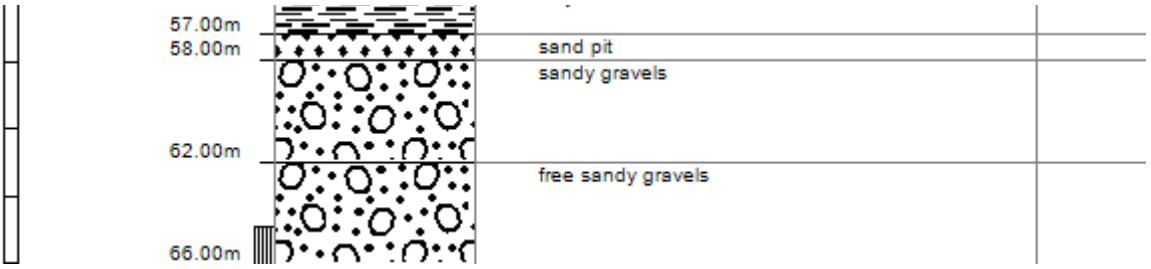
Bore Log

Borelog for well M36/8002

Grid Reference (NZTM): 1552537 mE, 5170701 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 35.7 m +MSD Accuracy: < 2.5 m
Driller: Smiths Welldrilling
Drill Method: Rotary/Percussion
Borelog Depth: 66.0 m Drill Date: 28-Oct-2005

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha




57.00m
58.00m
sand pit
sandy gravels
62.00m
free sandy gravels
66.00m

Bore or Well No	M36/8009
Well Name	SELWYN ROAD
Owner	MR & MRS GC & PM MORGAN

Well Number	M36/8009	**File Number**	CO6C/24231
Owner	MR & MRS GC & PM MORGAN	**Well Status**	Active (exist, present)
Street/Road	SELWYN ROAD	**NZTM Grid Reference**	BX23:52356-70860
Locality	BROADFIELD	**NZTM X and Y**	1552356 - 5170860
Location Description		**Location Accuracy**	50 - 300m
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**	12.20m below MP
Measuring Point Description	ToC	**Highest Water Level**	
Measuring Point Elevation	36.18m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 5 m	**First reading**	
Ground Level	0.40m below MP	**Last reading**	
Strata Layers	10	**Calc Min 80%**	11.92m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	1
Drill Date	01 Nov 2005	**Max Tested Yield**	2 l/s
Driller	Daly Water Wells Ltd	**Drawdown at Max Tested Yield**	3 m
Drilling Method	Rotary Rig	**Specific Capacity**	0.63 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	Slotted PVC	34	36				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
01 Nov 2006	1	2	26.396368	3.2	3

No comments for this well

Bore Log

Borelog for well M36/8009 page 1 of 2

Grid Reference (NZTM): 1552357 mE, 5170861 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 35.8 m +MSD Accuracy: < 0.5 m
Driller: Daly Water Wells Ltd
Drill Method: Rotary Rig
Borelog Depth: 36.0 m Drill Date: 01-Nov-2005

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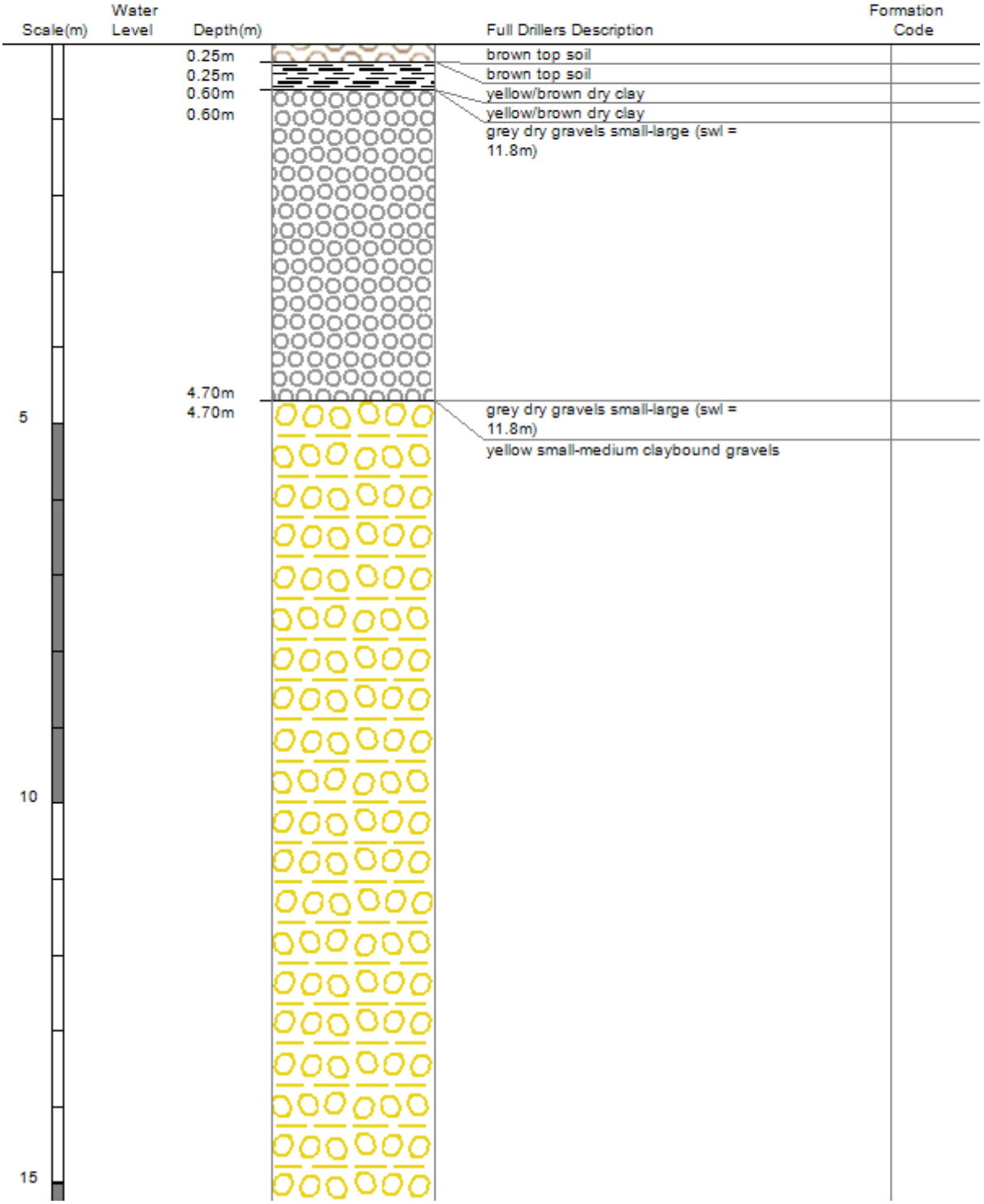

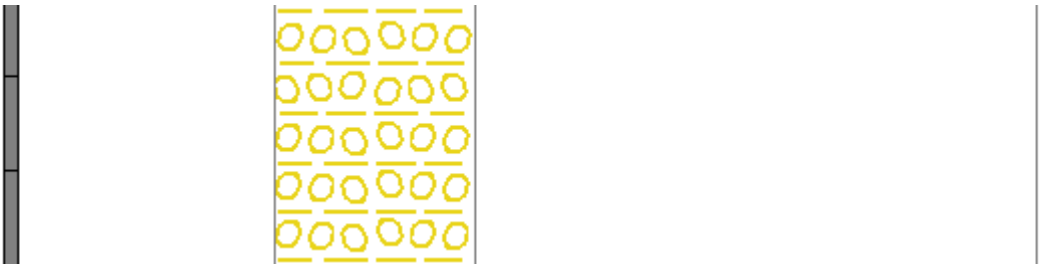

Bore or Well No	M36/8392
Well Name	572 SELWYN ROAD
Owner	A J LLOYD

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Well Number	M36/8392	**File Number**	CO6C/26653
Owner	A J LLOYD	**Well Status**	Active (exist, present)
Street/Road	572 SELWYN ROAD	**NZTM Grid Reference**	BX23:52567-70574
Locality	SPRINGSTON	**NZTM X and Y**	1552567 - 5170574
Location Description		**Location Accuracy**	2 - 15m
CWMS Zone	Selwyn - Waihora	**Use**	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	**Water Level Monitoring**	--
Depth	36.00m	**Water Level Count**	0
Diameter	150mm	**Initial Water Level**	10.00m below MP
Measuring Point Description		**Highest Water Level**	
Measuring Point Elevation	34.26m above MSL (Lyttelton 1937)	**Lowest Water Level**	
Elevation Accuracy	< 5 m	**First reading**	
Ground Level	0.00m above MP	**Last reading**	
Strata Layers	5	**Calc Min 80%**	11.83m below MP (Estimated)
Aquifer Name		**Aquifer Tests**	0
Aquifer Type		**Yield Drawdown Tests**	1
Drill Date	12 Jun 2007	**Max Tested Yield**	2 l/s
Driller	Daly Water Wells Ltd	**Drawdown at Max Tested Yield**	11 m
Drilling Method	Rotary Rig	**Specific Capacity**	0.18 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	36				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
12 Jun 2007	1	2	26.396368	11	0

Comments

Comment Date	Comment
20 Sep 2007	Gridref changed from: M36:6247-3217, BCR confirms
12 Nov 2007	Gridref changed from: M36:6255-3216. New gridref from plan in BCR
09 Jun 2009	Gridref changed from: M36:62572-32149 - Site visit 5 June 09, location GPS'd

Bore Log

Borelog for well M36/8392

Grid Reference (NZTM): 1552568 mE, 5170575 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 34.3 m +MSD Accuracy: < 0.5 m
Driller: Daly Water Wells Ltd
Drill Method: Rotary Rig
Borelog Depth: 36.0 m Drill Date: 12-Jun-2007

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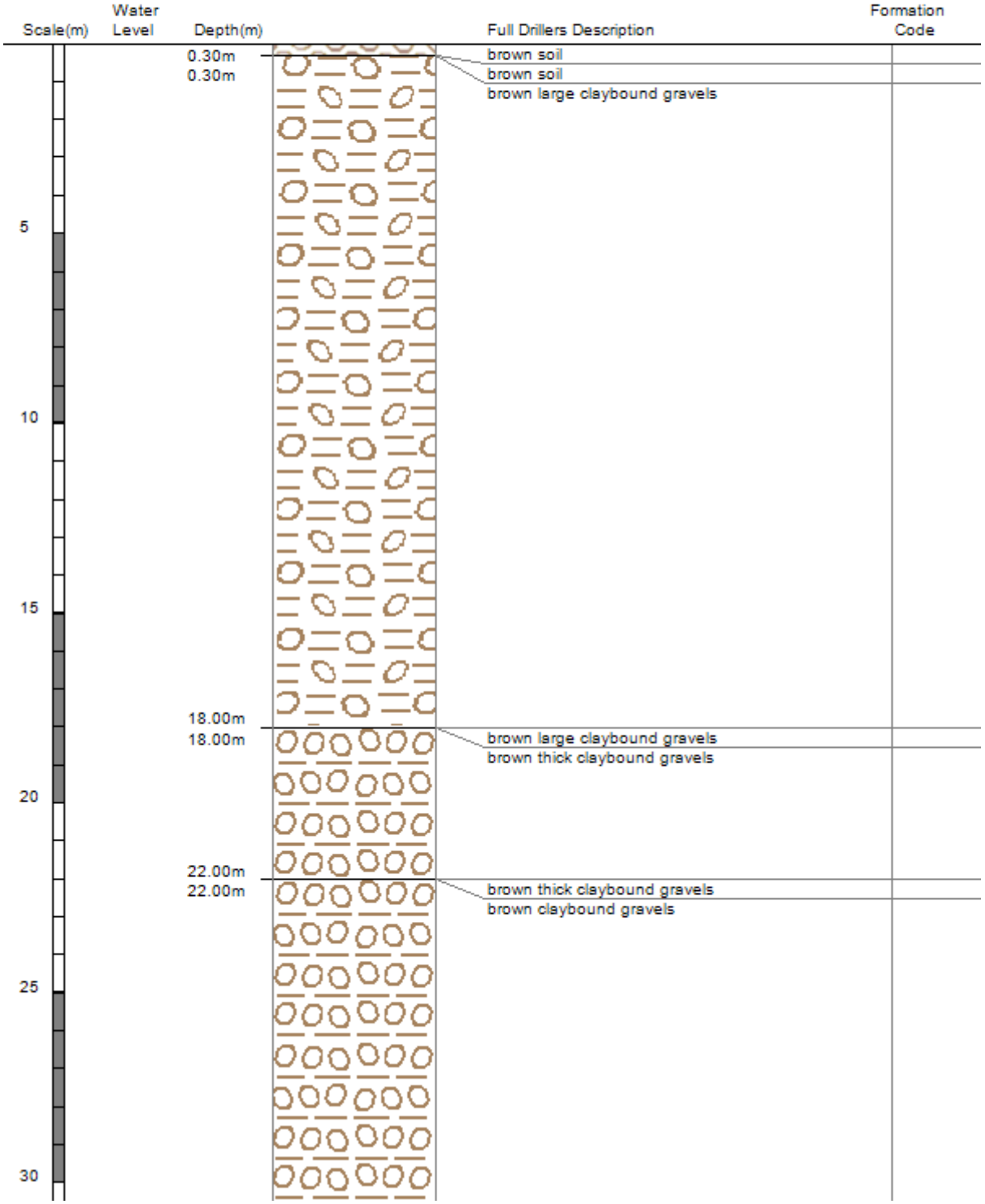

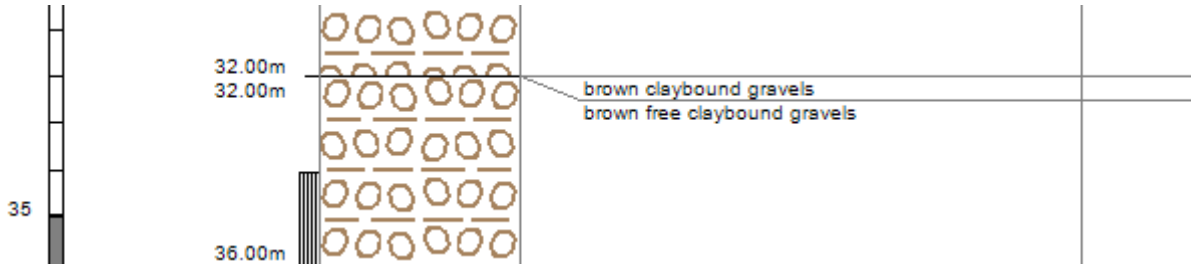
35
32.00m
32.00m
36.00m
brown claybound gravels
brown free claybound gravels

APPENDIX 5:

Statement of Professional Opinion

Statement of Professional Opinion on the Suitability of Land for Subdivision

(Appendix I to the Infrastructure Design Standard)

Issued by: *ENGEO Ltd*
(Geotechnical engineering firm or suitably qualified engineer)

To: *Broadfield Grange Limited*
(Owner/Developer)

To be supplied to: *Selwyn District Council*
(Territorial authority)

In respect of: *Residential Subdivision*
(Description of proposed infrastructure/land development)

At: *1/572 Selwyn Road (Lot 2 DP 337894)and 4/572 Selwyn Road (Lot 4 DP 337894)*
(Address)

I *(Geotechnical engineer)* *Don Bruggers* on behalf of *(Geotechnical engineering firm)* *ENGEO Ltd*

hereby confirm:

1. I am a suitably qualified and experienced geotechnical engineer and was retained by the owner/developer as the geotechnical engineer on the above proposed development.

2. My/the geotechnical assessment report, dated *16 June 2022* has been carried out in accordance with the Department of Building and Housing *Guidelines for geotechnical investigation and assessment of subdivisions* and includes:
   (i) Details of and the results of my/the site investigations.
   (ii) A liquefaction assessment.
   (iii) An assessment of rockfall and slippage, including hazards resulting from seismic activity.
   (iv) An assessment of the slope stability and ground bearing capacity confirming the location and appropriateness of building sites.
   (v) Recommendations proposing measures to avoid, remedy or mitigate any potential hazards on the land subject to the application, in accordance with the provisions of Section 106 of the Resource Management Act 1991.

3. In my professional opinion, I consider that Council is justified in granting consent incorporating the following conditions:

   As per our Geotechnical Investigation Report dated 16 June 2022 (reference: 18991.001.001_01).

4. This professional opinion is furnished to the territorial authority and the owner/developer for their purposes alone, on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any building.

5. This certificate shall be read in conjunction with my/the geotechnical report referred to in Clause 2 above, and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.

6. The geotechnical engineering firm issuing this statement holds a current policy of professional indemnity insurance of no less than $ *1,000,000*

(Minimum amount of insurance shall be commensurate with the current amounts recommended by IPENZ, ACENZ, TNZ, INGENIUM.)

.....

(Signature of Engineer)

Date: *16/06/2022*

Qualifications and experience: *CMEngNZ (CPEng)*