Infrastructure Servicing Report

Version D

eliot sinclair

486 Madras Street, Christchurch

Prepared for Woolworths NZ Limited

532253

Infrastructure Servicing Report

486 Madras Street, Christchurch

Prepared for Woolworths NZ Limited

532253

Quality Control Certificate

Eliot Sinclair & Partners Limited

eliotsinclair.co.nz

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Status:	Version D		
Release date:	21 October 2024		
Distributed to:	Woolworths NZ Limited		

Version History

Status	Description	Author	Release Date
A	Draft Issued to Woolworths	SCC	24 July 2024
B	Final Issued to Woolworths	SCC	13 September 2024
C	Boundary change to Figure 1	SCC	19 September 2024
D	Site Layout Amended	SCC	21 October 2024

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1. Introduction

Eliot Sinclair has been engaged by Woolworths NZ Ltd to prepare an Infrastructure Servicing Report to support the resource consent application for the site. The purpose of this report is to confirm the site can be serviced for the proposed commercial usage for a supermarket and other retail businesses. The land on which the supermarket is proposed to be constructed is currently unoccupied.

This report is based on the layout drawing attached in Appendix B. It is based on preliminary investigations (some of which are not yet complete) and we anticipate that, as further information comes to hand, some of the information provided in this report may need to be revised.

Detailed civil engineering design will be completed during the building consent phase.

2. Existing Site

The Site is located at 484 Madras Street, St Albans, Christchurch (refer to Figure 1 for the site location outline below). The site has previously been used as a grazing paddock for livestock and by Orion as a storage yard. The site is currently covered by long grass, trees, hardstand, and gravel areas.

The existing site drains to a depression which is generally located along the alignment of the existing DN375 stormwater pipeline through the centre of the site. Surface water ponds in this area during and after rain. Refer to Appendix A for the topographical survey plan.

Part of the site is within a Flood Management Area as shown in Figure 1.

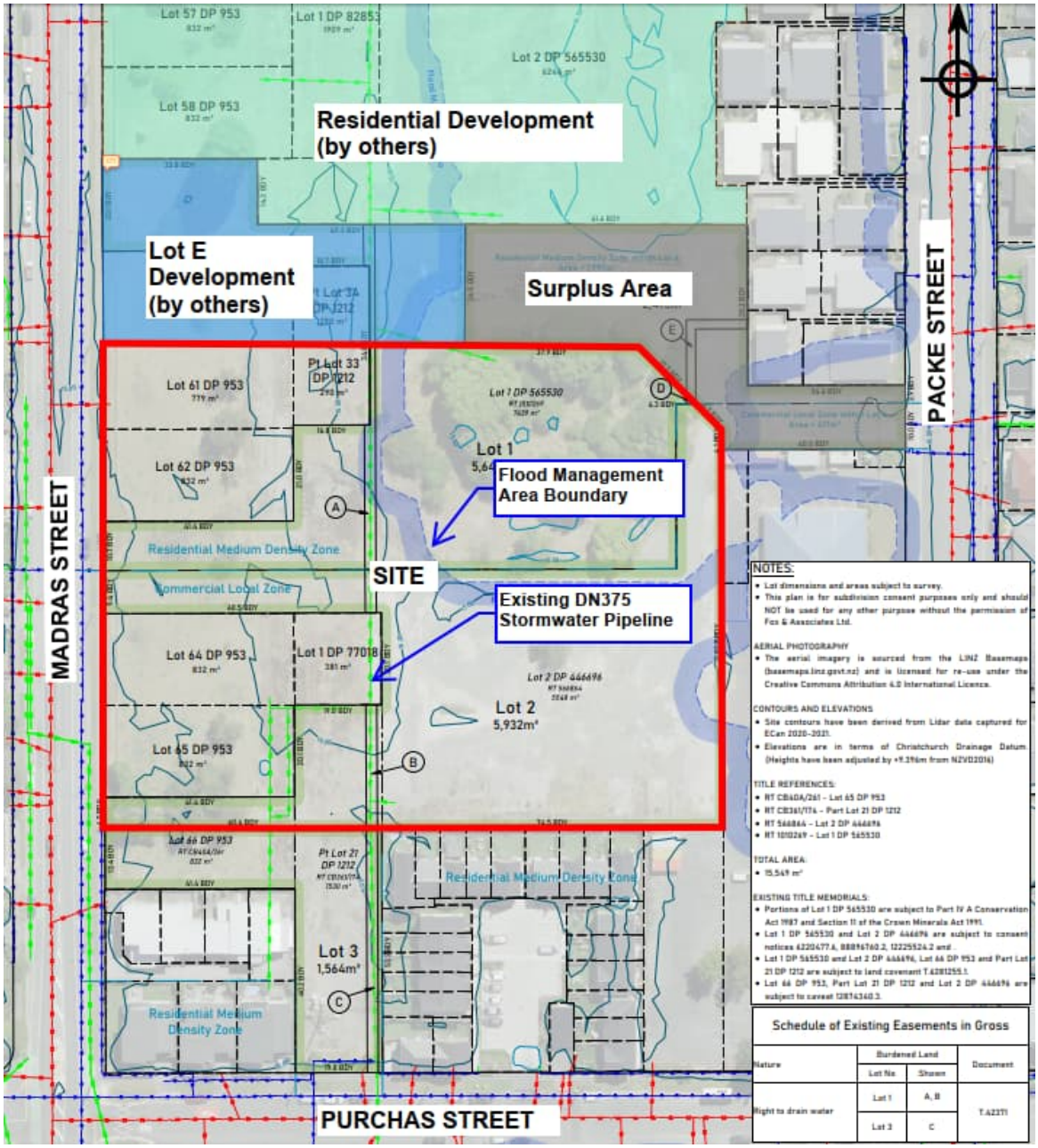


Figure 1 Aerial imagery illustrating extents of the site.

3. Proposed Development

The proposal involves subdividing the subject area into three titles:

- A commercial development is proposed for part of the site. The proposed layout for this site is shown in Appendix B.
- We understand that "Lot E" located immediately to the north will be sold and developed in the future by others. Lot E will be provided with services as part of the proposed development.
- We understand that a surplus area located immediately to the north and east will be sold back to the original owner. No servicing is being considered for this area as part of this design.

The Engeo Geotechnical Feasibility Assessment (refer to Appendix C) indicates that the underlying soils on the site comprise peat, silt and sand. Uncertified fill to varying depths (0.1m bgl to 1.1m bgl) was encountered throughout the site. Previous investigations indicate peat was encountered

between 0.15m bgl to 1.3m bgl, underlain by sand, silty sand, and sandy gravel. Groundwater was encountered as shallow as 0.1m bgl to as deep as 2.6m bgl. A groundwater level of 0.85m bgl has been adopted for the design based on the recommendations of the geotechnical feasibility assessment.

4. Water Supply

Refer to correspondence with CCC attached in Appendix H.

4.1. Existing Infrastructure

There is an existing DN100 watermain located in the Madras Street carriageway. This watermain supplies a DN50 water submain running along part of the frontage of the subject site and serving other properties along the east side of Madras Street. GPR survey indicates that there is also a submain extending along the Lot E frontage, however this may be an abandoned pipe as it is not shown on the CCC 3 waters GIS viewer.

There is an existing DN100 watermain located in the Purchas Street carriageway. This watermain supplies a DN40 water submain running along the northern Purchas Street frontage.

There is also a DN150 watermain located under the eastern side of the Packe Street carriageway. However, supplying the development from Packe Street would require an easement over neighbouring land.

4.2. Potable Water Supply

It is proposed to service the site via a new submain(s) for potable water supply. The potable connection will be separate to the firefighting supply. It is likely that this supply will be from the DN100 water main in Madras Street.

4.3. Fire Fighting Supply

The firefighting connection will be from the existing DN100 watermain on Madras Street. Eliot Sinclair has liaised with the fire engineer (Protech Design Limited) to discuss the firefighting demand for the site. Protech has confirmed that 3,200 L/min is the preferred firefighting supply rate.

A fire hydrant flow test was carried out on the 24th July 2024 (refer to hydrant test results in Appendix E). Protech have confirmed that the hydrant test results indicate that there is enough water volume to supply the firefighting demands. A pump set will be required, and the pump duty will need to take into consideration the CCC pressure management program. Please refer to the correspondence attached in Appendix D.

The firefighting supply connection will be configured with an underground valve and water meter installed within the road reserve as public infrastructure near the property boundary. A backflow preventer would be installed within the site boundary as a private asset. A typical diagram of this connection is provided below.

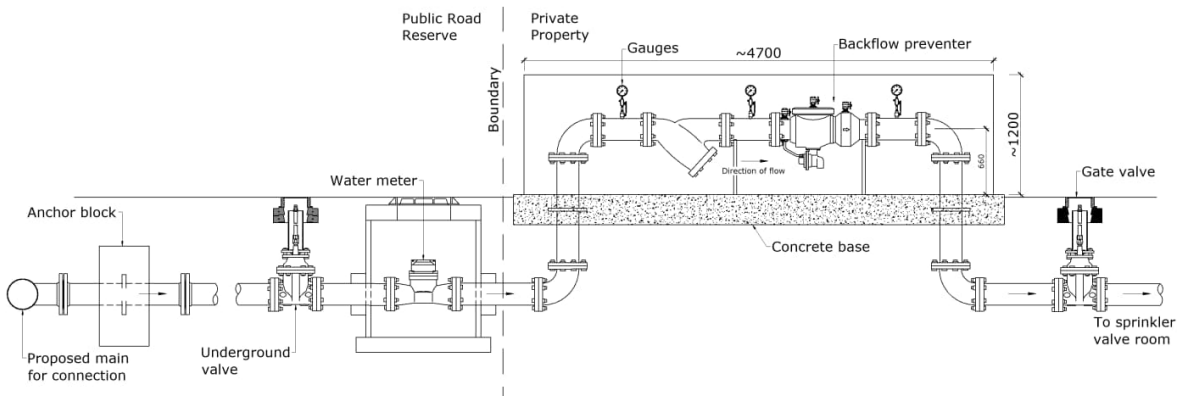


Figure 2 Firefighting water supply meter and backflow preventor

4.4. Lot E

Lot E can be serviced (potable water supply) directly from a new crossover connection from the DN100 Madras Street watermain. Alternatively, the existing DN50 submain can be extended along the subject site and Lot E frontage.

Note that GPR survey indicates that there is an existing water submain located along the Lot E frontage, however this is not shown on the CCC 3 water GIS viewer, which suggests that this pipeline may be abandoned.

5. Stormwater

Refer to correspondence with CCC attached in Appendix H.

5.1. Existing Infrastructure

There is an existing DN375 RCRR CCC owned stormwater pipeline crossing the site in a north-south direction. Within the subject site there are field sumps and private drainage networks that connect to this pipeline. This pipeline is subject to a right (in gross) to drain water in favour of the Christchurch City Council created by Transfer 42371.

There is a setback requirement under the Stormwater and Land Drainage Bylaw which in this case is 1.5m from either side of the centre of the pipe. Within the easement and within the Bylaw Maintenance Access Corridor we understand that Council expects no structures (including eaves, gravel rafts, minor landscaping structures, etc.), private services (except necessary crossings), trees, tree roots, decorative hardstand or pavers (basic asphalt or plain unreinforced concrete acceptable), etc.

We understand Council have had discussions with the developer (Mike Greer Homes) of the proposed "Residential Development" to the north of the site (as shown on Figure 1) to remove their section of this stormwater pipeline. If this occurs, there will be potential options to avoid the setback requirements in the Site as follow:

- Abandoning the existing pipeline (Lot E would require an alternative primary drainage outlet).
- Partially abandoning the existing pipeline (Lot E would require an alternative primary drainage outlet).
- Privatise the existing pipeline (Lot E would require an easement/right to drain stormwater through this pipeline).

5.2. Finished Floor Level and Compensatory Storage

Refer to correspondence from CCC attached in Appendix H.

There is no distinction made in the District Plan Flood Management Area (FMA) rules between commercial and residential FFL requirements. As the proposed buildings are within the FMA, a 400mm freeboard above the 1 in 200-year modelled flood level is required. The predicted 1 in 200-year flood model is shown in green below.



Figure 3 – 1 in 200-year modelled flood level.

The FFL requirement based on predicted 1 in 200-year flood level in area "X2" is 15.45m RL. If site reshaping and conveyance calculations remove the "X2" ponded area, Council have advised that the FFL could be set to 15.36m RL.

At this stage we propose the adoption of a minimum FFL of 15.45m, as this:

- Reduces risk of flooding to the car park and buildings.
- Provides greater primary drainage hydraulic capacity.
- Results in a greater depth to ground water table relative to finished surface levels.

Council have confirmed that there is no compensatory flood storage requirement for this site.

5.3. Primary System

We have identified two potential outfalls for primary stormwater discharge;

- Existing DN375 pipeline crossing the site in a north-south direction within the subject site and connecting to the CCC network in Purchas St.
- Existing DN375 pipeline located beneath the kerb and channel on the eastern site of Madras Street.

Primary stormwater discharge outfalls have been displayed on the Service Plan in Appendix F. Preliminary calculations indicate that the DN375 pipe between the site and Purchase St may need to be upsized to facilitate gravity drainage for primary flows from the site.

Council have requested that subsoil drainage should not be discharged directly to the road kerb and channel as this causes maintenance issues and algal formations on the road. The subsoil drains will need to be discharged to the Council's pipe network.

Disposal to the ground via soakage is not possible for this site due to the combination of high groundwater and low permeability soils.

5.4. Secondary System

The developed site will be shaped to convey stormwater runoff beyond the capacity of the primary network towards Madras Street (and potentially Purchas Street). The existing site drains to a depression which is generally located along the alignment of the existing DN375 stormwater pipeline.

Secondary flow paths will be provided along the Site perimeter to convey cross boundary flows and graded at a minimum fall of 1 in 500 to Madras Street. There may be some low points along the site perimeter which are too low to discharge to Madras Street. These areas will be reviewed at the detailed design stage.

Secondary flow paths have been displayed on the Service Plan in Appendix F.

5.5. Stormwater Treatment

In order for the stormwater runoff from the site to be covered by Christchurch City Councils global operational stormwater consent, stormwater treatment will be required for the site. As long as certain roofing materials are used, treatment of roof water runoff will not be required. Council have also requested that any subsoil drainage be passed through the proposed treatment system prior to discharge to their pipe network.

Council have confirmed that for the treatment of hardstand runoff, approved proprietary treatment devices from suppliers such as Stormwater 360 and Atlan will be acceptable. Due to the limited fall from the site to the outfalls, stormwater may need to be pumped to achieve sufficient driving head for treatment.

5.6. Stormwater Attenuation

Council have confirmed that they require stormwater attenuation to achieve stormwater neutrality (i.e. no increase from pre to post development site runoff) for the 50-year 24-hour duration event. Council have stipulated that this is to be based on the pre-development site being as per the current ground cover, even though the site was well developed previously with some large buildings. Council have stated this requirement is due to the poor drainage network in and around the site.

We have based our preliminary attenuation calculations on imagery from high resolution unmanned aerial vehicle (UAV) which indicates that the site consists of various surfaces including green pasture, asphalt, gravel, and concrete.

Stormwater attenuation will be achieved through a combination of above ground tanks to attenuate roof areas. Hardstand areas are likely to be attenuated via underground tanks or pumping to above ground tanks. Indicative attenuation volumes are shown on the Servicing Plan attached in Appendix F.

Due to the low-lying nature of the site, gravity drainage of below ground tanks may not be feasible. Therefore, pumping of runoff from car park areas may be necessary as discussed further below.

5.6.1. Pumping to attenuation tanks

Council have confirmed predicted 50-year flood levels for Purchas Street (refer to Appendix H for details). Preliminary calculations based on this information indicate that pumping treated hardstand runoff either from below ground tanks directly to the CCC network or via above ground tanks may be the only practical option.

We note that the CCC WWDG Part B Clause 13.6 states that "no new development that relies on stormwater pumping to maintain level-of-service should be permitted." We interpret this as referring to primary drainage rather than attenuation. We will clarify this with CCC during the detailed design phase.

The servicing plan shows some indicative above and below ground tank volumes based on preliminary calculations. Note that the final volume of tanks required will be subject to detailed design and verification of a number of assumptions.

5.7. Regional Consents

As the site is contaminated, construction phase stormwater discharge will require an ECan consent unless remediation is carried out.

Subsoil drainage will likely be required to ensure that the pavement layers are drained. CCC have indicated that this is likely to require an ECan consent unless the contamination level is less than three times the ANZECC guidelines for at least 90% protection.

5.8. Lot E

We expect that the Lot E stormwater primary system can be discharged to a kerb outlet on Madras Street or to the existing DN375 pipeline crossing the site in a north-south direction. We also anticipate that a secondary flow path can be provided to Madras Street. This will likely require filling within the site to raise existing ground levels above the Madras Street kerb level.

6. Wastewater

Refer to correspondence with CCC attached in Appendix H.

6.1. Existing Infrastructure

There is an existing DN225 sewer main located in Madras Street at a minimum depth of approximately 2m.

There are also DN150 and DN175 sewer mains on Purchas Street and Packe Street respectively. However, these are unlikely to provide a suitable outfall as they are located at higher invert levels and would require easements to achieve connections.

Council have confirmed that the site is not in a capacity constrained area and therefore does not require wastewater attenuation.

6.2. Commercial Development

There are three potential options for wastewater discharge as follows:

- Option 1 - Discharge to an existing DN150 sewer lateral located at #492 Madras Street (subject to confirmation of pipe depth and condition). GPR survey indicates that this lateral is approximately 800mm below existing ground level, so it is unlikely to be deep enough to re-use.
- Option 2 - Replace the existing DN150 sewer at #492 Madras Street with a new wastewater lateral connection to existing Council wastewater manhole ID#47469.
- Option 3 - Provide a new wastewater lateral with a new connection to the existing Council wastewater manhole ID#94008 (adjacent to #467 Madras Street).

Potential wastewater discharge options have been displayed on the Service Plan in Appendix F.

6.3. Lot E

The preferred wastewater discharge option is to construct a new lateral to the existing Madras Street sewer main. Alternatively, a new wastewater lateral could discharge to the subject site wastewater lateral.

7. Common Services (Power / Telecommunications / Gas)

We have received advice from Electrical Consulting Services Ltd (ECS) for the design of Enable fibre and Orion power supply for the proposed development. Refer to Appendix I for correspondence from ECS.

ECS propose the following (refer to the Service Plan in Appendix F):

- A new transformer and kiosk located in the landscaping area north of the proposed northern vehicle entrance off Madras Street.
- Extend the existing fibre network along the eastern Madras Street berm from north of the site to the proposed northern Madras Street site boundary where a pit is proposed with two breakout connections, one each for the proposed site and Lot E.
- Extend the existing fibre network along the eastern Madras Street berm from south of the site to the proposed southern Madras Street site boundary where a pit is proposed with a breakout connection to service the proposed site.

Rockgas have confirmed that there is no reticulated gas network available to service the site.

8. Earthworks and Erosion Sediment Control

An erosion, sediment, and dust management plan (ESDMP) will be prepared and implemented in accordance with best practice and the recommendations from ECan's *"Erosion & Sediment Control Toolbox for Canterbury".*

An ESDMP will provide the necessary measures required to mitigate environmental issues associated with earthworks, thereby minimising or preventing undue erosion and the risk of sediment laden stormwater discharges entering any drain or waterbody. It will also provide guidance for protecting the surrounding environment from dust emissions.

Below is a description of the likely erosion, sediment, and dust control measures to be implemented for the site earthworks. This list is an indication only and will be confirmed as part of the final ESDMP.

- A silt fence around the perimeter of the construction site.
- Stabilised site entrance/exits at site access points.

- Sediment protection around existing downstream sumps.

Key earthworks principles such as minimizing exposed areas and conducting earthworks during dryer months must also be considered during project planning and construction sequences.

9. Conclusion

The site can be serviced for wastewater, stormwater, potable water, communications, and electricity subject to preliminary and detailed design in conjunction with appropriate Council consents being obtained. On this basis the consent submission for utilizing the land for commercial use as a supermarket can be supported in respect of infrastructure and servicing capacity.

10. Disclaimer

This report has been prepared by Eliot Sinclair & Partners Limited ("Eliot Sinclair") only for the intended purpose as an Infrastructure Servicing Report.

The report is based on:

- Canterbury Maps (2022).
- CCC Services Maps (2022).
- Correspondence with CCC.
- Correspondence with Protech Design Limited
- Engeo Geotechnical Feasibility Assessment (9th December 2022)
- Eliot Sinclair Topographical Survey (July 2024)
- Woolworths Supermarket Feasibility Study Proposed Site Plan (17th July 2024)

Where data supplied by Woolworths NZ Limited or other external sources, including previous site investigation reports, have been relied upon, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Eliot Sinclair for incomplete or inaccurate data supplied by other parties.

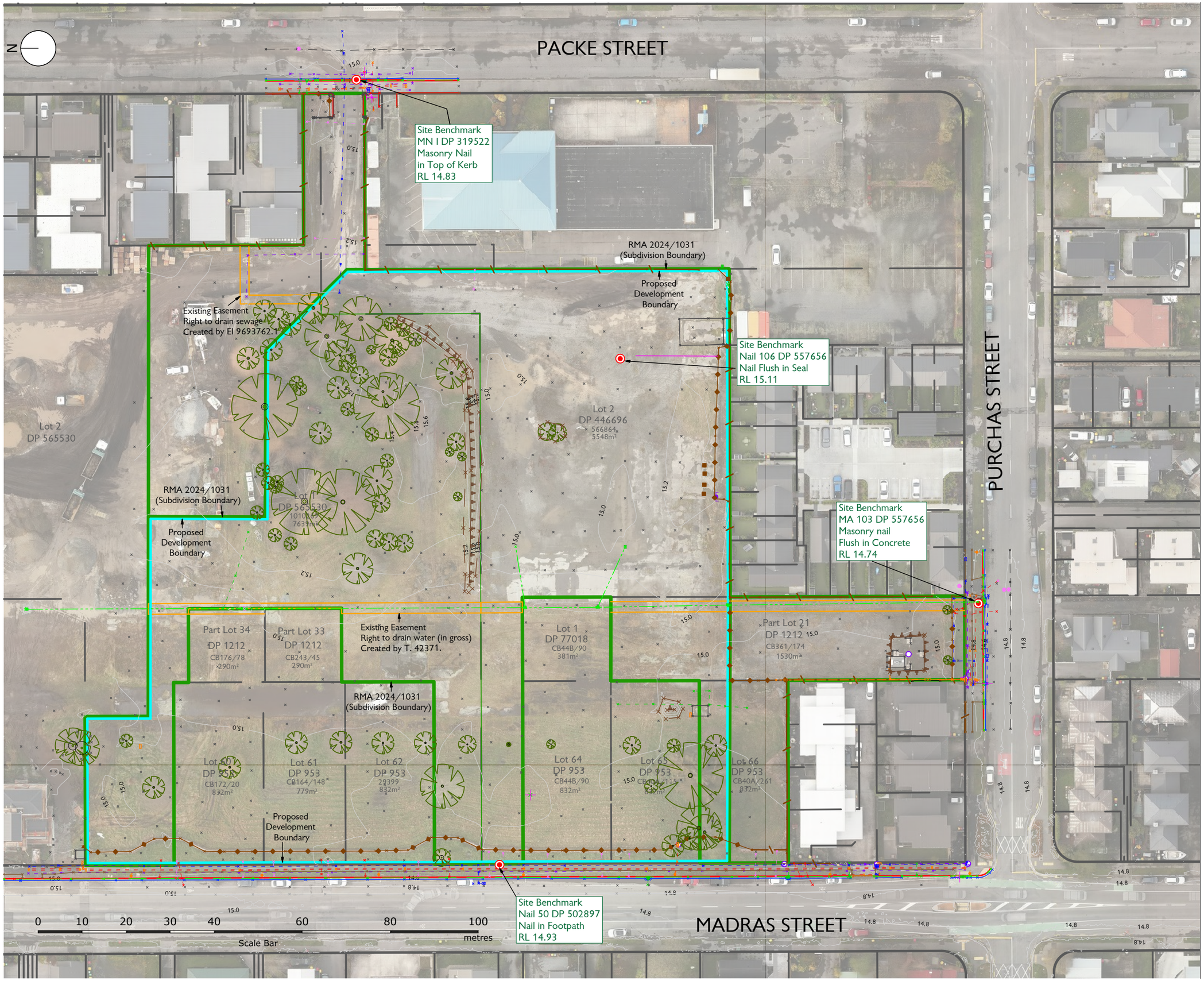
Whilst every care has been taken during our investigation and interpretation of available data to ensure that the conclusions drawn, and the opinions and recommendations expressed are correct at the time of reporting, Eliot Sinclair has not performed an assessment of all possible conditions or circumstances that may exist at the site. Eliot Sinclair does not provide any warranty, either express or implied, that all conditions will conform exactly to the assessments contained in this report.

The exposure of conditions or materials that vary from those described in this report, or occurrence of additional strong seismicity, or any update to the Building Act, NZBC or MBIE's Guidance may require a review of our recommendations. Eliot Sinclair should be contacted to confirm the validity of this report should any of these occur.

This report has been prepared for the benefit of Woolworths NZ Limited and Christchurch City Council for the purposes as stated above. No liability is accepted by Eliot Sinclair or any of their employees with respect to the use of this report, in whole or in part, for any other purpose or by any other party.

Appendix A. Topographical Survey Plan

C:\12dSynergy\data\SQL01\532253_107853\12d\SURVEY\SUR TP 00 484 Madras ST.12dmodel\$project [Tue Jul 9 16:47:01 2024] [kks]



DISCLAIMER
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SURVEY INFORMATION

SURVEYED	**G. Bourdin**
SURVEY DATE	**02.07.2024**
COORD SYSTEM	**NZGD2000**
CIRCUIT	**Mt. Pleasant 2000**
DATUM	**C.D.D**
ORIGIN OF LEVELS	**EKL9 (BM0331) 15.096m (July 2019 Network)**

NOTES

RECORD SHEET
This plan is a record sheet showing the extent and features surveyed. The accompaning CAD file includes point level annotation and the triangulated surface.

PROPERTY DATA
Boundary information has been adopted from the LINZ Digital Cadastral Database. Proposed subdivision boundaries and easements shown have been adopted from Fox & Associates Scheme Plan 2391W.06 20240320 Subdivision Plan- Rev E dated 20.03.2024. Boundaries are subject to final definition survey and have not been verified by field survey.

SPATIAL DATA
The physical data has been captured using a Trimble R12i RTK GNSS to a relative accuracy of +/- 20mm horizontally and +/- 30mm vertically in relation to site benchmarks.

Level information shown on Madras Street and Purchas Street has been obtained from a UAV surface. Estimated accuracy is ±30mm on hard pavement surfaces.

The contour interval shown is 0.20m.

UTILITY SERVICES
The position and alignment services shown on this plan have been obtained by GPR location services. All services between the kerb and road boundary were searched for within the survey area. Within the site boundaries, only the stormwater network was traced. There are a number of existing services within the site from past activties which were not traced or surveyed.

It is recommended that if accurate utility services data is required, that it be searched for on site by GPR and potholing techniques in conjunction with the as-built utility services records of the relevant authority.

Prior to construction activities being undertaken, it is recommended the site should be fully searched by GPR and all services found be confirmed redundant/safe.

CCC GIS 3waters information is contained within the digital file.

PROPERTY TITLE
The underlying title(s) includes easements, covenants and consent notices. A full review of these instruments should be undertaken prior to detailed design and construction.

AERIAL PHOTOGRAPHY
The UAV aerial imagery was flown on 26 June 2024.

REV.	DRAWN	DATE	NOTE
A	**GNOB**	**02.07.2024**	**For Information**

CLIENT
Woolworths NZ Limited

DESIGNED	
DRAWN	**GNOB**
REVIEWED	**KKS**
APPROVED	**05.07.2024 KKS**
STATUS	**For Information**
SCALE	**1:800 [A3]**

Topographic Survey

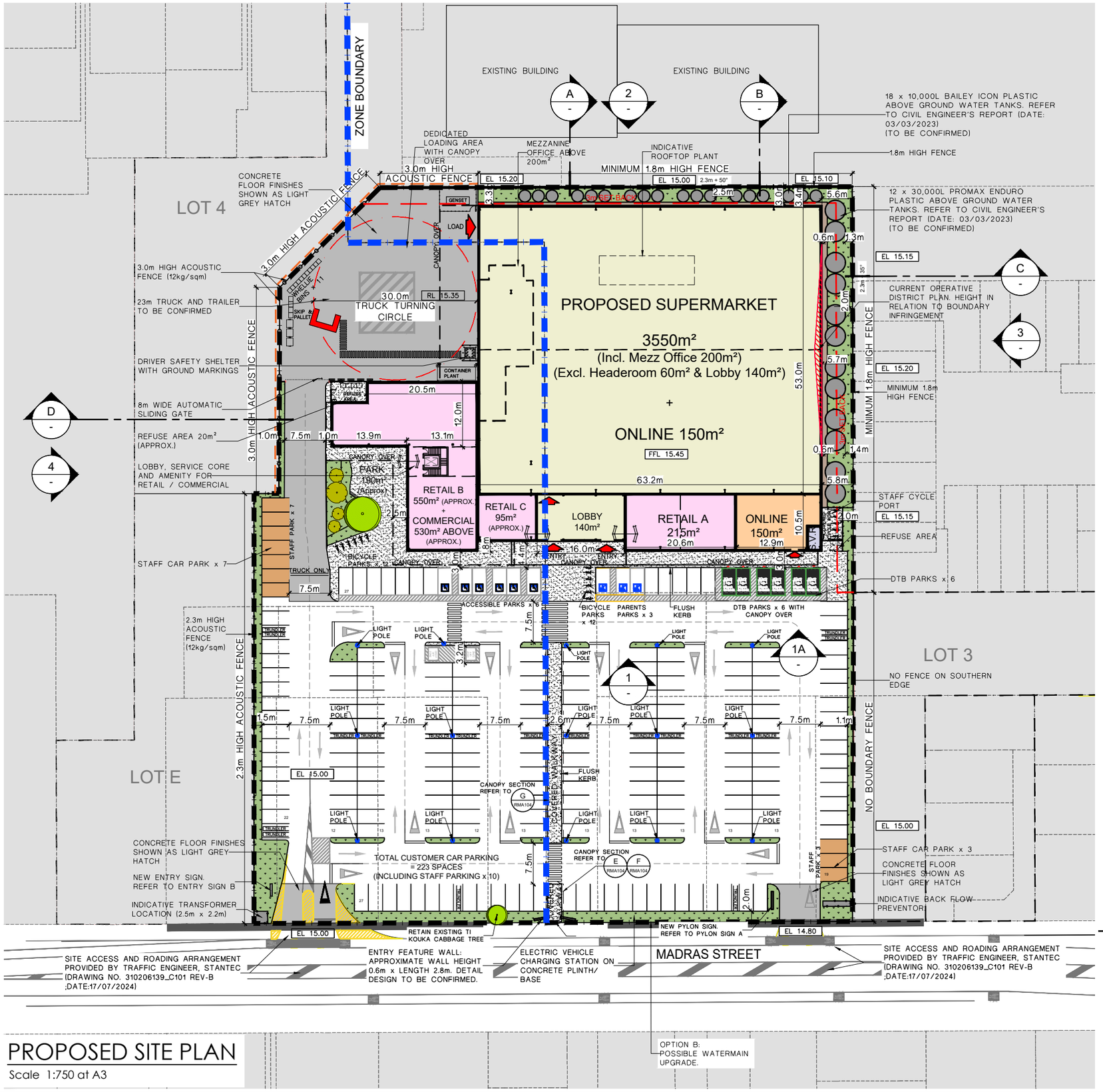
484 Madras Street
Edgeware, Christchurch

Site Survey

PROJECT	SET	SHEET	REV.
532253	**V1**	**V100**	**A**

eliot sinclair

Appendix B. Proposed Site Layout



PROPOSED SITE PLAN

Scale 1:750 at A3

DEVELOPMENT SUMMARY:

1. SUPERMARKET DEVELOPMENT SITE AREA = 14430m² (APPROX.)
2. SUPERMARKET AREA = 3550m² (1:20) (Incl. Mezz Office 200m²)
3. LOBBY = 140m² (APPROX.)
4. HEADEROOM = 60m² (APPROX.)
5. ONLINE = 150m² (1:50)
6. RETAIL A + B + C = 860m² (1:30) (INCL. CORE + AMENITY = 70m²)
7. COMMERCIAL (ABOVE RETAIL B) = 530m² (1:30)
8. S.V.R.= 13m² (APPROX.)
9. TOTAL BUILD GFA = 5303m² (APPROX.)

PARKING SUMMARY:

1. TOTAL CAR PARKING = 223 SPACES
   CONSISTS OF :

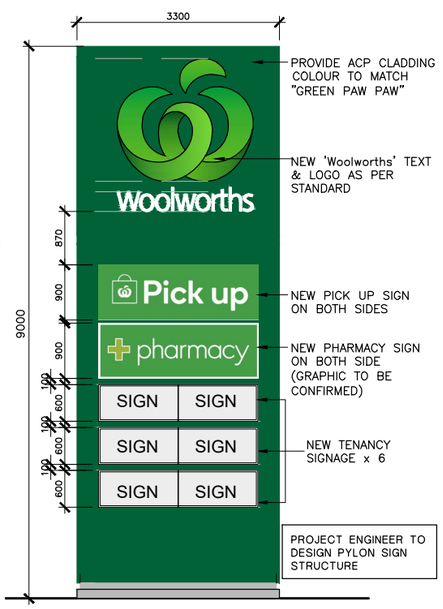
STANDARD PARK	=	197 SPACES
ACCESSIBLE PARK	=	6 SPACES
PARENTS PARK	=	3 SPACES
STAFF PARK	=	10 SPACES
DTB PARK	=	6 SPACES
DROP OFF PARK	=	1 SPACE

2. TOTAL CYCLE PARK = 34 SPACES
   CONSISTS OF :

SUPERMARKET VISITOR CYCLE = 12 SPACES
(SUPERMARKET FRONT ENTANCE)

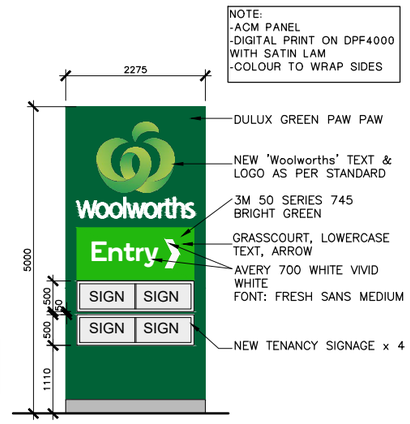
RETAIL VISITOR CYCLE = 12 SPACES
(NEXT TO THE PARK)

SUPERMARKET STAFF CYCLE = 10 SPACES
(NEXT TO S.V.R.)



PROPOSED PYLON SIGN A

Scale 1:100 at A3



PROPOSED ENTRY SIGN B

Scale 1:100 at A3

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Woolworths

PROPOSED WOOLWORTHS SUPERMARKET RMA

Woolworths Madras Street, Christchurch, New Zealand

SCALE: AS SHOWN
DATE: 13 September 2024
JOB NO: 2028-15
DWG NO: RMA-101

WOODHAMS MEIKLE ZHAN ARCHITECTS

Appendix C. Engeo Geotechnical Feasibility Assessment (9th December 2022)



ENGEO Limited
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T: +64 3 328 9012
www.engeo.co.nz

Project Number 21170.000.001

Geotechnical Feasibility Assessment

Corner of Madras and Purchas Street,
St Albans, Christchurch

Submitted to:
Woolworths New Zealand Limited
80 Favona Road
Mangere
Auckland 2024

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Appendices

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Appendix 2: Investigation Logs
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ENGEO Document Control:

Report Title	Geotechnical Feasibility Assessment - Corner of Madras and Purchas Street, St Albans, Christchurch			
Project No.	21170.000.001	**Doc ID**	03	
Client	Woolworths New Zealand Limited	**Client Contact**	Peter Buchan	
Distribution (PDF)	Peter Buchan			
Date	**Revision Details / Status**	**Author**	**Reviewer**	**WP**
05/12/2022	Issued to Client	DK / RC	MB	BK
09/12/2022	Issued to Client	DK	MB	JT

Executive Summary

Based on our review of previously completed investigations and analysis, the site is considered generally suitable for the proposed development provided the recommendations in this report are addressed. We have summarised the key findings of the report below:

Item	Recommendation	Report Section
Key geotechnical hazards	Shallow groundwater, extensive uncertified fill and organic deposits, liquefiable soils.	5
Groundwater	Groundwater level of 0.85 m may be assumed for the site.	4
Uncertified fill	Uncertified fill is found across the site to a maximum thickness of 1.1 m.	
Organic deposits	Deposits consisting of organic silt and peat are found across the site ranging from 0.8 to 2.6 m thick.	
Liquefaction	Liquefaction occurred on the site during the Canterbury Earthquake Sequence. Minor amounts were recorded in September 2010 and June 2011 with minor to moderate ejecta recorded in February 2011. Liquefaction analysis predicts up to 50 mm settlement at SLS and 80 mm at ULS seismic events.	5.4
Recommended supermarket foundation option	Driven, CFA or screw piles embedded within the gravel layer at approx. 6.5 m depth. May need to be lengthened depending on building uplift load demands.	6.1
Recommended Residential foundation option	Same foundation solutions as the supermarket foundation option above, albeit likely to be smaller diameter piles due to smaller load demands.	6.2

The above is not intended to exhaustively characterise relevant geotechnical features at this site. Accordingly, this report must be read and understood in full.

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1 Introduction

ENGEO Ltd was requested by Woolworths New Zealand Limited to undertake a geotechnical feasibility assessment of the property at the Corner of Madras and Purchas Street, St Albans, Christchurch (herein referred to as 'the site'). The purpose of the assessment was to complete a geotechnical feasibility study of the proposed development to support preliminary costing by the client.

Our scope of works was as follows:

- Review relevant geotechnical data available for the site, including previous reports by Geotech Consulting Ltd (GCL), Kirk Roberts Consulting Ltd (KR), and Tonkin + Taylor Ltd (T&T).
- Update the liquefaction analysis in line with current MBIE Guidance.
- Assess potential foundation options for the proposed structure with the purpose of providing sufficient information for WWNZ to complete preliminary costing of the development.

This work has been carried out in accordance with our agreement by email (received 21 October 2022). Our scope of works does not include detailed design of foundations to a level suitable for building consent.

2 Site Description and Proposed Development

The site comprises the entirety of 476, 480, 486 Madras Street, 81 Packe Street and parts of 484, 492 Madras Street and 109 Purchas Street. The site has a total area of approximately 1.3 ha and is currently zoned as partially commercial and partially residential medium density (CCC, 2022). The nearest waterways are the Avon River approximately 650 m southeast and St Albans / Dudley Creek 1 km northeast.

We understand that the site is proposed to be developed with a new supermarket and attached office space in the east of the site, with the remainder to be paved carparking areas. Access to the site is proposed through Madras Street.

3 Desktop Study

3.1 Regional Geology

The site has been regionally mapped by GNS (Brown & Weeber, 1992) to be underlain by peat swamps of the Springston Formation, now drained, and by Forsyth et al. (2008) as peat, silt and sand in existing or drained swamps.

3.2 Natural Hazards

3.2.1 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 approximately 6 km north of the recently discovered Port Hills Fault, the ruptures of which initiated the Canterbury Earthquake Sequence (CES). This 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).

3.2.2 Canterbury Earthquake Sequence

Ground Shaking

Bradley and Hughes (2012) have developed a contour map of the conditional median peak ground accelerations (PGA) interpolated from data measured at various recording stations during the 2010-2011 Canterbury Earthquake Sequence (CES). Based on the model by Bradley and Hughes (2012), and earthquake magnitude scaling to M7.5, we can conclude that the site was tested in excess of SLS during the February 2011 event (PGA M7.5 approximately 0.3g, or 85% of ULS) and approximately at SLS levels of shaking during the September 2010 and June 2011 events (0.13g and 0.1g, respectively).

Liquefaction and Lateral Spreading

We have reviewed aerial photography taken following each major event in the CES and mapped ground cracking recorded following the February 2011 event.

- September 2010: minor quantity of liquefaction ejecta visible on site and in the surrounding area.
- February 2011: moderate quantities of liquefaction ejecta visible on site and in the surrounding area. Appears more significant towards the north and southwest of the site. Several ground cracks up to 50 mm in width recorded running parallel along Madras Street and Canon Street to the north of the site. Several unclassified cracks are recorded running parallel along Packe Street to the southwest of the site. Consider that these cracks are likely to be as a result of ground settlement beneath the pavement rather than lateral spreading, due to the lack of free faces in the vicinity of the site.
- June 2011: minor quantities of liquefaction ejecta visible on site and in surrounding area.

Residential parts of the site (western, southern and eastern edges) have been mapped as Technical Category 3 (TC3), where “moderate to significant land damage from liquefaction is possible in future large earthquake” (MBIE, 2012).

3.2.3 Flooding

The western and southern areas of the site are mapped within the Christchurch City Council (CCC) Flood Management Area in the Christchurch District Plan (CCC, 2020).

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3.3 Historical Aerial Photography Review

We have reviewed aerial photography dating back to 1940 with the aim of identifying changes in geomorphology and land use over time.

- 1940 to 1944 aerial photo: residential dwellings occupy majority of the site; central portion to the north of the site is unused grassland.
- 1960 to 1964 aerial photo: a large warehouse structure and storage yard has been constructed in the previous grass area to the north of the site. We understand that this was a workshop owned by Orion.
- 1980 to 1984: throughout the 1970s the residential dwellings that run along Madras, Packe and Purchas Streets are removed. These streets are clear of residential dwellings by the time this photograph was taken. The Orion workshop has expanded towards the south. Much of the site area is now paved.
- 2004 to 2010: Orion appear to have vacated the site by the early 2000s, leaving most of the area paved.

The latest imagery suggests medium density residential housing has been constructed south of the site along Purchas Street, and to the east of the site along Packe Street.

3.4 Third Part Investigation Data

We provide a summary of investigation data available near the site below. It should be noted that some of the following reports were targeting the wider city block encompassed by Madras, Canon, Packe and Purchas Streets, an area larger than the focus of this report. Locations of relevant tests are provided in Appendix 1.

Packe / Madras Development – Initial Site Investigation Results (Geotech Consulting Ltd, 2002)

- An initial site investigation was carried out by GCL in April 2002.
- GCL met with an Orion representative (Orion operated the substation / workshops previously located in the centre of the site) who indicated that the buildings immediately south of the proposed development area were previously founded on piles driven to 4 m depth (no map is provided so it is unclear which buildings are referred to here).
- Seven hand auger boreholes (HA01 – 07) with associated Scala penetrometer tests were drilled along the eastern and western edges of the city block in April 2002. Three hand augers (HA03, 06, 07) were completed in the vicinity of the site. Hand augers are limited to the edges of the site as large areas of the site are currently paved with asphalt or filled with hardfill. These hand augers encounter:
    - Silty fill to 0.6 – 0.8 m depth.
    - Fibrous peat to 1.7 – 2.0 m depth.
    - Silty sand and sand to 2.6 – 2.9 m depth.
    - Refusal on inferred gravels at the base of the sand layer.
    - Groundwater table noted between 0.6 – 0.8 m depth during drilling.

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- Scala testing appears to have only been carried out within the organic layer, where blow counts of 1 – 2 blows/100 mm are typical. GCL state that the fill and peat layers are 'soft', the sand layer 'medium dense', and the gravel layer is medium dense to very dense. It is unclear how these strengths have been characterised.

- GCL recommends that the site is unsuitable for typical shallow foundations due to the thick deposits of uncertified fill and organics, and that piles should be considered for future developments. GCL recommends that further testing is carried out consisting of machine boreholes to investigate the depth and thickness of the gravel layer across the site.

Preliminary Geotechnical Site Assessment of Ex-Orion Site, Madras St (Tonkin & Taylor, 2011)

- T&T completed a preliminary geotechnical assessment of the site with the purpose of providing a Statement of Professional Opinion as to the suitability of the land for building construction to support an application for boundary changes.

- T&T reference site walkovers completed by GCL following the February 2011 and June 2011 earthquakes. GCL observed 'some' sand boils and 'rare' cracking and surface manifestation of liquefaction at the site as being minor to mild. T&T completed a site walkover in July 2011 and noted 'small to moderate' sand boils in a number of locations across the site with very minor ground cracking (up to 15 mm width). T&T consider that their observations are consistent with GCL's earlier walkover and published aerial photography.

- Six test pits (TP01 - 06) were completed across the wider city block in July 2011 using a 12-tonne excavator. Four of these (TP03 – 06) are in the vicinity of the proposed development area. The strata encountered by the test pits were generally consistent to the GCL hand augers but with variability in the thickness of the layers. The maximum depth of sand encountered was 5 m in TP05.

- T&T concluded that further deep testing confirming the strength and thickness of the gravel layer would be required to inform choice of an appropriate foundation solution.

Corner of Madras and Canon Street – Geotechnical Report (Kirk Roberts Consulting Engineers Ltd, 2012)

- KR completed a geotechnical investigation of the site in 2012 as part of a supermarket development.

- Nine dual tube boreholes (DT01 - 09) were drilled in October 2011 to depths ranging from 9.0 to 10.5 m bgl with standard penetration tests (SPT) completed at 1.5 m intervals. Five of these (DT01 – 05) were completed within the area of concern of this report. Boreholes were terminated due to "increased cobble size which made retrieval of same and penetration of the SPT cone very difficult." The strata encountered was broadly the same as in previous investigations. The boreholes indicate the gravel layer extends to at least 10.5 m depth.

- KR completed an SPT based liquefaction assessment which indicated negligible settlements at SLS levels of shaking, and up to 60 mm at ULS shaking.

- KR recommend the foundation system for the proposed development consist of deep piles. Recommended screw or driven piles likely to be faster and more economical than bored.

Madras Street Subdivision – Geotechnical Report (Geotech Consulting Ltd, 2020)

- This report was written to support a proposed subdivision of the site to facilitate the development of commercial and aged care residential facilities. No new testing was completed.
- Specific hazards relevant to the site noted as part of the Section 106 RMA natural hazard assessment include subsidence and flooding (inundation).

New Zealand Geotechnical Database

- We have accessed an additional five boreholes through the NZGD. Two of these (BH_50589 & 57805) are located to the south of the site, one (BH_185863) to the north, one (BH_9978) to the east, and one to the west (BH_75599).
- The strata encountered in the first four boreholes are generally consistent with the site-specific testing. Boreholes to the south of the site log interbedded medium dense layers of sand within the gravel layer. These boreholes extend to between 10 – 20 m bgl and indicate that the base of the gravel layer varies from 9 m (north of the site) to 12 m (east and south of the site). Underlying the gravel layer is medium dense to dense sand. The borehole to the west of the site encounters sand with interbedded layers of gravel.

4 Engineering Geological Model

ENGEO has summarised the investigation data gathered by previous consultants on the site into a geological ground model presented in Table 1. Geological units are discussed in more detail below.

Table 1: Generalised Geological Profile

Unit	Typical material description	Typical depth to top of layer (m bgl)	Typical layer thickness range (m)	SPT N_{60} range	Typical SPT N_{60}
1	Uncertified fill / topsoil	0	0.1 – 1.1	Not assessed	N/A
2	Peat / organic silt	0.15 – 1.3	0.8 – 2.6	1 – 9	1
3	Sand / silty sand	1.7 – 2.7	0.2 – 3.3	7 – 13	10
4	Sandy gravel	1.15 – 10+	7+	14 – 50+	30

Uncertified Fill

Uncertified fill to varying depths was encountered in nearly every investigation within the site. It is variable in both its composition and thickness. Fill within the building platform was logged as gravelly silty sand with rubbish and rootlets; within the rubbish was a mix of ash, glass, brick, metal, plastic and concrete. Fill outside the building platform was indicated to have a lower gravel content and was logged as a silt / sand with minor gravel and rubbish.

Peat / Organic Silt

This layer is logged by the GCL hand augers and KR boreholes (the borehole logs appear to have been written by the drillers), as dark brown fibrous peat. T&T comment in their report that they believe it is more accurately characterised in some locations (TP03 & 05) as soft organic sandy silt with lenses of spongy compressible peat lenses, preserved wood, and silty sand. In TP04 it is described as PEAT with organic sandy silt lenses and minor roots. Organic deposits appear to be thickest towards the east of the building footprint.

Sand

Typically logged as fine or fine to medium sand with silt quantity ranging from trace to silty. T&T test pits log trace organics within this layer. One borehole was logged as silt. Thickest sand deposits are located towards the west of the site (where peat deposits are thinner). The sand is logged as medium packed by T&T; SPT tests indicate that it is loose to medium dense.

Sandy Gravel

Logged as sandy gravels in the site testing with traces of wood and cobbles. SPT N counts indicate the layer is typically characterised as medium dense to dense. The boreholes terminate at 10.5 m depth. The NZGD boreholes (east & south) indicate that this gravel layer extends to at least 12 m depth towards the south and east of the site and approximately 9 m north of the site. NZGD boreholes indicate that there may be interbedded sand layers within the gravel, these are not noted on the site-specific boreholes.

Groundwater

Groundwater level varies across the site and has been logged as shallow as 0.1 m bgl (DT05) and as deep as 2.6 m bgl (TP04). The borehole and hand augers typically logged the groundwater level at the interface between fill and peat (0.1 to 1.3). The borehole drilling method includes the addition of water to the ground, which may have artificially raised the local water table at the time of drilling. Test pits by T&T log ‘seepage’ beginning at the fill / peat interface and ‘flow’ at sand / gravel interface.

A groundwater level of 0.85 m has been adopted for analysis.

5 Geotechnical Analysis

5.1 Introduction

We consider the following geotechnical aspects are required to be assessed to evaluate the safe and economic development of the site:

- Static consolidation settlement of the organic deposits found across the site.
- Seismic liquefaction induced settlement of the sand layer underlying the organics.
- Competency of uncertified variable fills across the site.

Each of these aspects is discussed in the following sections. We also consider that risk from flooding should be considered as part of the development, as part of the site area lies within the CCC flood management area.

5.2 Geotechnical Material Properties

The following geotechnical parameters have been adopted in our analyses:

Table 2: Assumed Geotechnical Parameters

Geological Unit	Unit Weight, γ (kN/m^3)	Friction Angle, ϕ' (°)	Cohesion, c (kPa)
4 – Sandy gravel	20	35	0

Material properties based of correlations presented in Bowles (1997) and Look (2007).

5.3 Seismic Hazards

Potential seismic hazards resulting from nearby moderate to major earthquakes can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking, ground lurching, regional subsidence or uplift, soil liquefaction, lateral spreading, and landslides.

The following sections present a discussion of seismic hazards as they apply to the site.

5.3.1 Site Soil Class

A site soil classification of 'Class D – Deep or Soft Soil Site' as per NZS 1170.5:2004 is considered to be appropriate for the site based on soil strength materials to the base of the investigations and our understanding of the geological setting.

5.3.2 Ground Rupture

As cited in Section 3.2.1, the site is located at least 6 km from the nearest known active fault. At this distance, fault related ground rupture and ground lurching are considered unlikely.

5.3.3 Ground Shaking

Ground shaking and subsequent effects on structures, infrastructure and engineering systems can be extensive and affect large areas. The intensity, frequency and duration of ground shaking drives the effect of earthquake loading on structures, while the severity of ground shaking drives the level of ground deformation. In geotechnical assessments, amplitude, frequency and duration of shaking are the main factors considered.

ENGEO has assumed the potential site development is classed as Importance Level 2 (IL2) structures. Peak horizontal ground accelerations (a_{max}) for use in geotechnical assessments are provided in Table 3. A_{max} values have been taken from the recommended values provided in Table A1 - Appendix A of MBIE/NZGS Module 1 for the Canterbury Earthquake Region.

Table 3: Peak Horizontal Ground Acceleration

Design Case	Return Period	a_{max}	Magnitude	Seismic Performance Expectations
SLS1	25 years	0.13 g	7.5	Under SLS seismic loading the expectation is that deflections do not result in damage causing loss of function of the structure and that damage is readily repairable.
SLS2[1]		0.19 g	6.0	
ULS	500 years	0.35 g	7.5	Under ULS seismic loading the structure should be able to accommodate the potential deformations without structural collapse and protect the safety of the occupants.

[1]MBIE recommends analysing a second SLS case when using the Boulanger & Idriss, 2014, method for assessing liquefaction triggering.

5.4 Liquefaction Assessment

5.4.1 Assessment Input Parameters

We have assessed the likelihood of liquefaction triggering and post-liquefaction induced vertical settlement occurring at the site using the SPT data from the four boreholes within the proposed building platform (DT01 – 04) and following the methodology outlined by Boulanger and Idriss (2014) and Zhang et al. (2002). This assessment has been completed in general accordance with MBIE Guidance Module 3. The main input parameters used in our assessment included the following:

- Ground motion parameters included in Table 3.
- A probability of liquefaction triggering curve (P_L) of 16% (deterministic curve).
- We have considered the groundwater level of 0.85 m as discussed in Section 4.

Several of the boreholes (DT01, DT02) do not have SPT tests completed within the potentially liquefiable sand layer. We have assumed an uncorrected SPT N count of 9 for this layer, based on the average recorded in the other boreholes.

5.4.2 Liquefaction Analysis Results

Results of the liquefaction assessment are summarised below; the liquefaction analysis results are presented as attachments to this report in Appendix 3.

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Table 4: Liquefaction Analysis Results

Design Case	Calculated Free-Field Settlements[2]	Liquefaction Severity Number (LSN) Performance
SLS[1]	0 mm (DT02), 10 – 50 mm (DT01, 03, 04)	Little to minor expression of liquefaction (LSN 0 – 12)
ULS	10 mm (DT02), 60 – 80 mm (DT01, 03, 04)	Minor to moderate expression of liquefaction (LSN 12 – 23) (DT01, 03, 04), Little to no expression of liquefaction (LSN 4) (DT02)

[1]Only the second SLS scenario has been described (M6.0, PGA 0.19g) as these results predict more severe liquefaction.

[2]For an undeveloped site, settlements beneath buildings may be greater.

The liquefaction analysis indicates that the overlying fill and organic silt / peat deposits are too cohesive to liquefy (these soil types are not typically susceptible to liquefaction). The underlying sand and silty sand deposits are susceptible to liquefaction at both SLS and ULS levels of shaking. The calculated settlements are largely a result of liquefaction triggering within the sand layer. In DT02 this is logged as a 0.2 m thick layer of silt and therefore to cohesive for liquefaction to trigger, hence the large ranges in calculated settlements. The adjacent TP04 logs the same layer as sand with minor silt.

Analysis indicates that patches of the gravel deposits have low enough SPT N counts for liquefaction to trigger at ULS. In sandy gravels the likelihood of liquefaction triggering at the levels of shaking is generally low, it is possible that the lower SPT N counts (e.g. N = 10 at 4.5 m in DT01) may be a result of a lens of high sand content within the gravel layer. The boreholes to the south of the site indicate that this may be the case.

In general, the analysis appears to be generally consistent with the observations following the CES.

5.5 Lateral Spread

Given the site is situated approximately 700 m from the nearest significant waterway, and lack of lateral spread induced ground cracking recorded during the Canterbury Earthquakes, we consider the risk of lateral spread affecting the development to be low.

5.6 Flooding

We have noted that parts of the site are located within the CCC Flood Management Area. This risk of surface flooding to the development is outside of our area of expertise and should be assessed by a Civil Engineer.

6 Recommendations

6.1 Foundations

Based on our understanding and analysis of potential geo-hazards posing risk to the site, we have discussed potential foundation options for the supermarket building in Table 5.

Table 5: Supermarket Foundation Options

Foundation Options	Pros	Cons	Comments
Shallow foundations	-	-	Unsuitable for this site due to presence of uncertified fill, organics and potentially liquefiable sands. Combination of these factors will result in significant total and differential settlements for buildings utilising shallow foundations.
Geogrid reinforced gravel raft (excavate and replace)	Provides a uniform bearing surface for the structure. Will reduce potential for differential settlements by allowing the raft to 'tilt' as a unit. Relatively affordable (unless extensive dewatering is required) and can be completed by any competent earthworks Contractor.	Structure is likely to undergo significant static settlements due to presence of organic materials, and seismic settlements due to liquefaction triggering. Shallow water table likely to result in a requirement for dewatering.	Approximately 0.8 – 1.2 m founding depth. Amount of static and seismic settlements are likely to be unsuitable for the structure.
Surcharge site	Mitigates static settlement of organics increasing the viability of a geogrid reinforced gravel raft 0.6 – 0.8 m thick + shallow foundations.	Very long timeframes (6 – 24 months depending on weight of surcharge). May require several metres of material to be placed across site. Requires significant amount of material to be imported and removed upon completion. Does not mitigate liquefaction induced seismic settlement. The settlement potential of the organic layer is currently poorly understood. Will require additional boreholes / lab testing to be completed. May affect existing neighbouring structures. May still require dewatering to construct gravel raft following surcharging.	-

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Foundation Options	Pros	Cons	Comments
Stone columns ground improvement	No dewatering requirement. Densification of soil mitigates potential for liquefaction triggering and subsequent settlements. Stone columns able to transfer loads through organic soils.	Lack of confinement within the organic layer. Columns will therefore have to be very closely spaced and likely require grouting. Complex quality assurance requirements. Voids in stone columns may become infilled with fines during seismic events, thus reducing their effectiveness at mitigating liquefaction in repeat events.	Stone columns typically unsuitable in silty or organic deposits due to the confinement issue noted. Close spacing of columns required likely results in this option being uneconomic. Stone columns would extend to the gravel layer at approx. 3 – 5 m depth.
Deep piles	Robust solution which mitigates static settlement due to organic deposits and seismic settlement due to liquefiable deposits. Unreinforced grout columns could be used for areas of compression only loading (i.e. beneath floor slab). Quick to install, relative to the other options and minimal earthworks required. History of piling on the site suggests it is feasible. No dewatering.	Potentially expensive for a large floor area. May face difficulties with procurement for large number of piles. May induce vibrations and settlement in neighbouring structures (depending on installation method).	Typical options for piling include bored, continuous flight augered piles (CFA) driven and screw piles. Bored piles would likely require casing in these ground conditions and are therefore likely to be more expensive and time consuming than the other options. CFA, driven and screw piles are considered geotechnically suitable for the site. Pile founding depth requires embedded of at least three times the pile diameter within the gravel layer. Pile founding depth approx. 5 – 6.5 m. If significant uplift loading on the structure, then deeper embedment depths may be required.

In our opinion, piling to the underlying gravel layer at 3 – 5 m depth is the most suitable option to support proposed structure. Either driven, CFA or screw piles are likely to be the most appropriate for the site conditions. Selection of which will depend on availability, price, and loading requirements.

6.2 Comment on Residential Foundation Options

We understand through discussions with the client that you wish to understand potential foundation options for residential development on the land immediately north of the site (currently labelled as future development in the WWNZ plans provided, 2022). From a geotechnical perspective, the risks to this area of the site are the same as the proposed supermarket (Table 5) and the most appropriate foundation option remains piles. Residential buildings are less heavily loaded than commercial supermarkets and so will likely require smaller piles (in the range of 150 to 300 mm diameters) but founded to a similar depth.

6.3 Preliminary Pile Capacities

To inform costing for the project we have calculated preliminary pile capacities and sizes. End bearing capacity has been calculated using the methodology presented in B1/VM4, with uplift capacity calculated using the methodology presented by Meyerhof & Adams (1968). Results are presented in Table 6. Pile capacities have been calculated using the following assumptions:

- Geotechnical properties as presented in Section 5.2.
- We have conservatively assumed the top of the gravel layer is present at 5 m depth. Piles are embedded 1.5 m within the gravel layer at 6.5 m depth.
- We have not considered shaft friction, either positive benefit from the embedded portion of the pile within the gravel and sand or potential negative skin friction effects from organic deposits or liquefiable sands in this preliminary calculation.
- Pile capacities calculated are preliminary only and require re-assessment during detailed design in support of building consent, should the proposed development progress to this stage.

Table 6: Preliminary Pile Capacities

Pile width / helix diameter (m)	Ultimate end bearing capacity (kN)	Ultimate uplift capacity (screw pile only) (kN)
0.3	250	75
0.4	450	130
0.5	700	200
0.6	1020	300

A Strength reduction factor of ø=0.5 should be applied to the capacities presented above (B1/VM4).

Driven piles will have negligible uplift capacity unless they are embedded much deeper within the gravel layer. If the structure has significant uplift demands, then piles may need to extend much deeper than the 6.5 m assumed, or screw piles should be used.

6.4 Pavement Design Considerations

Given the proximity of organics to the surface and the shallow groundwater table, a non-standard pavement design may be required. We provide the following options in Table 7 for consideration.

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Peat consolidates over time with additional loading and as it decomposes, resulting in loss of volume and therefore settlement. The proximity of the peat to the surface means that it is within the zone of influence of the pavement and any loss of volume or compression will likely result in heave / deformation of the pavement.

Furthermore, seasonal fluctuations in groundwater may cause variation in the volume of the peat deposits through a shrink / swell effect. With the proximity of the peat in parts of the site to the ground surface this could result in the ground deforming slightly, thereby affecting the long-term performance of pavements.

These aspects should be taken into account by the Civil Engineer.

Table 7: Pavement Design Options

Pavement Options	Pros	Cons	Comments
Standard pavement design with low CBR	Cheap Easy to construct by most contractors	Long term settlement of the peat will affect the pavement surface Pavement may need to be replaced more frequently than standard	Target a thicker area for undercutting/ replacement and design for a very low CBR equivalent
Geogrid reinforced subbase	Easy to construct by most contractors Will help distribute vehicle loads and minimise differential settlement Likely increase long term performance when compared to a standard pavement design	Long term settlement of the peat will likely affect the pavement surface Pavement may need to be replaced more frequently than standard (but less frequently than a standard option)	Cement stabilisation of the near surface soils may also be an option to help bridge across the soft soils. However, this may prove more expensive that using geogrid but could use the on-site soils rather than cut and replace with hard fill.
Lightweight fill (GeoFoam)	Offsets the vehicle loading and can be designed to apply no new net load to the peat Could be targeted at heavy vehicle areas with light vehicle areas Easy to install	Likely to be expensive Buoyancy affects will need to be considered Not environmentally friendly (product is polystyrene)	If opting for a lightweight fill option, it is likely that using EcoBloc would be more beneficial to the development as it serves two functions.

Pavement Options	Pros	Cons	Comments
EcoBloc system or equivalent (stormwater attenuation)	Offsets the vehicle loading and can be designed to apply no new net load to the peat Can be used to attenuate stormwater which we understand will likely be required Easy to install	Likely to be expensive Buoyancy affects will need to be considered	This could be targeted for the heavily loaded areas of the site (i.e. truck access), with a less robust system for the lightly loaded areas of the site (car parking)
Surcharge (preload)	Consolidates the peat to offset the load from vehicles A standard pavement solution could be applied, likely with geogrid Wick drains could be installed to reduce the surface time (allows water to drain to the surface)	Can take a long time (6 to 24 months depending on thickness of peat and weight of surcharge) Needs a large volume of material Requires regular surveying May increase surface water discharge (by compressing the peat	Wick drains could be installed to reduce the surface time (allows water to drain to the surface) Likely only beneficial if the main building platform is also surcharged Would require additional geotechnical investigation and consolidation testing to design the surcharge

Ultimately, the decision on how to construct the pavement for this development will need input from a Civil Engineer. Different options may be selected for different areas of the site depending on the performance requirements.

6.5 Civil Services' Considerations

The uncertified fill, organic layer and shallow groundwater are likely to be problematic for services. Dewatering may be required when excavating for services. Services should be designed with flexible connections that are easy to access for repair because consolidation of the organic layer is likely in the static case and additional liquefaction induced settlement is likely in the seismic case.

7 Sustainability

We encourage you to consider sustainability when assessing the options available for your project. Where suitable for the project, we recommend prioritising the use of sustainable building materials (such as timber in favour of concrete or steel), locally sourced (materials readily available to Contractors as opposed to materials requiring import), and installed in an environmentally friendly way (e.g., reduced carbon emissions and minimal contamination). If you would like to discuss these options further, ENGEO staff are available to offer suggestions.

8 Conclusions and Future Work

Based on our review and analysis presented in this report, the proposed development is considered feasible from a geotechnical point of view. The key hazards to address with the development area are static subsidence due to organic variable uncertified fill layers, seismic subsidence due to liquefaction of the sand layer, shallow groundwater and flooding (not included in the scope of this report). ENGEO considers the most appropriate foundation solution for the proposed development to be piling to the gravel layer at approximately 3 – 5 m depth.

Analysis completed within this report has been to a level suitable for feasibility assessment and costing by the client. Further assessment is required during the detailed design phase of the project to progress pile design to a level suitable for Building Consent. Input from a Structural Engineer will be required to estimate quantity and size of piles required. Should piles be chosen as the preferred foundation option we recommend that load testing of trial piles is completed prior to construction to directly measure pile performance in the ground conditions.

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9 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, Woolworths New Zealand 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 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



Dai Kiddle

Geotechnical Engineer



Rowan Cook, CMEngNZ (PEngGeol)

Senior Engineering Geologist

Report reviewed by



Mark Broughton, CMEngNZ (CPEng)

Senior Geotechnical Engineer

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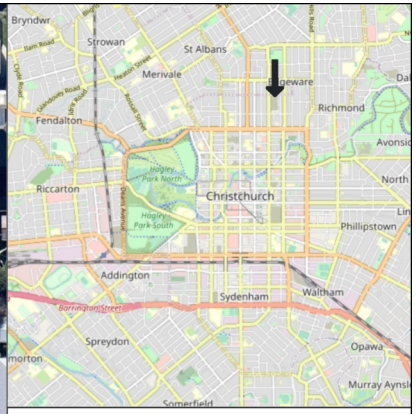
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APPENDIX 1:

Site Plan





Legend

- Site Boundary
- Kirk Roberts Borehole (2011)
- Tonkin & Taylor Test Pit (2011)
- Geotech Consulting Hand Auger (2002)
- NZGD Borehole
- Site Boundary
- Approximate Proposed Building Location

0 25 m 50 m

© Nearmap

ENGEO

Produced by **Datanest.earth**

Title: Site Plan		
Client: Woolworths New Zealand		Figure No: 2 Size: A4
Project: WWNZ Madras Street	Drawn: DKi	
Date: 30-11-2022	Checked: RC	
Proj No: 21170.000.000	Scale: 1:1150	Version: 1.0

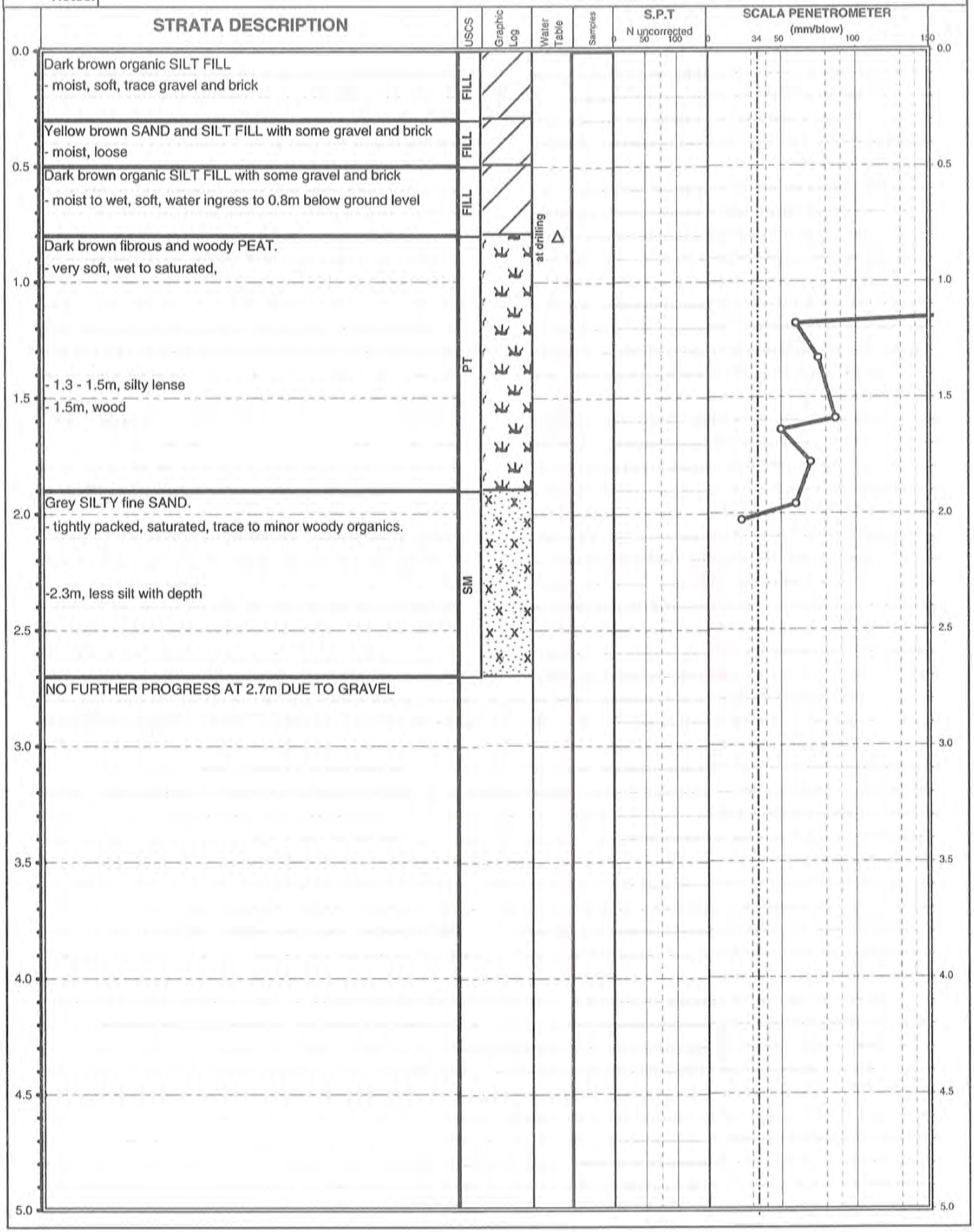
APPENDIX 2:

Investigation Logs

GEOTECH

SHALLOW BOREHOLE LOG
GEOTECH CONSULTING LTD

Project:	Madras/Packe St (ex Orion Site)			Hole No:	HA2
Client:	Glasson Potts Fowler			Job No:	2342
Hole location:	Refer Site Plan			Logged by:	RBW
Driller: R Wise	Contractor:	Equipment: Hand auger	R.L.:	Date drilled:	19/04/2002
				Checked by:	NJT
				Date checked:	26/04/2002
Notes:				Max depth:	2.70

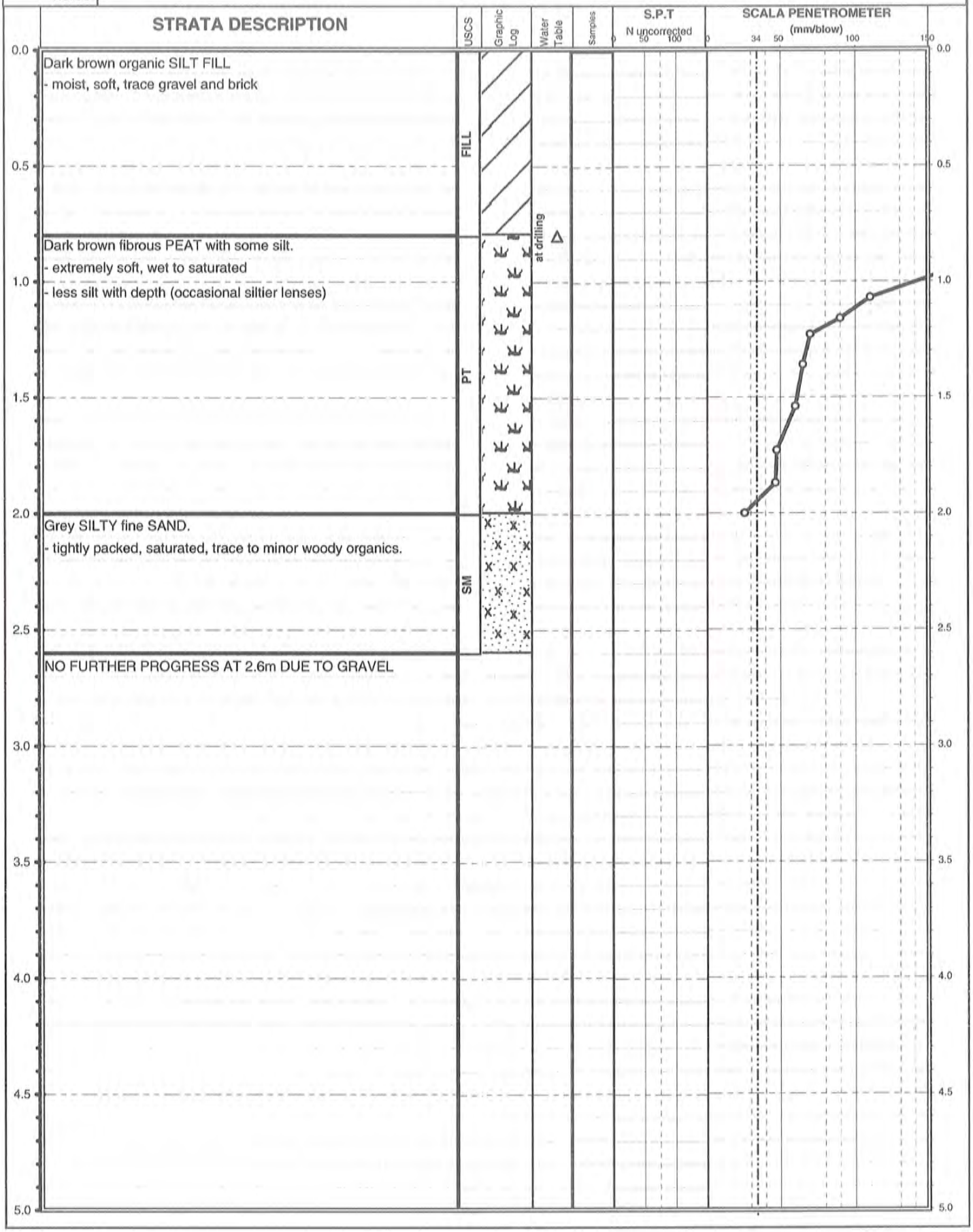


GEOTECH

SHALLOW BOREHOLE LOG
GEOTECH CONSULTING LTD

Project:	Madras/Packe St (ex Orion Site)			Hole No:	HA3
Client:	Glasson Potts Fowler			Job No:	2342
Hole location:	Refer Site Plan			Logged by:	RBW
Driller: R Wise	Contractor:	Equipment: Hand auger	R.L:	Date drilled:	19/04/2002
				Checked by:	NJT
				Date checked:	26/04/2002
				Max depth:	2.60

Notes:



GEOTECH

SHALLOW BOREHOLE LOG
GEOTECH CONSULTING LTD

Project:	Madras/Packe St (ex Orion Site)			Hole No:	HA6
Client:	Glasson Potts Fowler			Job No:	2342
Hole location:	Refer Site Plan			Logged by:	RBW
Driller: R Wise	Contractor:	Equipment: Hand auger	R.L:	Date drilled:	24/04/2002
				Checked by:	NJT
				Date checked:	26/04/2002
				Max depth:	2.75

Notes:

STRATA DESCRIPTION	USCS	Graphic Log	Water Table	Samples	S.P.T N uncorrected (0, 50, 100)	SCALA PENETROMETER (mm/blow) (0, 34, 50, 100, 150)
Dark brown organic SILT FILL - moist, soft, some large brick fragments	FILL					
Dark brown to black fibrous PEAT. - extremely soft, wet to saturated - auger pushed from 1.1 to 1.8m below ground level - 1.8m, siltier with depth	PT		at drilling Δ			
Blueish grey SILTY fine SAND. - saturated, medium tightly packed, trace peaty organics	SM					
Grey medium SAND. - saturated, loose to medium tightly packed	SP					
NO FURTHER PROGRESS AT 2.75m DUE TO GRAVEL						

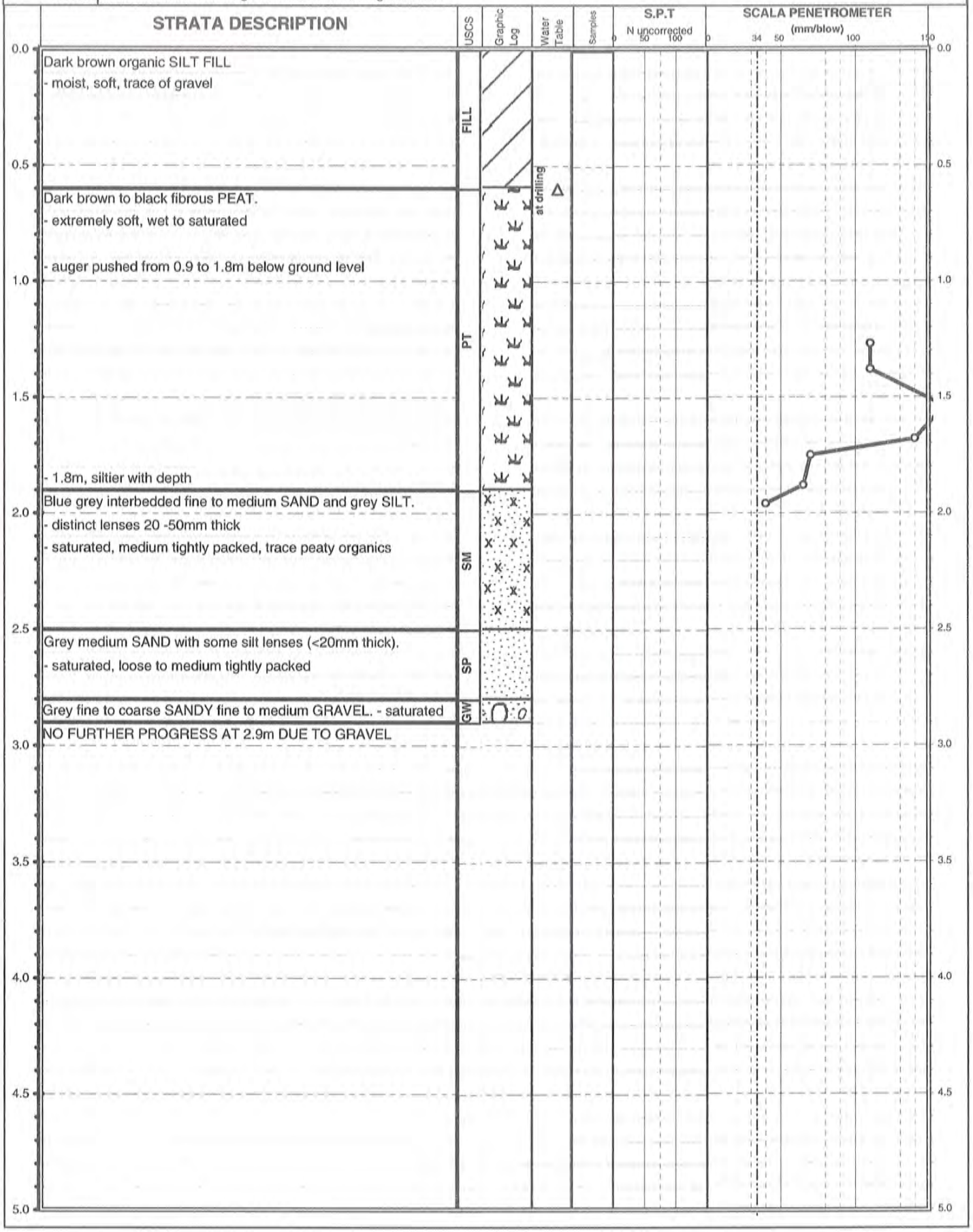
0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0

SHALLOW BOREHOLE LOG
GEOTECH CONSULTING LTD

GEOTECH

Project:	Madras/Packe St (ex Orion Site)				
Client:	Glasson Potts Fowler				
Hole location:	Refer Site Plan				
Driller: R Wise	Contractor:	Equipment: Hand auger		R.L.:	
Notes: scala sunk under own weight from 0.6-1.3m below ground level					

Hole No:	HA7
Job No:	2342
Logged by:	RBW
Date drilled:	24/04/2002
Checked by:	NJT
Date checked:	26/04/2002
Max depth:	2.90



TONKIN & TAYLOR LTD

EXCAVATION LOG

EXCAVATION No: TP2
Location: NE of site roughly opposite 88 Packe St
SHEET 2 OF 2

PROJECT: Ex Orion site | LOCATION: Madras/Purchas/Packe/Canon Sts | JOB No: 51888

CO-ORDINATES: 5743380 mN, 2481250 mE
R.L. m
DATUM

EXPOSURE TYPE: Test Pit
EQUIPMENT: 12 tonne excavator
OPERATOR: Blakely Construction
DIMENSIONS: 2.2 x 1.5

EXCAV. STARTED: 6/7/11
EXCAV FINISHED: 6/7/11
LOGGED BY: PAV
CHECKED BY: AFS

EXCAVATION TESTS | ENGINEERING DESCRIPTION | GEOLOGICAL

PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION / WEATHERING	STRENGTH / DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa) 10 25 50 100 200	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
		Water inflows @ 2.8m causing collapse of bottom of pit					GP	Sandy fine to medium GRAVEL. Light grey, moderately packed, wet. Sand, medium.	W			YALDHURST MEMBER OF SPRINGSTON FORMATION (ALLUVIAL)	
					3.5			**EOH @ 3.2m**, target strata achieved. Hole backfilled.					
					4.0								
					4.5								
					5.0								
					5.5								

SKETCH

See Sheet 1

T+T DATATEMPLATE.GDT nav

EXCAVLOG ORIONTPS.GPJ 8/7/11

TONKIN & TAYLOR LTD

EXCAVATION LOG

EXCAVATION No: TP3
Location: Central area of site

PROJECT: Ex Orion site | LOCATION: Madras/Purchas/Packe/Canon Sts | JOB No: 51888

CO-ORDINATES: 5743290 mN 2481220 mE | EXPOSURE TYPE: Test Pit | EXCAV. STARTED: 6/7/11

EQUIPMENT: 12 tonne excavator | EXCAV FINISHED: 6/7/11

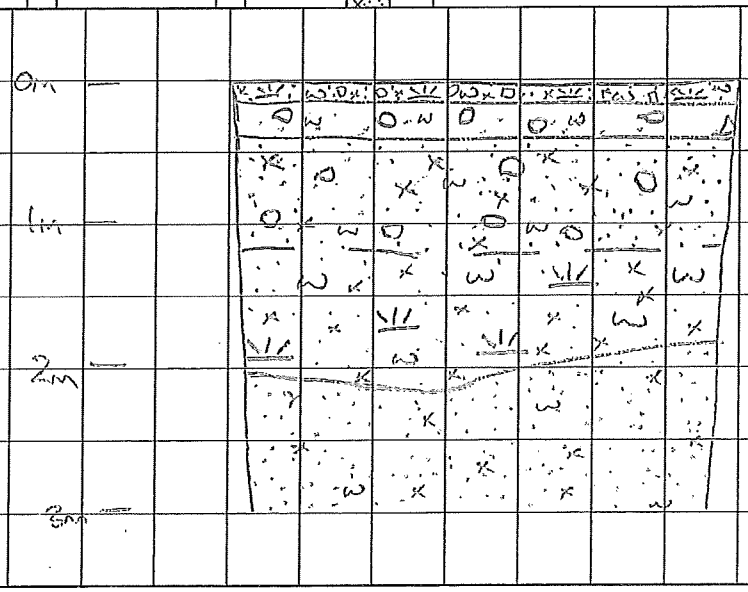
R.L. m | OPERATOR: Blakely Construction | LOGGED BY: PAV

DATUM | DIMENSIONS: 3.5 x 1.6 | CHECKED BY: AFS

EXCAVATION TESTS | ENGINEERING DESCRIPTION | GEOLOGICAL

PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONOARY AND MINOR COMPONENTS	MOISTURE CONDITION / WEATHERING	STRENGTH / DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa) 10 25 50 100 200	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
								Silty gravelly organic SAND with rootlets. Dark brown, loosely packed, moist.	M			TOPSOIL	
							SP	Gravelly fine to medium SAND with some rootlets. Light brown, loosely packed, moist. Gravels, medium to coarse, subrounded.				FILL	
		Minor seepage			0.5		SP	Gravelly silty fine to medium SAND with some rubbish and minor rootlets. Light grey, loosely packed, moist. Gravels, medium to coarse, subrounded. Rubbish includes ash, glass, brick, metal, broken concrete pieces up to 400 mm.					
					1.0		OL	Organic sandy SILT with peat lenses and some preserved trees. Dark brown, loosely packed, nonplastic, moist. Sand, fine. Peat, spongy/ compressible. Interbedded with gravelly silty fine to medium SAND (as at 0.35m) and also interbedded with silty fine to medium SAND, light grey, moderately packed, moist.				YALDHURST MEMBER OF SPRINGSTON FORMATION (PEAT SWAMPS)	
					1.5		SW	Fine to medium SAND with minor silt and trace woody organics. Light grey, moderately packed, moist.				YALDHURST MEMBER OF SPRINGSTON FORMATION (ALLUVIAL)	
					2.0								
					2.5								

SKETCH



Continues Sheet 2

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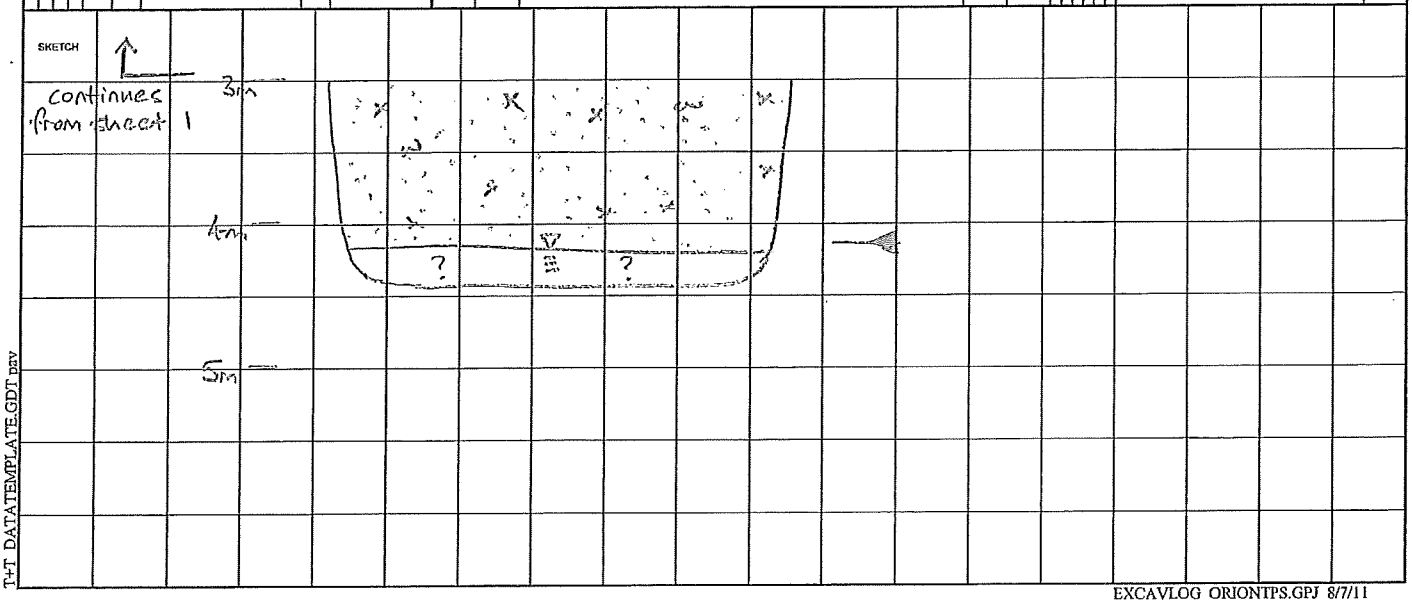
EXCAVATION LOG

EXCAVATION No: TP3
Location: Central area of site

PROJECT: Ex Orion site	LOCATION: Madras/Purchas/Packe/Canon Sts		JOB No: 51888
CO-ORDINATES: 5743290 mN 2481220 mE	EXPOSURE TYPE: Test Pit		EXCAV. STARTED: 6/7/11
	EQUIPMENT: 12 tonne excavator		EXCAV FINISHED: 6/7/11
R.L. m	OPERATOR: Blakely Construction		LOGGED BY: PAV
DATUM	DIMENSIONS: 3.5 x 1.6		CHECKED BY: AFS

EXCAVATION TESTS					ENGINEERING DESCRIPTION						GEOLOGICAL	
PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	R.L. (m) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION / WEATHERING	STRENGTH / DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa) 10 25 50 100 200	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
		Water inflowing causing collapse of bottom of pit				SW	Fine to medium SAND with minor silt and trace woody organics. Light grey, moderately packed, moist.	M			YALDHURST MEMBER OF SPRINGSTON FORMATION (ALLUVIAL)	
				3.5			- Light brown.					
				4.0			- Light grey.					
							Unseen due to water inflows. Inferred gravelly layer at approximately this depth.	W				
				4.5			**EOH @ 4.4m**, collapsing at base due to water inflows. Hole backfilled.					
				5.0								
				5.5								

SKETCH



T+T DATATEMPLATE.GDT 7/7/11

TONKIN & TAYLOR LTD

EXCAVATION LOG

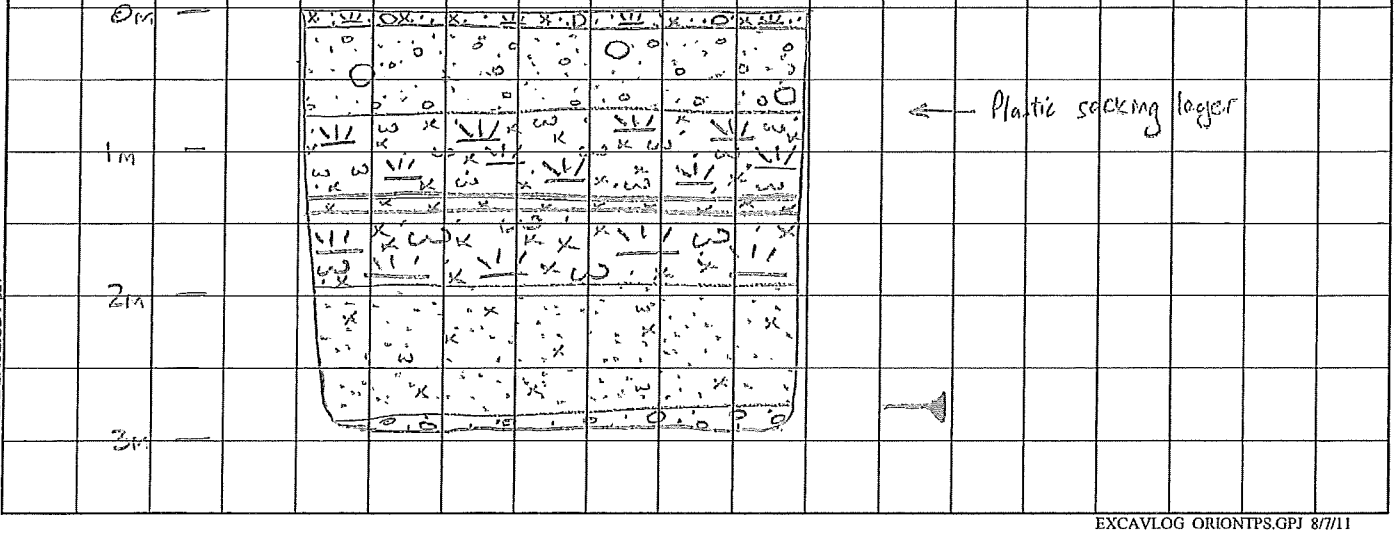
EXCAVATION No: TP4
Location: SE end of site

SHEET 1 OF 1

PROJECT: Ex Orion site		LOCATION: Madras/Purchas/Packe/Canon Sts	JOB No: 51888
CO-ORDINATES: 5743220 mN 2481230 mE	EXPOSURE TYPE: Test Pit		EXCAV. STARTED: 6/7/11
	EQUIPMENT: 12 tonne excavator		EXCAV FINISHED: 6/7/11
R.L. m	OPERATOR: Blakely Construction		LOGGED BY: PAV
DATUM	DIMENSIONS: 3.5 x 3.5		CHECKED BY: AFS

EXCAVATION TESTS					ENGINEERING DESCRIPTION					GEOLOGICAL	
PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	R.L. (m) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION / WEATHERING	STRENGTH / DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa) 50 100 200	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
				0.0			Silty gravelly organic SAND with rootlets. Brown, loosely packed, moist.	M			TOPSOIL	
						SP	Gravelly medium to coarse SAND with some cobbles and minor rubbish (wood, ash). Gravels, medium to coarse, subrounded. Cobbles, subrounded.				FILL	
				0.5			(Plastic sacking liner above PEAT layer.)					
						PT	PEAT with organic sandy silt lenses and minor roots. Black, spongy/compressible, nonplastic, moist. Silt, soft. Sand, fine. - Dark brown. Identifiable decompsed wood.				YALDHURST MEMBER OF SPRINGSTON FORMATION (PEAT SWAMPS)	
				1.0								
						ML	SILT. Light grey, soft, low plasticity, moist.					
				1.5		PT	PEAT with organic sandy silt lenses, roots and decomposed wood. Dark red-brown, spongy/ compressible, nonplastic, moist. Silt, soft. Sand, fine.					
				2.0		SW	Fine to medium SAND with minor silt and trace woody organics. Light grey, moderately packed, moist.				YALDHURST MEMBER OF SPRINGSTON FORMATION (ALLUVIAL)	
		Water inflows causing collapse of bottom of pit		2.5		GP	Sandy medium to coarse GRAVEL. Light grey, loosely packed, wet. Sand, medium. Gravel, subrounded.	W				
							EOH @ 2.9m, target strata achieved. Hole backfilled.					

SKETCH



T+T DATATEMPLATE.GDT pav

TONKIN & TAYLOR LTD

EXCAVATION LOG

EXCAVATION No: TP5
Location: SW end of site behind 2/466 Madras St

PROJECT: Ex Orion site | LOCATION: Madras/Purchas/Packe/Canon Sts | JOB No: 51888

CO-ORDINATES: 5743210 mN, 2481140 mE
R.L. m
DATUM

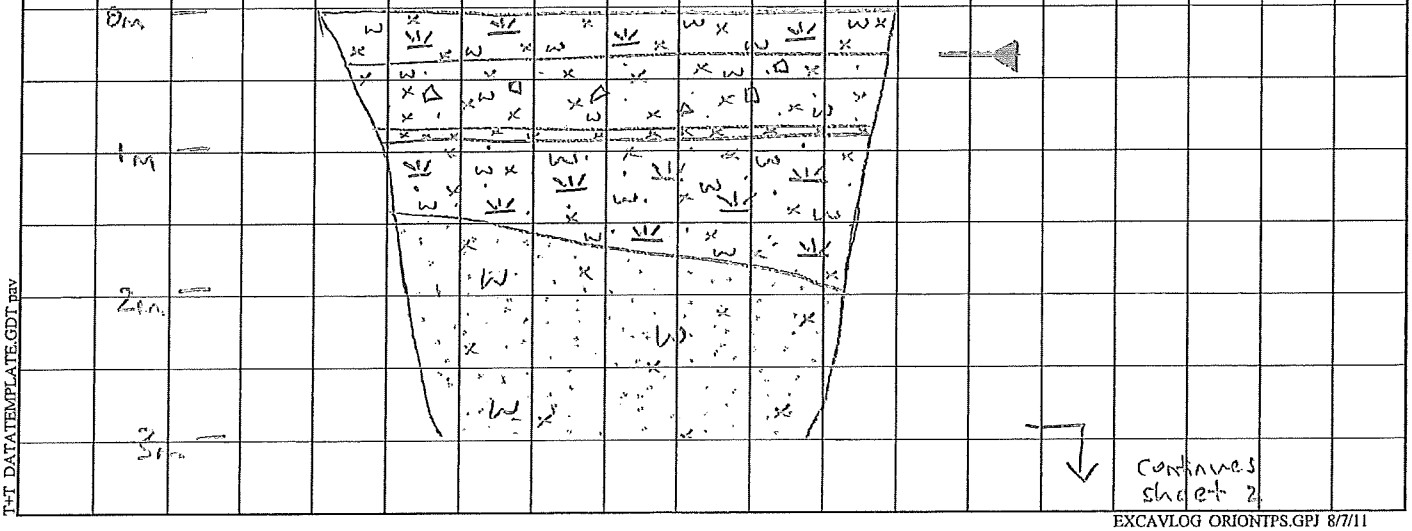
EXPOSURE TYPE: Test Pit
EQUIPMENT: 12 tonne excavator
OPERATOR: Blakely Construction
DIMENSIONS: 4.0 x 1.6

EXCAV. STARTED: 6/7/11
EXCAV FINISHED: 6/7/11
LOGGED BY: PAV
CHECKED BY: AFS

EXCAVATION TESTS | ENGINEERING DESCRIPTION | GEOLOGICAL

PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	R.L (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION / WEATHERING	STRENGTH / DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa) 12.5 50 100 200	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
					0.0			Organic SILT with some rootlets and rubbish (bricks). Dark brown, loosely packed, nonplastic, moist.	M			TOPSOIL	
		Minor seepage			0.5		ML	SILT with some fine sand, rubbish and twigs and minor subangular cobbles. Brown-grey, loosely packed, nonplastic, moist. Rubbish includes brick, broken concrete, metal pipe, wooden beams.					
							ML	SILT. Light grey, soft, low plasticity, moist.				YALDHURST MEMBER OF SPRINGSTON FORMATION (PEAT SWAMPS)	
					1.0		OL	Organic sandy SILT with peat lenses and preserved tree branches. Dark red-brown, soft, nonplastic, moist. Sand, fine. Peat, spongy/compressible.					
					1.5		SW	Fine SAND with some silt and trace woody organics. Light grey, moderately packed, moist.				YALDHURST MEMBER OF SPRINGSTON FORMATION (ALLUVIAL)	
					2.0								
					2.5								

SKETCH



TONKIN & TAYLOR LTD

EXCAVATION LOG

EXCAVATION No: TP5
Location: SW end of site behind 2/466 Madras St

PROJECT: Ex Orion site | LOCATION: Madras/Purchas/Packe/Canon Sts | JOB No: 51888

CO-ORDINATES: 5743210 mN, 2481140 mE
R.L. m
DATUM

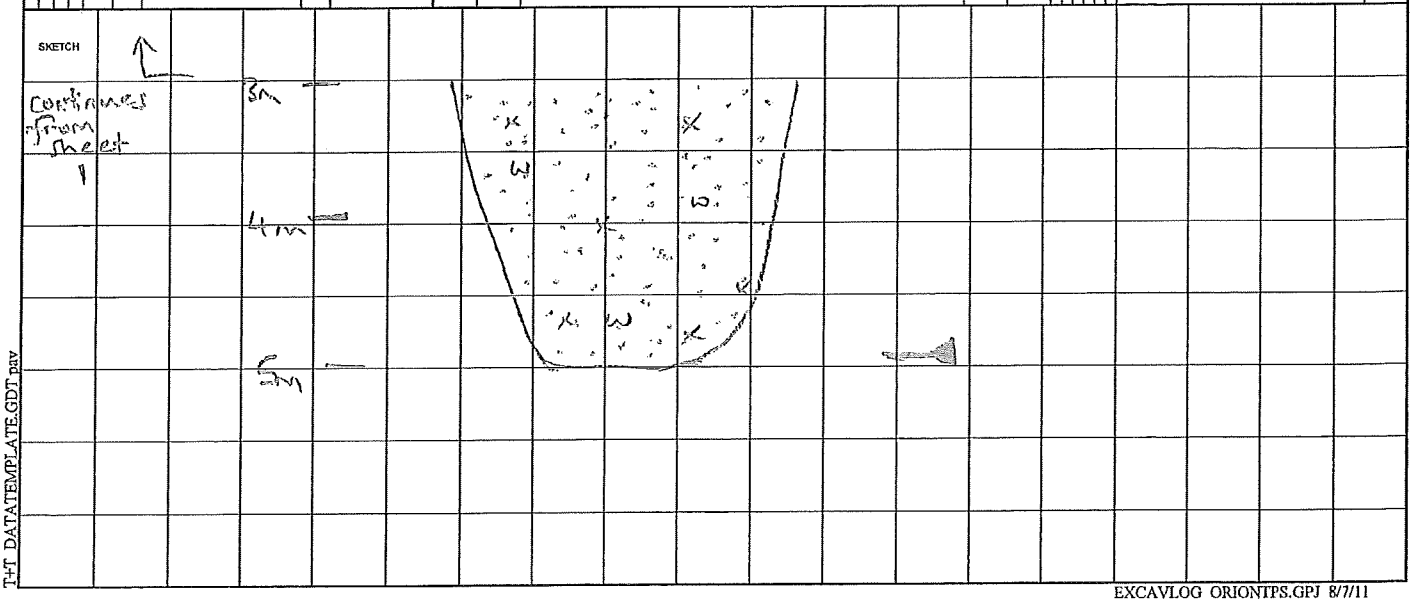
EXPOSURE TYPE: Test Pit
EQUIPMENT: 12 tonne excavator
OPERATOR: Blakely Construction
DIMENSIONS: 4.0 x 1.6

EXCAV. STARTED: 6/7/11
EXCAV FINISHED: 6/7/11
LOGGED BY: PAV
CHECKED BY: AFS

EXCAVATION TESTS | ENGINEERING DESCRIPTION | GEOLOGICAL

PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION / WEATHERING	STRENGTH / DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa) 10 25 50 100 200	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
		Water started inflowing after approx 5min of hole open			3.5		SW	Fine SAND with some silt and trace woody organics. Light grey, moderately packed, moist.	M			YALDHURST MEMBER OF SPRINGSTON FORMATION (ALLUVIAL)	
					4.0								
					4.5								
					5.0			**EOH @ 5.0m**, maximum reach of digger. Hole backfilled. Note: water began to inflow to bottom of pit after leaving open for approx 5min; thus infer that likely close to gravelly layer.					
					5.5								

SKETCH



TONKIN & TAYLOR LTD

EXCAVATION LOG

EXCAVATION No: TP6
Location: W of site opposite 491 Madras St

SHEET 1 OF 1

PROJECT: Ex Orion site | LOCATION: Madras/Purchas/Packe/Canon Sts | JOB No: 51888

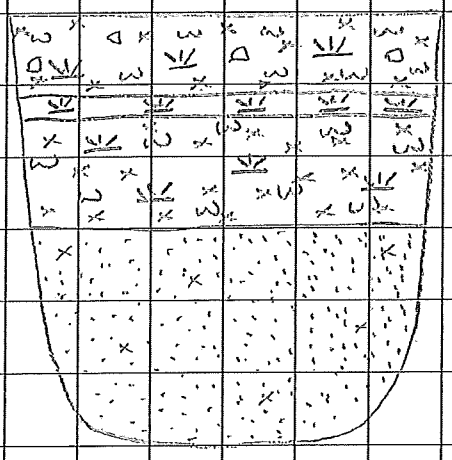
CO-ORDINATES: 5743350 mN 2481150 mE
R.L. m
DATUM

EXPOSURE TYPE: Test Pit
EQUIPMENT: 12 tonne excavator
OPERATOR: Blakely Construction
DIMENSIONS: 3.0 x 1.6

EXCAV. STARTED: 6/7/11
EXCAV FINISHED: 6/7/11
LOGGED BY: PAV
CHECKED BY: AFS

EXCAVATION TESTS				ENGINEERING DESCRIPTION						GEOLOGICAL	
PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION / WEATHERING	STRENGTH / DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa) 10 25 50 100 200	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
		Seepages			0.5			Organic SILT with rootlets and minor gravels. Dark brown, soft, nouplastic, moist. Gravels, medium to coarse, subrounded.	M			TOPSOIL	
								- Wet	W				
							PT	PEAT. Decomposed wood, soft, dark brown, wet.				YALDHURST MEMBER OF SPRINGSTON FORMATION (PEAT SWAMPS)	
			Bag sample 0.65-0.85m				MH	SILT. Light grey, very soft, moderately plastic, wet.					
			Bag sample 0.9-1.2m		1.0		OL	Organic sandy SILT with peat lenses and some rootlets and preserved tree branches. Dark brown, soft, nonplastic, wet. Sand, fine. Peat, spongy/compressible.					
		Water inflows causing collapse of bottom of pit			1.5		SW	Fine to medium SAND with minor silt and trace woody organics. Light grey, moderately packed, moist.	M			YALDHURST MEMBER OF SPRINGSTON FORMATION (ALLUVIAL)	
			Bag sample 2.0-2.5m		2.0								
					2.5			**EOH @ 3.0m**, seepages causing bottom of hole to cave in. Infer near gravelly layer. Hole backfilled.					

SKETCH



T+T DATATEMPLATE.GDT pav

EXCAVLOG ORIONTPS.GPJ 11/7/11

Bore Log

McMILLAN DRILLING SERVICES

Client: Kirk Roberts Consulting Ltd

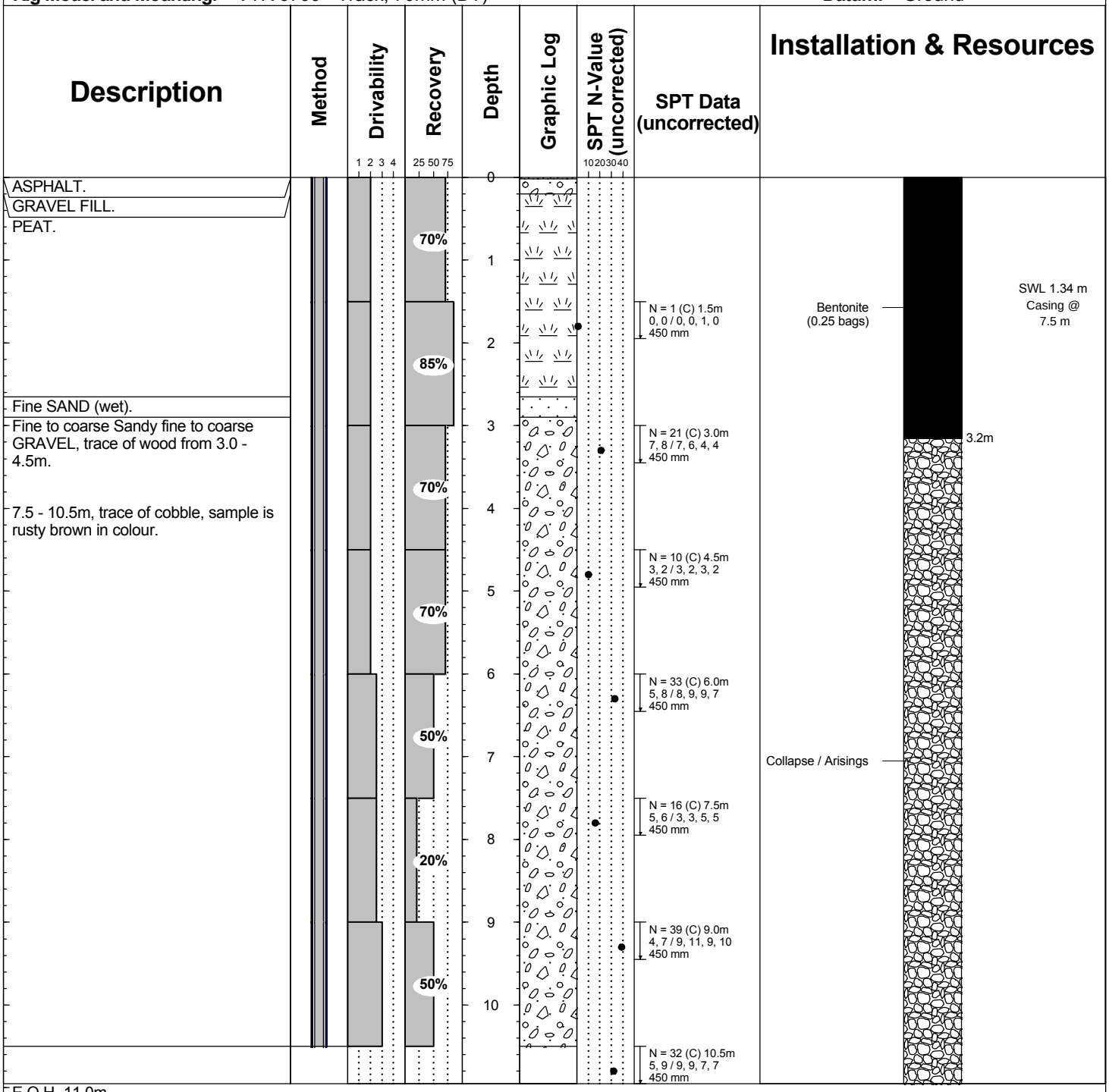
Project: Packe Street / Madras Street, Christchurch

Bore No.: BH001

Job No.: 9384

Site Location: Old Orion Site
Grid Reference: 2481249 mE, 5743254 mN (NZMG)
Rig Operator: C. Nee
Rig Model and Mounting: VTR 9700 - Track, 70mm (DT)

Date Commenced: 7/10/2011
Date Completed: 10/10/2011
Consent:
Datum: Ground



E.O.H 11.0m

Remarks:
Geotechnical Investigation Borehole BH001 with SPT Testing.
400 litres water added.
SPT: Safety Auto Trip Hammer #393 used (energy ratio 85.4%)

Drivability
1 Easy Push - No Hammer \ Fast Penetration
2 Relatively Easy Push - Light Hammer \ Relatively Fast
3 Medium Push - Consistent Hammer \ Medium
4 Hard Push - Full Hammer \ Somewhat Slow
5 Very Hard Push - Very Slow, Full Hammer \ Very Slow

Additional Resources:

Plastic Liner	**m**	**10.5**
Flush Mounted Toby Box		
- Standard	**ea**	
- Environmental	**ea**	
Above Ground Protective Surround	**ea**	
Geotextile Sock	**m**	
Handclear Location	**ea**	
Decontaminate Equipment	**ea**	

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Report Created: 21/10/2011 4:01:47 p.m.

Bore Log

McMILLAN DRILLING SERVICES

Client: Kirk Roberts Consulting Ltd

Project: Packe Street / Madras Street, Christchurch

Bore No.: BH002

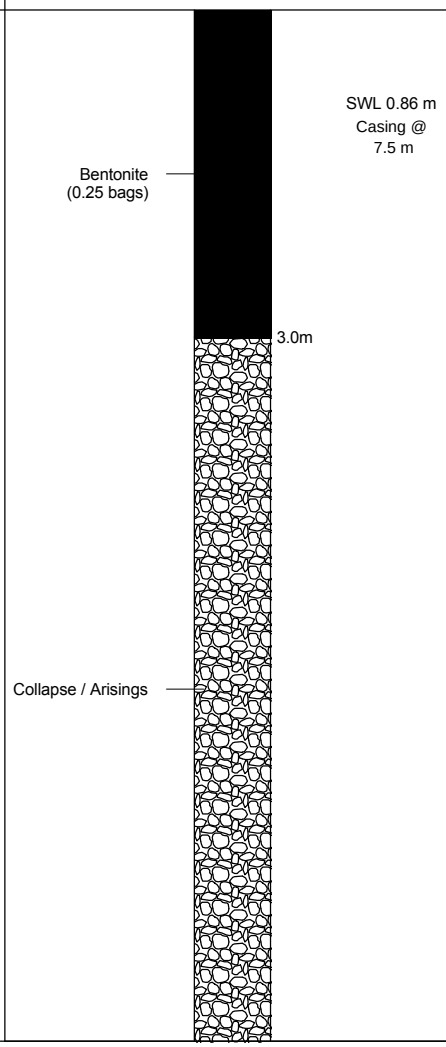
Job No.: 9384

Site Location: Old Orion Site
Grid Reference: 2481252 mE, 5743222 mN (NZMG)
Rig Operator: C. Nee
Rig Model and Mounting: VTR 9700 - Track, 70mm (DT)

Date Commenced: 5/10/2011
Date Completed: 6/10/2011
Consent:
Datum: Ground

Description	Method	Drivability (1 2 3 4)	Recovery (25 50 75)	Depth	Graphic Log	SPT N-Value (uncorrected) (10 20 30 40)	SPT Data (uncorrected)
TOPSOIL.				0			
GRAVEL FILL.							
Grey SAND (wet).			55%	1			N = 1 (C) 1.5m 0, 0 / 0, 0, 1, 0 450 mm
PEAT.			45%	2			
SILT.				3			N = 25 (C) 3.0m 7, 7 / 7, 6, 6, 6 450 mm
Fine to coarse Sandy fine to coarse GRAVEL, grading coarser with depth.			50%	4			N = 19 (C) 4.5m 3, 3 / 3, 5, 5, 6 450 mm
			65%	5			
				6			N = 21 (C) 6.0m 4, 6 / 6, 5, 4, 6 450 mm
			70%	7			
				8			N = 30 (C) 7.5m 4, 7 / 7, 7, 7, 9 450 mm
			60%	9			N = 44 (C) 9.0m 8, 11 / 11, 12, 11, 10 450 mm
E.O.H 9.5m							

Installation & Resources



Remarks:
Geotechnical Investigation Borehole BH002 with SPT Testing.
200 litres water added.
SPT: Safety Auto Trip Hammer #393 used (energy ratio 85.4%)

Drivability
1 Easy Push - No Hammer \ Fast Penetration
2 Relatively Easy Push - Light Hammer \ Relatively Fast
3 Medium Push - Consistent Hammer \ Medium
4 Hard Push - Full Hammer \ Somewhat Slow
5 Very Hard Push - Very Slow, Full Hammer \ Very Slow

Additional Resources:

Plastic Liner	m	9
Flush Mounted Toby Box		
- Standard	ea	
- Environmental	ea	
Above Ground Protective Surround	ea	
Geotextile Sock	m	
Handclear Location	ea	
Decontaminate Equipment	ea	

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Report Created: 21/10/2011 4:03:25 p.m.

Bore Log

McMILLAN DRILLING SERVICES

Client: Kirk Roberts Consulting Ltd

Project: Packe Street / Madras Street, Christchurch

Bore No.: BH003

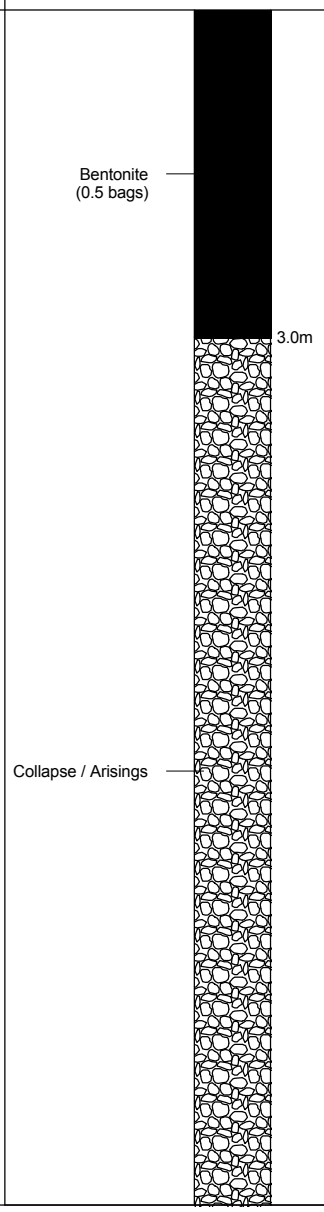
Job No.: 9384

Site Location: Old Orion Site
Grid Reference: 2481195 mE, 5740251 mN (NZMG)
Rig Operator: C. Nee
Rig Model and Mounting: VTR 9700 - Track, 70mm (DT)

Date Commenced: 6/10/2011
Date Completed: 7/10/2011
Consent:
Datum: Ground

Description	Method	Drivability (1 2 3 4)	Recovery (25 50 75)	Depth	Graphic Log	SPT N-Value (uncorrected) (10 20 30 40)	SPT Data (uncorrected)
ASPHALT.				0			
GRAVEL FILL.							
PEAT.			70%	1			
Fine SAND, grading to medium with depth.			90%	2			N = 6 (C) 1.5m 0, 1 / 0, 1, 2, 3 450 mm
				3			N = 29 (C) 3.0m 2, 4 / 6, 6, 8, 9 450 mm
Fine to coarse Sandy fine to coarse GRAVEL.			65%	4			
-4.4 - 4.5m, Driller notes lens of wood.			55%	5			N = 31 (C) 4.5m 5, 9 / 7, 8, 7, 9 450 mm
			75%	6			N = 15 (C) 6.0m 2, 6 / 4, 4, 3, 4 450 mm
			Bag%	7			N = 20 (C) 7.5m 5, 7 / 6, 5, 4, 5 450 mm
				8			
			45%	9			N = 27 (C) 9.0m 9, 11 / 8, 7, 6, 6 450 mm
				10			N = 40 (C) 10.5m 6, 10 / 12, 11, 9, 8 450 mm
E.O.H 11.0m							

Installation & Resources



Remarks:
Geotechnical Investigation Borehole BH003 with SPT Testing.
600 litres water added.
SPT: Safety Auto Trip Hammer #393 used (energy ratio 85.4%)

Drivability
1 Easy Push - No Hammer \ Fast Penetration
2 Relatively Easy Push - Light Hammer \ Relatively Fast
3 Medium Push - Consistent Hammer \ Medium
4 Hard Push - Full Hammer \ Somewhat Slow
5 Very Hard Push - Very Slow, Full Hammer \ Very Slow

Additional Resources:

Plastic Liner	m	10.5
Flush Mounted Toby Box		
- Standard	ea	
- Environmental	ea	
Above Ground Protective Surround	ea	
Geotextile Sock	m	
Handclear Location	ea	
Decontaminate Equipment	ea	

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Bore Log

McMILLAN DRILLING SERVICES

Client: Kirk Roberts Consulting Ltd

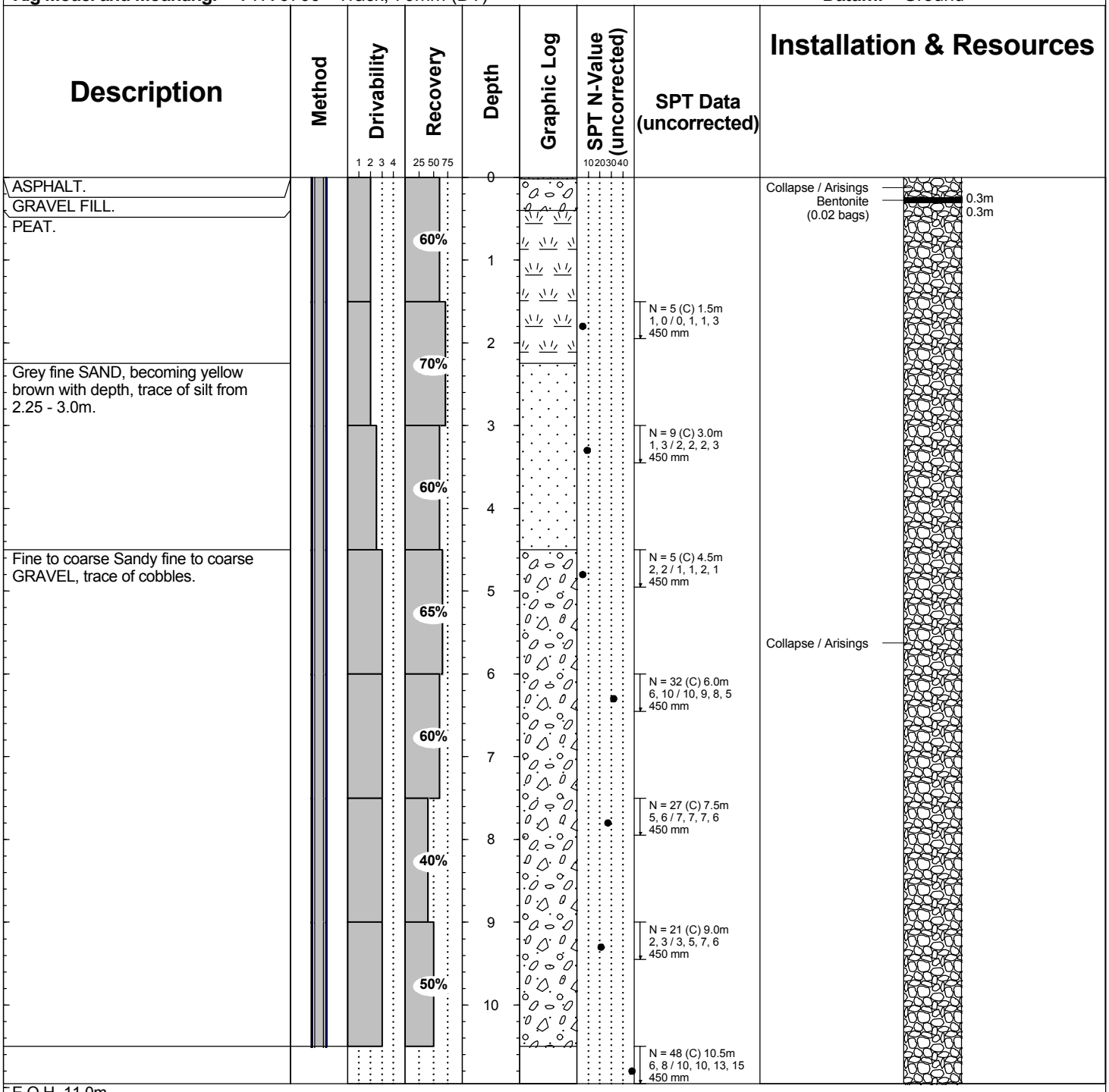
Project: Packe Street / Madras Street, Christchurch

Bore No.: BH004

Job No.: 9384

Site Location: Old Orion Site
Grid Reference: 2481196 mE, 5743220 mN (NZMG)
Rig Operator: C. Nee
Rig Model and Mounting: VTR 9700 - Track, 70mm (DT)

Date Commenced: 6/10/2011
Date Completed: 6/10/2011
Consent:
Datum: Ground



Remarks:
Geotechnical Investigation Borehole BH004 with SPT Testing.
200 litres water added.
SPT: Safety Auto Trip Hammer #393 used (energy ratio 85.4%)

Drivability
1 Easy Push - No Hammer \ Fast Penetration
2 Relatively Easy Push - Light Hammer \ Relatively Fast
3 Medium Push - Consistent Hammer \ Medium
4 Hard Push - Full Hammer \ Somewhat Slow
5 Very Hard Push - Very Slow, Full Hammer \ Very Slow

Additional Resources:

Plastic Liner	m	10.5
Flush Mounted Toby Box		
- Standard	ea	
- Environmental	ea	
Above Ground Protective Surround	ea	
Geotextile Sock	m	
Handclear Location	ea	
Decontaminate Equipment	ea	

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Report Created: 21/10/2011 4:01:47 p.m.

Bore Log

McMILLAN DRILLING SERVICES

Client: Kirk Roberts Consulting Ltd

Project: Packe Street / Madras Street, Christchurch

Bore No.: BH005

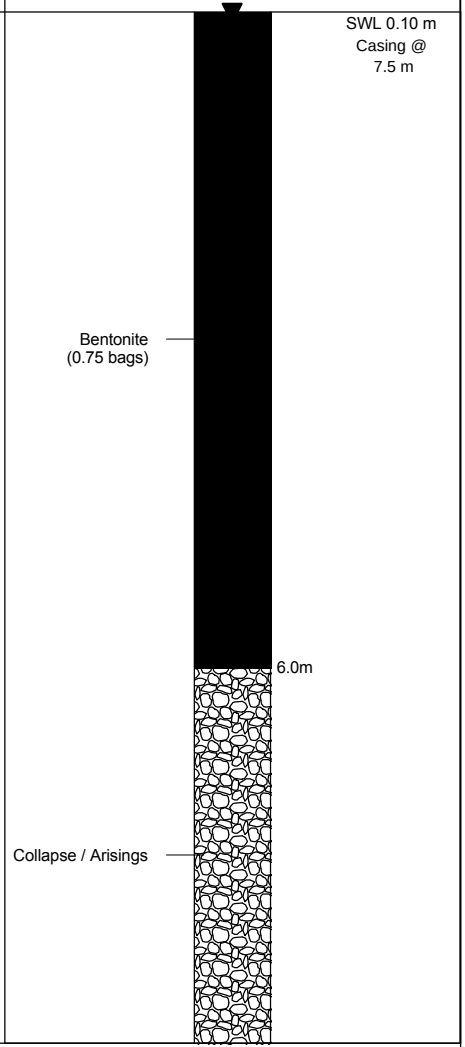
Job No.: 9384

Site Location: Old Orion Site
Grid Reference: 2481155 mE, 5743211 mN (NZMG)
Rig Operator: C. Nee
Rig Model and Mounting: VTR 9700 - Track, 70mm (DT)

Date Commenced: 3/10/2011
Date Completed: 14/10/2011
Consent:
Datum: Ground

Description	Method	Drivability (1 2 3 4)	Recovery (25 50 75)	Depth	Graphic Log	SPT N-Value (uncorrected) (10 20 30 40)	SPT Data (uncorrected)
TOPSOIL.			70%	0			
PEAT.				1			N = 1 (C) 1.5m 0, 0 / 0, 1, 0, 0 450 mm
			95%	2			
Very fine SAND, trace of silt from 3.0 - 4.5m.				3			N = 7 (C) 3.0m 2, 3 / 2, 1, 2, 2 450 mm
			100%	4			
Fine to coarse Sandy fine to coarse GRAVEL, trace of cobbles with depth.			45%	5			N = 15 (C) 4.5m 2, 4 / 4, 4, 3, 4 450 mm
				6			N = 38 (C) 6.0m 7, 9 / 9, 9, 10, 10 450 mm
			50%	7			
				8			N = 30 (C) 7.5m 3, 6 / 7, 8, 8, 7 450 mm
			35%	9			N = 36 (C) 9.0m 5, 9 / 9, 8, 10, 9 450 mm
E.O.H 9.5m							

Installation & Resources



Remarks:
Geotechnical Investigation Borehole BH005 with SPT Testing.
300 litres water added.
SPT: Safety Auto Trip Hammer #393 used (energy ratio 85.4%)

Drivability
1 Easy Push - No Hammer \ Fast Penetration
2 Relatively Easy Push - Light Hammer \ Relatively Fast
3 Medium Push - Consistent Hammer \ Medium
4 Hard Push - Full Hammer \ Somewhat Slow
5 Very Hard Push - Very Slow, Full Hammer \ Very Slow

Additional Resources:

Plastic Liner	**m**	9
Flush Mounted Toby Box		
- Standard	**ea**	
- Environmental	**ea**	
Above Ground Protective Surround	**ea**	
Geotextile Sock	**m**	
Handclear Location	**ea**	
Decontaminate Equipment	**ea**	

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Report Created: 21/10/2011 4:01:47 p.m.

Soil Borehole Log

Location: 91 Purchas Street, Edgeware, Christchurch

Reference: GA_20089

North (m): 5181546
East (m): 1571161
Elevation (m): 6
Hole Depth (m): 15.45
Orientation (°): -
Inclination (°): 90

Grid: NZTM
Datum: MSL

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth	TCR (%)	SPT N-value (Uncorrected)	Samples & In-situ Testing	Backfill & Installation
		CONCRETE.					0.00				0.10 Bentonite
		Sandy fine to coarse GRAVEL with trace silt; grey. Loose to medium dense; wet; rounded to angular; sand, fine to coarse (FILL).	GW	W	L-MD					B SAMPLE: 0.25m, 1	
		SILT with trace of sand, white plastic and brick fragment; dark grey and black. Firm to stiff; wet; low plasticity; sand, fine (FILL).	ML		F-St	▼	0.50			B SAMPLE: 0.50m, 2	0.60 Drill cuttings
		SILT; grey. Firm to stiff; wet; low plasticity.					1.00			SAMPLE: 1.00m, 3	
		No recovery.					1.50			SPT N = 0 Depth: 1.00m Type: Raymond Split Spoon 0, 0 / 0, 0, 0, 0 450mm penetration	
		Silty fine SAND with minor wood; grey. Loose; saturated; poorly graded; wood is at 2.2 m bgl and 5 cm thick.	SM	S	L		2.00			SAMPLE: 2.00m, 4	
		No wood. Medium dense below 3.0 m.			MD		2.50			SPT N = 5 Depth: 2.00m Type: Raymond Split Spoon 0, 1 / 0, 1, 1, 3 450mm penetration	
		Fine to medium SAND with trace silt; grey. Medium dense; saturated; poorly graded.	SP				3.00			SAMPLE: 3.00m, 5	
		Silty fine SAND; grey. Medium dense; saturated; poorly graded.	SM				3.50			SPT N = 13 Depth: 3.00m Type: Raymond Split Spoon 2, 2 / 4, 2, 3, 4 450mm penetration	
		Fine to medium SAND with trace silt; grey. Dense; saturated; poorly graded.	SP		D		4.00			SPT N = 15 Depth: 4.00m Type: Raymond Split Spoon 1, 1 / 2, 3, 5, 5 450mm penetration	
		Sandy fine to coarse GRAVEL with minor silt; grey. Dense; saturated; well graded; rounded to subrounded; sand, fine to coarse.	GW				4.50			SPT N = 33 Depth: 5.00m Type: Raymond Split Spoon 3, 8 / 9, 9, 8, 7 450mm penetration	5.00 Surrounding ground collapse
		Fine to medium SAND with trace of silt; grey. Very dense; saturated; poorly graded.	SP				5.00			SPT N = 50+ Depth: 6.00m Type: Raymond Split Spoon 4, 9 / 10, 15, 15, 10 450mm penetration	
		Sandy fine to coarse GRAVEL with trace of silt; grey. Very dense; saturated; well graded; rounded to subrounded; sand, fine to medium.	GW		VD		5.50				
		Sandy medium to coarse GRAVEL with minor silt; grey. Very dense; saturated; well graded; sand, fine to medium.					6.00				
		Sandy fine to coarse GRAVEL with trace silt; grey. Medium dense; saturated; well graded; rounded to subrounded; sand, fine to coarse.			MD		6.50			SPT N = 50+ Depth: 7.00m Type: Raymond Split Spoon 6, 13 / 8, 12, 15, 15 450mm penetration	
		Fine to medium SAND with trace silt; grey. Dense; saturated; poorly graded.	SP		D		7.00				
		Sandy fine to coarse GRAVEL with trace silt. Dense; saturated; well graded; rounded; sand, fine to coarse.	GW				7.50			SPT N = 27 Depth: 8.00m Type: Raymond Split Spoon 7, 10 / 5, 7, 7, 8 450mm penetration	
							8.00				
							8.50			SPT N = 38 Depth: 9.00m Type: Raymond Split Spoon 2, 6 / 7, 11, 9, 11 450mm penetration	
							9.00				
							9.50			SPT N = 44 Depth: 10.00m	

Driller
Speight Drilling

Logger
MS

Drill Method / Rig
HQ3 / CS1000

Start Date
20/06/2014

Checked By
JD

End Date
20/06/2014

Remarks
Coordinates and elevation are estimates only.
Hammer Efficency Energy ratio Ce = 0.95.
GWL measured in the Hand Augered Borehole prior to the drilling.

Borehole logged in accordance with NZGS guideline "Field description of soil and rock" 2005
Vane tests completed in accordance with NZGS guideline

Hole Depth
15.45m

NZGD ID: BH_50589

NZGD ID: BH_50589

Golder Associates

Soil Borehole Log

Location: 91 Purchas Street, Edgeware, Christchurch

Reference: GA_20089

North (m): 5181546
East (m): 1571161
Elevation (m): 6
Hole Depth (m): 15.45
Orientation (°): -
Inclination (°): 90

Grid: NZTM **Datum:** MSL

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth	TCR (%)	SPT N-value (Uncorrected)	Samples & In-situ Testing	Backfill & Installation
		Fine to medium SAND with trace silt; grey and brown. Dense; saturated; poorly graded.	SP	S	D		10.50			Type: Raymond Split Spoon 8, 12 / 9, 11, 10, 14 450mm penetration	5.00 Surrounding ground collapse
		Sandy fine to medium GRAVEL with trace silt. grey and brown. Dense; saturated; poorly graded rounded; sand, fine to medium.	GP				11.00			SPT N = 31 Depth: 11.00m Type: Raymond Split Spoon 3, 1 / 1, 6, 10, 14 450mm penetration	
		Gravelly fine to medium SAND; brown. Dense; saturated; poorly graded; gravel, medium to coarse; rounded.	SP				11.50				
		Fine to medium SAND with trace silt; brown. Dense; saturated; poorly graded.	GW				12.00			SPT N = 50+ Depth: 12.00m Type: Raymond Split Spoon 1, 5 / 10, 10, 13, 17 450mm penetration	
		Sandy fine to coarse GRAVEL with minor silt; brown. Dense; saturated; well graded; rounded; sand, fine to medium.					12.50				
		Fine to medium SAND with trace silt; brown. Very dense; saturated; poorly graded.	SP		VD		13.00			SPT N = 30 Depth: 13.00m Type: Raymond Split Spoon 11, 13 / 8, 7, 7, 8 450mm penetration	
		Sandy fine to coarse GRAVEL with minor silt; brown. Very dense; saturated; well graded; sand, fine to medium.	GW				13.50				
		Gravelly fine to medium SAND; brown. Dense; saturated; poorly graded; gravel, medium to coarse, rounded.	SP		D		14.00			SPT N = 35 Depth: 14.00m Type: Raymond Split Spoon 2, 2 / 1, 9, 10, 15 450mm penetration	
		Silty fine SAND with trace gravel; brown. Dense; saturated; well graded; gravel medium to coarse.	SM				14.50				
		Fine SAND; brown. Dense; saturated; poorly graded.	SP				15.00			SPT N = 27 Depth: 15.00m Type: Raymond Split Spoon 2, 4 / 4, 5, 8, 10 450mm penetration	
		Sandy medium to coarse GRAVEL with minor silt; brown. Medium dense; saturated; well graded; rounded.	GW		MD						

EOH: 15.45 m

Driller	Logger	Remarks
Speight Drilling	MS	Coordinates and elevation are estimates only. Hammer Efficency Energy ratio Ce = 0.95. GWL measured in the Hand Augered Borehole prior to the drilling.
Drill Method / Rig		
HQ3 / CS1000		
Start Date	**Checked By**	
20/06/2014	JD	
End Date		
20/06/2014		

Borehole logged in accordance with NZGS guideline "Field description of soil and rock" 2005
Vane tests completed in accordance with NZGS guideline

Hole Depth 15.45m

NZGD ID: BH_50589

NZGD ID: BH_185863

McMILLAN Drilling

Client: Geotech Consulting Ltd

Bore No.: DT2102

Project: 476 Madras Street, Christchurch

Job No.: 19817

Site Location: 476 Madras Street, Christchurch

Date: 17/5/2021 - 18/5/2021

Grid Reference: 1571245.39m E, 5181740.02m N (NZTM) - Map or aerial photograph

Rig Operator: S. Cardona

Elevation: 0.00m

Datum: Ground

Equipment: AMS VTR9700D - truck

Description	Depth	Method	Runs and recovery	Water at hole depth	SPT (NZS 4402) N-value Uncorrected	In-Situ Tests	Samples - Permeability tests	Installation & Resources
Fine to coarse GRAVEL with some sand, trace of silt and organics; brownish grey.	0.00	90mm OD Dual tube	90%					Bentonite
Sandy SILT; grey. Moist.	0.50m		90%					
PEAT; dark brown.	1.20m		95%					
Sandy SILT; grey. Wet.	2.30m		85%			SPT (S) 3.00m 2, 2 / 2, 2, 3, 5 450mm N = **12**	SPT sample 3.00 - 3.30m	
Medium SAND with trace of silt; grey.	2.60m		75%	0.40m bgl		SPT (S) 4.00m 2, 1 / 1, 1, 2, 3 450mm N = **7**	SPT sample 4.00 - 4.30m	
Sandy fine to coarse GRAVEL; grey.	4.50m		75%			SPT (C) 5.00m 11, 14 / 11, 11, 10, 11 450mm N = **43**		5.60m
			75%			SPT (C) 6.00m 3, 17 / 23, 27, 10 315mm Effective Refusal N = **60+**		Surrounding ground collapse
			75%			SPT (C) 7.00m 4, 12 / 17, 17, 16, 10 410mm Effective Refusal N = **60+**		
			85%	0.60m bgl		SPT (C) 8.00m 6, 20 / 20, 21, 19 370mm Effective Refusal N = **60+**		
Medium to coarse SAND with trace of silt; brown.	9.20m		70%			SPT (C) 9.00m 7, 7 / 10, 9, 10, 10 450mm N = **39**		
EOH: 10m	10.00		75%			SPT (S) 10.00m 2, 1 / 1, 2, 2, 4 450mm N = **9**	SPT sample 10.00m No sample recovery	

Remarks

Hammer energy ratio 73.9%

Additional Resources:

Core boxes: -
Liners/splits: 10m
Bentonite: 2 bags

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Hole Depth: 10m

Created: 24/05/2021 12:15:18

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NZGD ID: BH_185863

NZGD ID: BH_57205

Bore Log

McMILLAN Drilling GROUP

Client: Opus International Ltd

Project: Barbadoes/ Edgeware Mobile Phone Tower Site

Bore No.: BH001

Job No.: 15135

Site Location: 105A Purchas Street, Christchurch
Grid Reference: 1571231mE 5181555mN NZTM
Rig Operator: P. Taulava
Rig Model & Mounting: Geoprobe 8140LS

Date Commenced: 21/09/2015
Date Completed: 22/09/2015
Consent: -
Datum: Ground

Description	Method	Drivability	Recovery	Depth	Graphic Log	SPT N-value (Uncorrected)	In-Situ Tests (Uncorrected)	Samples - Permeability tests	Installation & Resources
0.00m FILL: sandy coarse gravel with some silt. Asphalt at 1.00m bgl.	Sonic core drilling		70%	0.5			SPT (C) 1.00m 4, 2 / 1, 1, 1, 1 450mm N = 4		0.00m Bentonite (3 bags)
1.00m SILT; grey.			100%	1.0					
1.20m PEAT.			100%	1.5					
2.20m Silty SAND; grey.			100%	2.0			SPT (S) 2.00m 0, 0 / 0, 0, 1, 2 450mm N = 3	SPTLS 2.00 - 2.40m	
2.70m Sandy GRAVEL; grey.			100%	2.5					
			100%	3.0			SPT (S) 3.00m 7, 7 / 7, 7, 8, 8 450mm N = 30	SPTLS 3.00 - 3.36m	
4.40m SAND; brown.			100%	3.5					
			100%	4.0			SPT (S) 4.00m 1, 1 / 0, 0, 0, 0 450mm N = 0	SPTLS 4.00 - 4.45m	
			100%	4.5					
			100%	5.0			SPT (S) 5.00m 0, 0 / 3, 2, 3, 5 450mm N = 13	SPTLS 5.00 - 5.45m	
			100%	5.5					
			100%	6.0			SPT (S) 6.00m 1, 2 / 4, 5, 5, 4 450mm N = 18	SPTLS 6.00 - 6.45m	6.00m Surrounding ground collapse
7.40m Sandy GRAVEL.			100%	6.5					
			100%	7.0			SPT (S) 7.00m 1, 0 / 3, 4, 9, 11 450mm N = 27	SPTLS 7.00 - 7.45m	
			100%	7.5					
			100%	8.0			SPT (S) 8.00m 3, 4 / 7, 8, 9, 9 450mm N = 33	SPTLS 8.00 - 8.45m	
			100%	8.5					
			100%	9.0			SPT (S) 9.00m 7, 9 / 9, 8, 8, 9 450mm N = 34	SPTLS 9.00 - 9.30m	
			100%	9.5					
			100%	10.0			SPT (C) 10.00m 8, 10 / 9, 9, 10, 7 450mm N = 35		
			100%	10.5					
11.40m SAND; brown.			100%	11.0			SPT (C) 11.00m 6, 7 / 9, 9, 10, 13 450mm N = 41		
			100%	11.5					
12.40m Sandy GRAVEL			100%	12.0			SPT (S) 12.00m 4, 5 / 2, 3, 3, 3 450mm N = 11	SPTLS 12.00 - 12.15m	
			100%	12.5					
			100%	13.0			SPT (C) 13.00m 11, 9 / 10, 11, 13, 12 450mm N = 46		
13.80m SAND; brown.			100%	13.5					
			100%	14.0			SPT (S) 14.00m 3, 2 / 3, 3, 5, 7 450mm N = 18	SPTLS 14.00 - 14.36m	
EOH: 15m				14.5			SPT (S) 15.00m 3, 3 / 5, 7, 9, 10 450mm N = 31	SPTLS 15.00 - 15.30m	

Remarks

Geotechnical investigation borehole BH001 with SPT testing

Static water levels:
0.40m bgl at casing depth of 13.00m;22/9/2015, 8:00 am

Samples in core boxes

1000 liters water added

Safety auto trip hammer #368 used (energy ratio 90.1%)

Drivability

1 Easy Push - No Hammer \ Fast Penetration
2 Relatively Easy Push - Light Hammer \ Relatively Fast
3 Medium Push - Consistent Hammer \ Medium
4 Hard Push - Full Hammer \ Somewhat Slow
5 Very Hard Push - Full Hammer \ Very Slow

Additional Resources:

Plastic Liner / PVC Splits	**m**	-
Flush Mounted Toby Box		
- Standard	**ea**	
- Environmental	**ea**	
Above Ground Protective Surround	**ea**	
Geotextile Sock	**m**	-
Hand Clear Location	**ea**	
Decontaminate Equipment	**ea**	

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Hole Depth: 15m

Generated by GEROC Core-GS

Created: 24/09/2015 11:58:34 a.m.

NZGD ID: BH_57205

NZGD ID: BH_9978

TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH-05
Hole Location:
STA-POD18-BH05
(2/74 Packe Street)
SHEET 1 OF 2

PROJECT: CHCH TC3 GEOTECHNICAL INVESTIGATIONS		LOCATION: ST ALBANS	JOB No: 52003.000
CO-ORDINATES	5743296.12 mN 2481335.36 mE	DRILL TYPE: Roto-Sonic	HOLE STARTED: 14/8/12 HOLE FINISHED: 14/8/12
R.L.	5.92 m	DRILL METHOD: PQDT/Auto SPT	DRILLED BY: Pro-Drill
DATUM	NZMG, MSL (CCC 20/01/12 Datum -9.043m)	DRILL FLUID: LP2000	LOGGED BY: GLDS-KJ CHECKED: BMcD

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.

FLUID LOSS | WATER | CORE RECOVERY (%) | METHOD | CASING | TESTS | SAMPLES | R.L. (m) | DEPTH (m) | GRAPHIC LOG | CLASSIFICATION SYMBOL | MOISTURE CONDITION / WEATHERING | STRENGTH/DENSITY CLASSIFICATION | SHEAR STRENGTH (kPa) | COMPRESSIVE STRENGTH (MPa) | DEFECT SPACING (mm)

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling.

Geological unit	Core recovery (%)	Method	Tests	Classification symbol	Moisture condition / weathering	Strength/density classification	Engineering description
ASPHALT							ASPHALT.
FILL				GW	M		Sandy fine to coarse GRAVEL, grey, subangular, moist, well graded. Sand is fine to medium.
				SP			Fine to medium SAND with some silt, grey, moist, poorly graded.
YALDHURST MEMBER OF THE SPRINGSTON FORMATION (ALLUVIAL)	100	PQDT		MH			Sandy SILT with some organics, dark brown, moist, low plasticity. Sand is fine to medium.
			FC1.5 ATP1.5		W		1.5m- wet. 1.5m- no SPT test.
	100	PQDT		SP			Fine to medium SAND with some silt and trace rootlets, grey, wet, poorly graded.
							2.5m- minor silt, rootlets absent.
	33	SPT	5/4//5/5/4/6 N=20	GW		MD	Sandy fine to coarse GRAVEL with trace cobbles, greyish brown, subrounded, medium dense, wet, well graded. Sand is fine to coarse.
	100	PQDT					3.15 to 3.45m- no recovery.
	33	SPT	5/6//5/6/7/7 N=25				
	100	PQDT					4.65 to 4.95m- no recovery.
	33	SPT	5/7//5/6/7/6 N=24				
	100	PQDT					6.15 to 6.45m- no recovery.
	100	SPT	5/6//6/6/5/6 N=23				
	100	PQDT					
	100	SPT	5/6//6/8/7/8 N=29				
	100	PQDT					

T+T DATATEMPLATE.GDT rcb

Log Scale 1:50

NZGD ID: BH_9978

NZGD ID: BH_9978

TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH-05
Hole Location:
STA-POD18-BH05
(2/74 Packe Street)
SHEET 2 OF 2

PROJECT: CHCH TC3 GEOTECHNICAL INVESTIGATIONS | LOCATION: ST ALBANS | JOB No: 52003.000

CO-ORDINATES 5743296.12 mN, 2481335.36 mE
R.L. 5.92 m
DATUM NZMG, MSL (CCC 20/01/12 Datum -9.043m)

DRILL TYPE: Roto-Sonic
DRILL METHOD: PQDT/Auto SPT
DRILL FLUID: LP2000

HOLE STARTED: 14/8/12
HOLE FINISHED: 14/8/12
DRILLED BY: Pro-Drill
LOGGED BY: GLDS-KJ CHECKED: BMcD

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION / ROCK DESCRIPTION
YALDHURST MEMBER OF THE SPRINGSTON FORMATION (ALLUVIAL)			100	PQDT							GW	W	MD				Sandy fine to coarse GRAVEL with trace cobbles, greyish brown, subrounded, medium dense, wet, well graded. Sand is fine to coarse.
			100	SPT		6/5//5/5/5/6 N=21		-5	11								10.5m- grey
			100	PQDT													11
						*FC12.0		-6	12								
CHRISTCHURCH FORMATION (MARINE/ ESTUARINE)			100	SPT		6/5//5/3/3/5 N=16	B				SP						Fine to medium SAND with minor silt, grey, medium dense, wet, poorly graded. 12
			100	PQDT				-7	13								13
			100	SPT		1/2//4/6/7/8 N=25		-8	14								13.3m- trace silt, light brown. 14
			100	PQDT		*FC15.0		-9	15								15
			100	SPT		2/1//3/4/6/9 N =22	B										
			100	PQDT				-10	16								16
			100	SPT		4/5// 7/10/13/13 N=43		-11	17				D				16.5m- dense. 17
			100	PQDT				-12	18								
			100	SPT		5/7// 10/15/18/7 for 30mm N>50							VD				18.0m- very dense. 18
			100	PQDT				-13	19								19.0m- greyish brown. 19
								-14	20								End of borehole at 19.5mbgl (target depth)

T+T DATATEMPLATE.GDT rcb

Log Scale 1:50

BOREHOLE LOG TC3 2012 STA POD18 BH05.GPJ 28/4/2012

NZGD ID: BH_9978

APPENDIX 3:

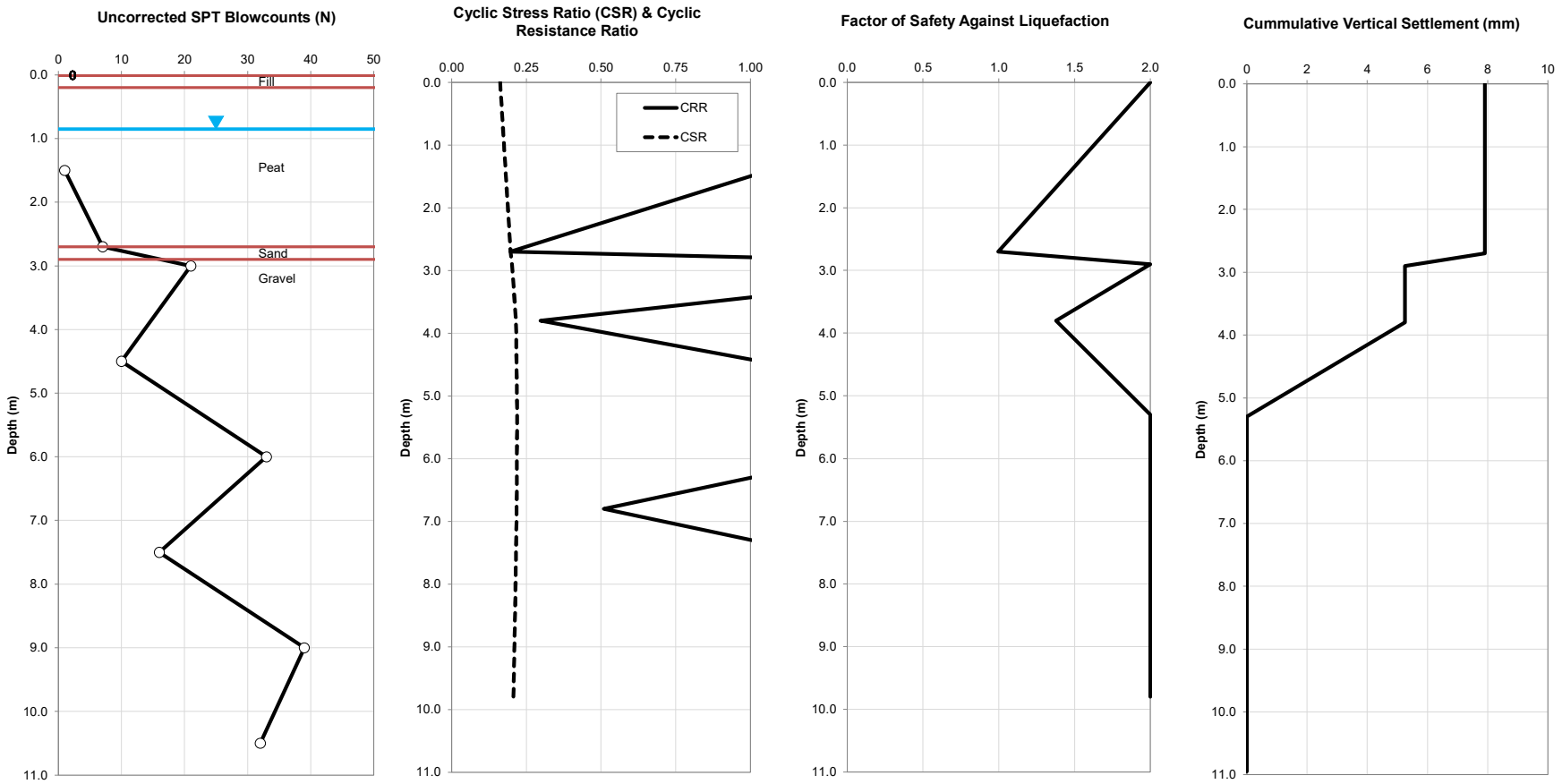
Liquefaction Analysis Results

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: WWNZ
Project Location: Madras St

Borehole: DT01
Total Depth: 10.95 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

2: Little to no expression of liquefaction, minor effects

ENGEO Ref: 21170
Author: Dki
Reviewer: MB
Date: 28/11/2022

Design Case: SLS Case 2
Magnitude: 6
PGA (g): 0.19
Analysis Method: Idriss and Boulanger (2008,2010)

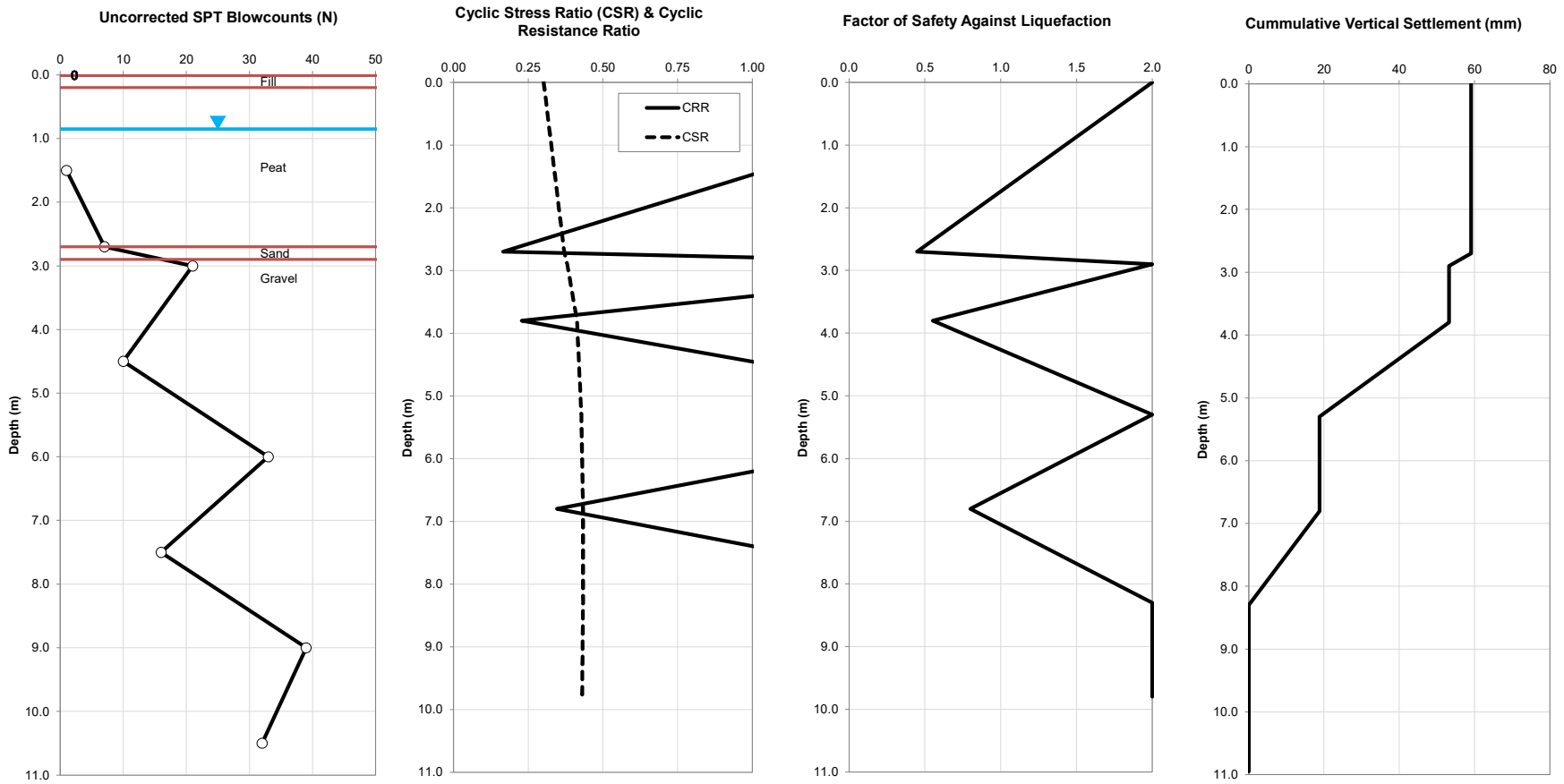
Groundwater Depth (m): 0.85
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: WWNZ
Project Location: Madras St

Borehole: DT01
Total Depth: 10.95 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

12: Minor expression of liquefaction, some sand boils

ENGEO Ref: 21170
Author: Dki
Reviewer: MB
Date: 28/11/2022

Design Case: ULS
Magnitude: 7.5
PGA (g): 0.35
Analysis Method: Idriss and Boulanger (2008,2010)

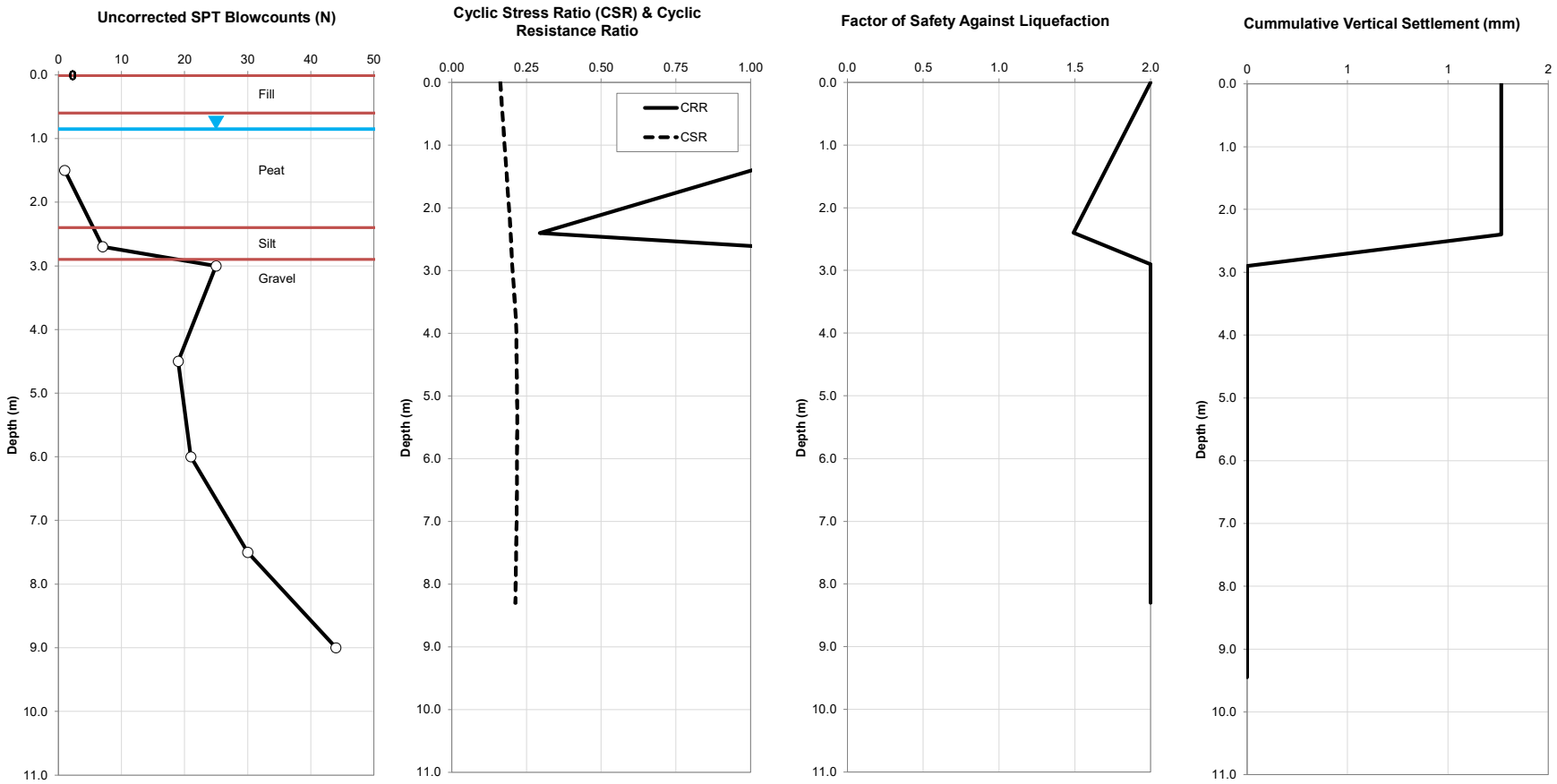
Groundwater Depth (m): 0.85
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: WWNZ
Project Location: Madras St

Borehole: DT02
Total Depth: 9.45 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

0: Little to no expression of liquefaction, minor effects

ENGEO Ref: 21170
Author: Dki
Reviewer: MB
Date: 28/11/2022

Design Case: SLS Case 2
Magnitude: 6
PGA (g): 0.19
Analysis Method: Idriss and Boulanger (2008,2010)

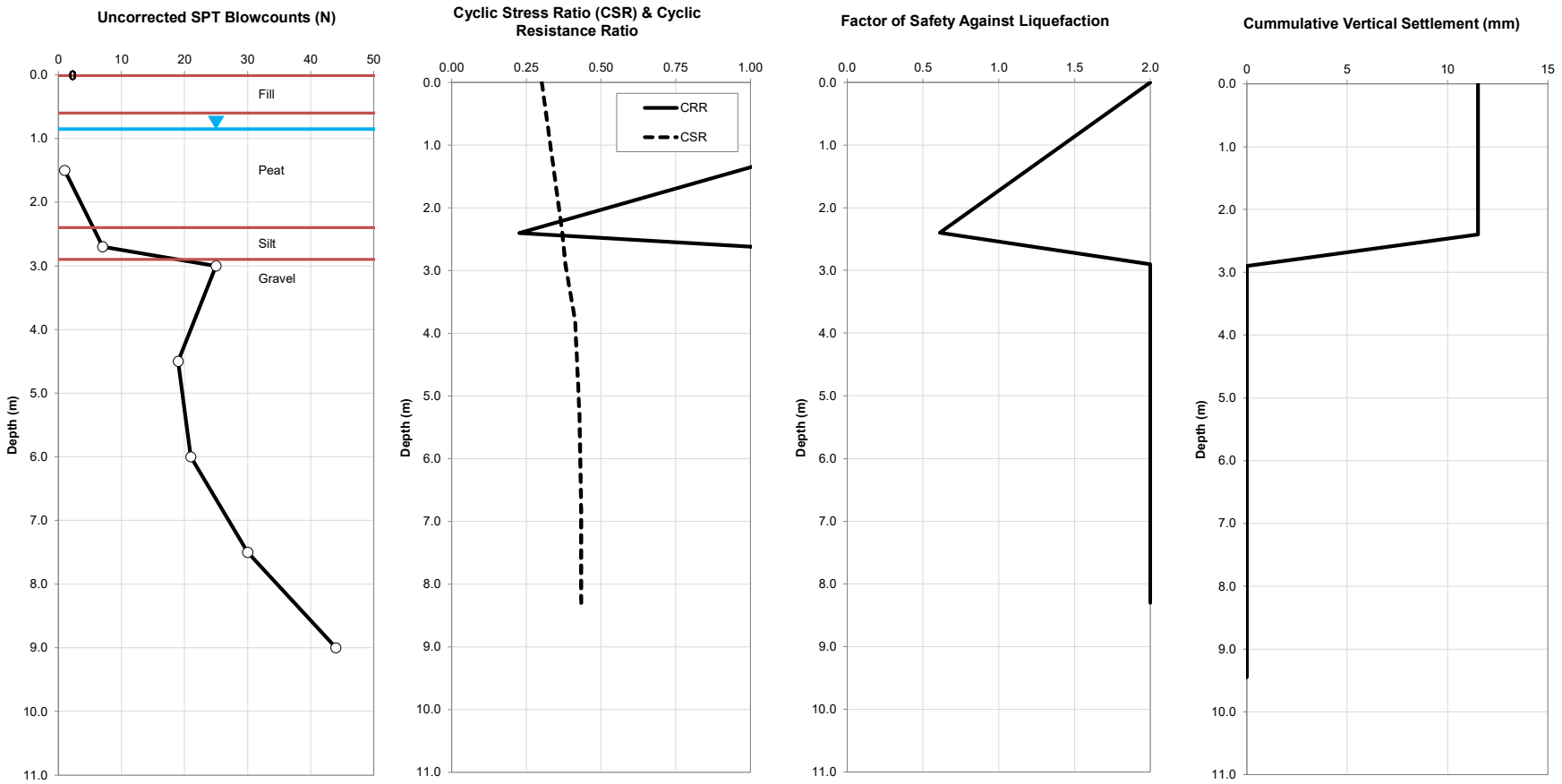
Groundwater Depth (m): 0.85
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: WWNZ
Project Location: Madras St

Borehole: DT02
Total Depth: 9.45 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

4: Little to no expression of liquefaction, minor effects

ENGEO Ref: 21170
Author: Dki
Reviewer: MB
Date: 28/11/2022

Design Case: ULS
Magnitude: 7.5
PGA (g): 0.35
Analysis Method: Idriss and Boulanger (2008,2010)

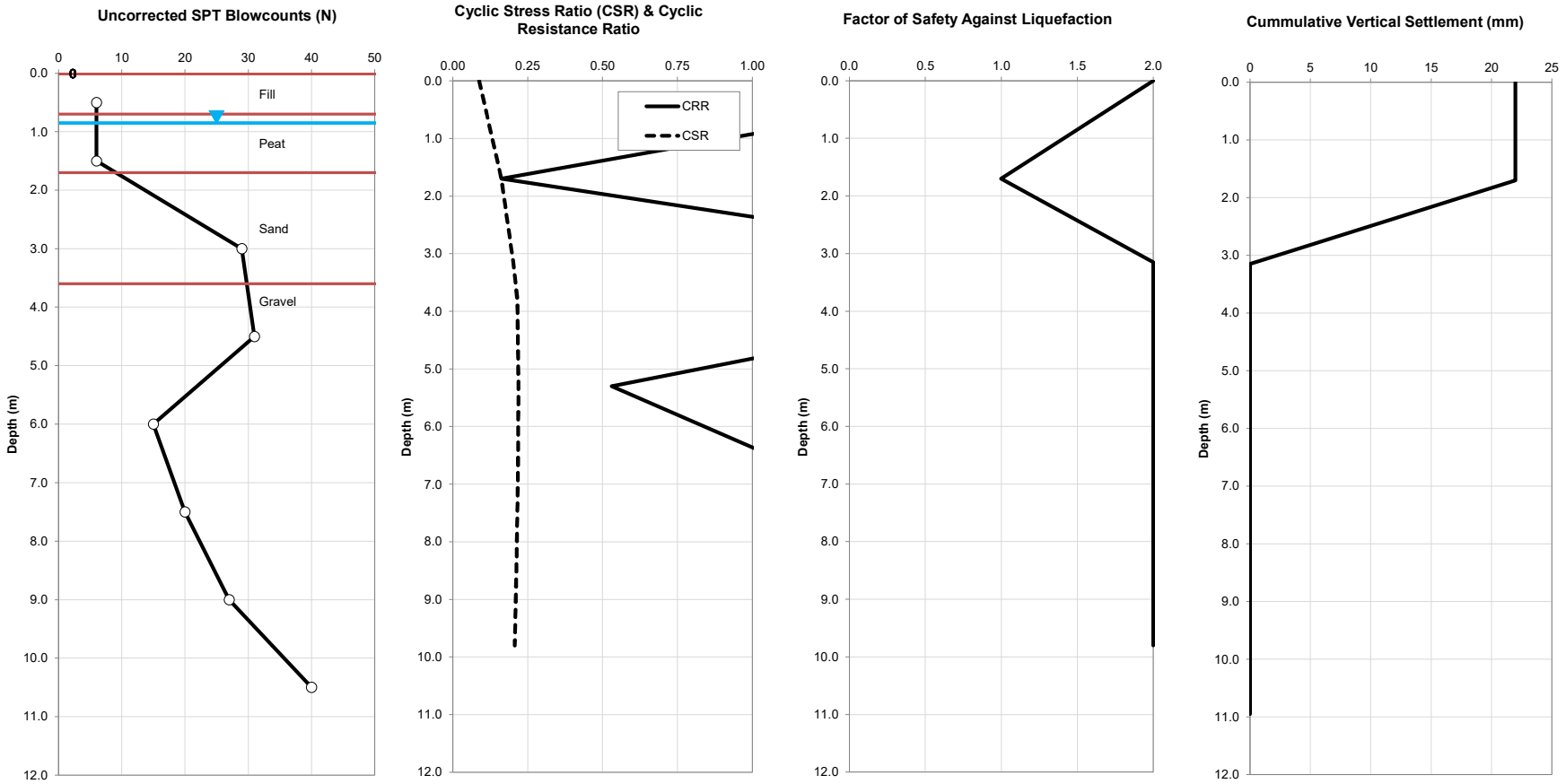
Groundwater Depth (m): 0.85
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: WWNZ
Project Location: Madras St

Borehole: DT03
Total Depth: 10.95 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

9: Little to no expression of liquefaction, minor effects

ENGEO Ref: 21170
Author: Dki
Reviewer: MB
Date: 28/11/2022

Design Case: SLS Case 2
Magnitude: 6
PGA (g): 0.19
Analysis Method: Idriss and Boulanger (2008,2010)

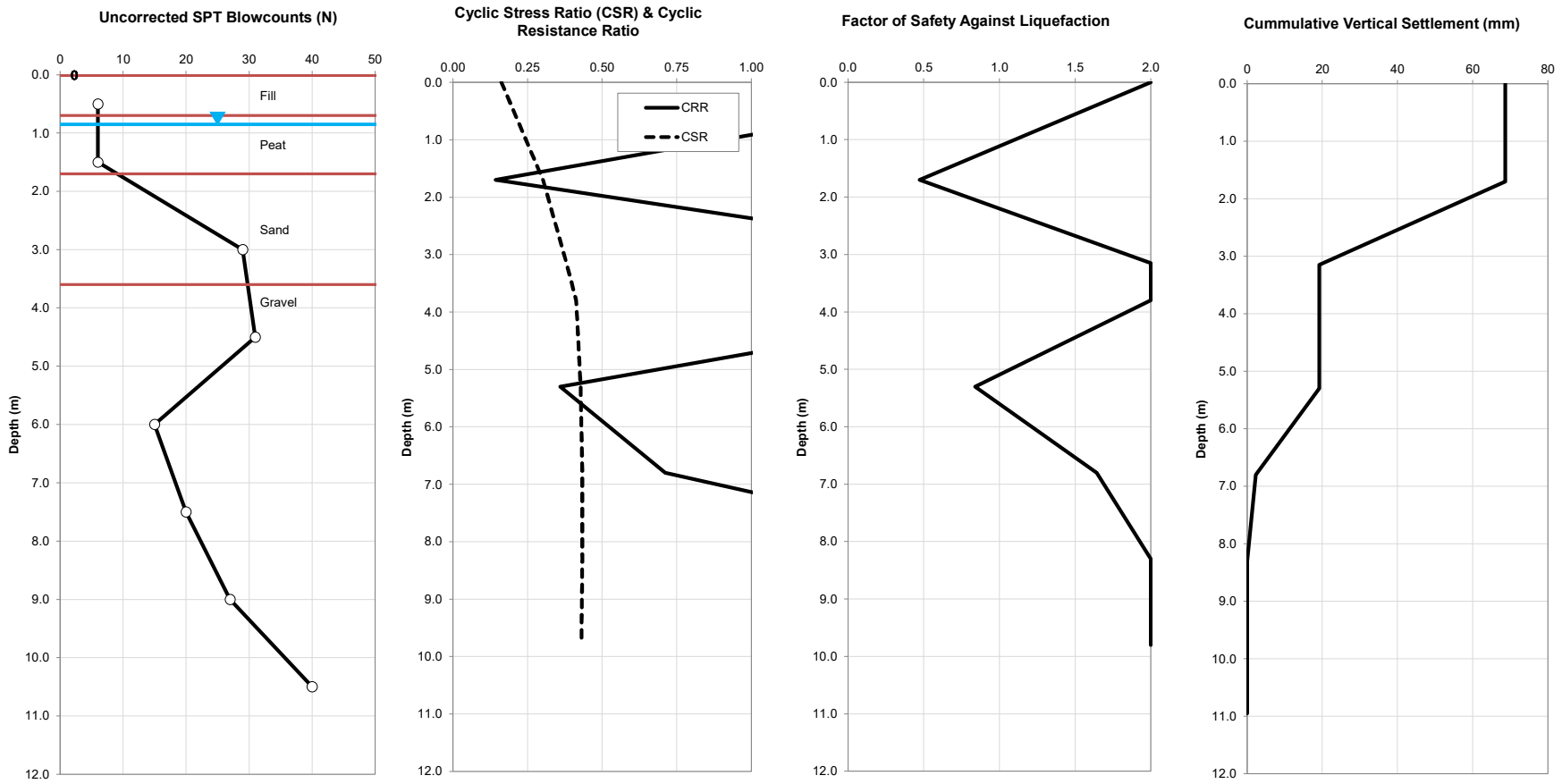
Groundwater Depth (m): 0.85
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: WWNZ
Project Location: Madras St

Borehole: DT03
Total Depth: 10.95 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

23: Moderate expression of liquefaction, with sand boils and some structural damage

ENGEO Ref: 21170
Author: Dki
Reviewer: MB
Date: 28/11/2022

Design Case: ULS
Magnitude: 7.5
PGA (g): 0.35
Analysis Method: Idriss and Boulanger (2008,2010)

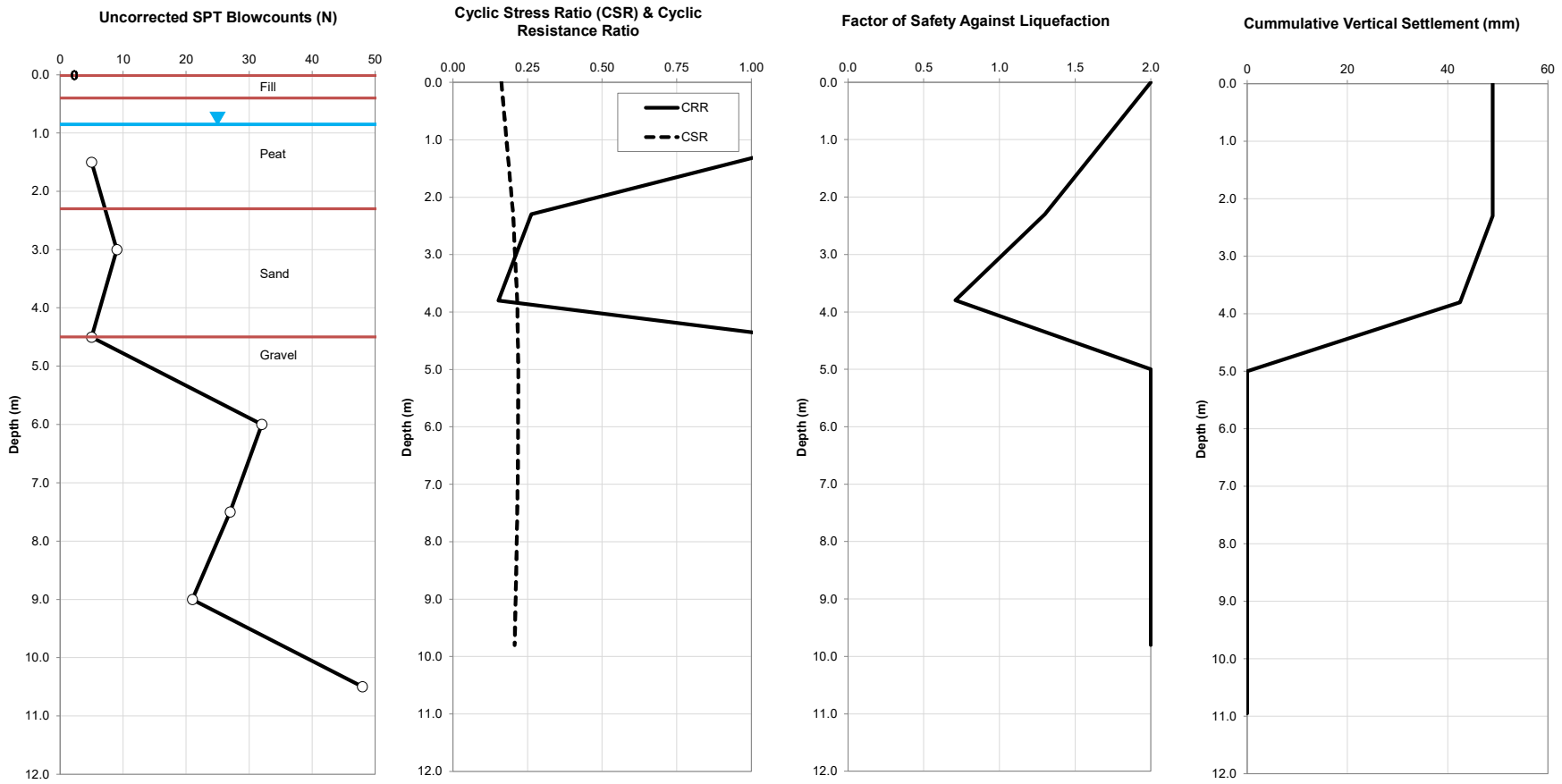
Groundwater Depth (m): 0.85
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: WWNZ
Project Location: Madras St

Borehole: DT04
Total Depth: 10.95 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

12: Minor expression of liquefaction, some sand boils

ENGEO Ref: 21170
Author: Dki
Reviewer: MB
Date: 28/11/2022

Design Case: SLS Case 2
Magnitude: 6
PGA (g): 0.19
Analysis Method: Idriss and Boulanger (2008,2010)

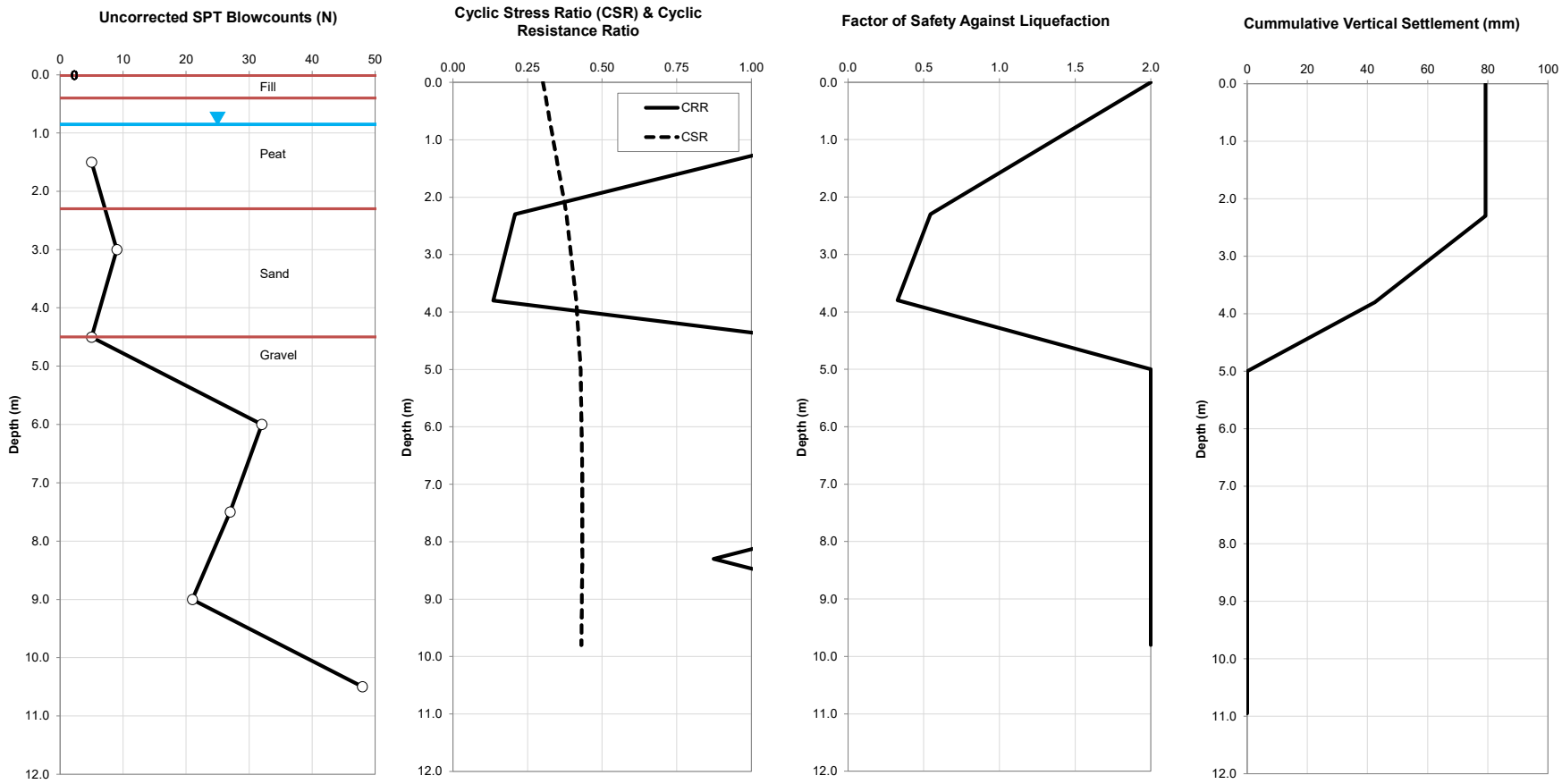
Groundwater Depth (m): 0.85
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Standard Penetration Test (SPT) - Based Liquefaction Triggering and Vertical Settlement Analysis Results

ENGEO Ltd
engeo.co.nz
03 328 9012

Project Name: WWNZ
Project Location: Madras St

Borehole: DT04
Total Depth: 10.95 m



Liquefaction Severity Number (LSN) & Performance Indicated by LSN

22: Moderate expression of liquefaction, with sand boils and some structural damage

ENGEO Ref: 21170
Author: Dki
Reviewer: MB
Date: 28/11/2022

Design Case: ULS
Magnitude: 7.5
PGA (g): 0.35
Analysis Method: Idriss and Boulanger (2008,2010)

Groundwater Depth (m): 0.85
Probability of Liquefaction Curve Used: 16 %
Vertical Settlement Method: Ishihara & Yoshimine (1992)
MSF Method: B&I 2014

Appendix D. Protech Design Ltd Correspondence

Simon Crundwell

From: Nicky Marshall <nicky@protechdesign.co.nz>
Sent: Thursday, 25 July 2024 1:43 pm
To: Daniel Shao; liz ridder
Cc: Liam Jagvik; Simon Crundwell; Will Herbst
Subject: RE: [#532253] WWNZ Rolleston South & Madras Street - Fire Hydrant Testing

[EXTERNAL EMAIL: Always check the FROM address of an email and treat links and attachments with caution. Check with Helpdesk if unsure.]

Hi
I only expected Packe St to be tested if inadequate water in Madras St.
The results look pretty good – enough water volume.
A pump set would be required. It's duty would need to take into consideration the CCC pressure management program.



Kind regards

Nicky Marshall
Southern Regional Manager

PROTECH DESIGN LIMITED
Specialist Fire Protection Consultants
Mobile Phone: +64 (0)21 433 488 Email: nicky@protechdesign.co.nz Web: www.protechdesign.co.nz
Address:105A Alabama Rd, Redwoodtown, Blenheim 7201, NZ

"I always wondered why somebody doesn't do something about that. Then I realised I was somebody" Lily Tomlin

---

From: Daniel Shao <daniel.shao@woolworths.co.nz>
Sent: Thursday, July 25, 2024 9:31 AM
To: liz ridder <stephen.ridder@aon.com>
Cc: Liam Jagvik <LJJ@eliotsinclair.co.nz>; Nicky Marshall <nicky@protechdesign.co.nz>; Simon Crundwell <sc@eliotsinclair.co.nz>; Will Herbst <will.herbst@aon.com>
Subject: Re: [#532253] WWNZ Rolleston South & Madras Street - Fire Hydrant Testing

Hi Stephen - was testing the water pressure in Packe St not part of the brief?

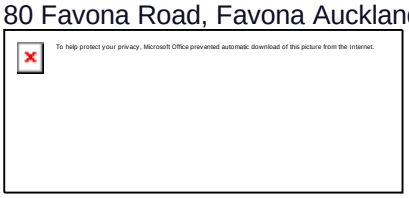
@Nicky Marshall - can you please advise on the implications of the Madras St test results, which will in turn inform whether further testing (of Packe St or other options) is needed.

Thanks

Daniel Shao
Development Manager

M 027 216 6035
E daniel.shao@woolworths.co.nz

80 Favona Road, Favona Auckland 2024



On Thu, 25 Jul 2024 at 08:06, Stephen Ridder <stephen.ridder@aon.com> wrote:

> Good morning all,
>
> Please find attached a copy of the flow test results for Madras street.
>
> *Note: I am on leave for a month as of 23 August.*
>
> Regards
>
> **Stephen Ridder** | Fire Protection Consultant – Aon Fire Protection
> Aon New Zealand | Aon Global Risk Consulting
> 388 Blenheim Road, Upper Riccarton, Christchurch 8140, New Zealand
> m +64 27 836 5261
> stephen.ridder@aon.com | www.aon.co.nz
>
> **From:** Liam Jagvik <LJJ@eliotsinclair.co.nz>
> **Sent:** Monday, July 22, 2024 9:32 AM
> **To:** Stephen Ridder <stephen.ridder@aon.com>
> **Cc:** Nicky Marshall <nicky@protechdesign.co.nz>; Simon Crundwell <sc@eliotsinclair.co.nz>; Daniel Shao <daniel.shao@woolworths.co.nz>; Will Herbst <will.herbst@aon.com>
> **Subject:** RE: [#532253] WWNZ Rolleston South & Madras Street - Fire Hydrant Testing
>
> **ALERT:** This message originated outside of Aon's network. **BE CAUTIOUS** before clicking any link or attachment.
>
> Hi Stephen

I see that Will is away on leave. Are you able to give us an update in Will's absence?

Cheers

Liam Jagvik
SURVEYOR | DIRECTOR
BSurv MNZIS LCS
+64 3 379 4014 ext. 162
+64 27 699 0592
eliotsinclair.co.nz
Christchurch | Rangiora | Wānaka
Queenstown | Hokitika | Nelson

Caution: This email (including any attachments) may contain confidential and privileged information. If you have received it in error, please 1) notify the sender by return email (or telephone) and then delete this email, together with all attachments and your reply and 2) do not act on this email in any other way. Please visit https://www.eliotsinclair.co.nz/terms-conditions for important information concerning this message. Thank you.

From: Liam Jagvik
Sent: Friday, July 19, 2024 4:06 PM
To: Will Herbst <will.herbst@aon.com>
Cc: Nicky Marshall <nicky@protechdesign.co.nz>; Simon Crundwell <sc@eliotsinclair.co.nz>; Daniel Shao <daniel.shao@woolworths.co.nz>
Subject: FW: [#532253] WWNZ Rolleston South & Madras Street - Fire Hydrant Testing

Hi Will

I understand Aon has been engaged to complete the hydrant testing for this site. Could you please give us an update on the timing for the testing and results?

Kind regards

From: Liam Jagvik
Sent: Thursday, July 11, 2024 10:54 AM
To: will.herbst@aon.com; Nicky Marshall <nicky@protechdesign.co.nz>
Cc: Daniel Shao <daniel.shao@woolworths.co.nz>; Simon Crundwell <sc@eliotsinclair.co.nz>
Subject: [#532253] WWNZ Rolleston South & Madras Street - Fire Hydrant Testing

Appendix E. Fire Hydrant Test Results

WATER SUPPLY TEST SHEET – FW2

Client: Woolworths NZ
Address of test: Madras Street
Test Criteria: As advised by Protech
Flow Rates: 3200 L/min
Time of test: 09:45 on 24 July 2024

The water supply was flown from the fire hydrants opposite #453 and #473 Madras Street.
The residual pressure was recorded at the fire hydrant opposite #503 Madras Street.



Flow test results, test conducted 09:45 24 July 2024

Residual pressure #503 (kPa)	Flow at point #473 (Litres per minute)	Flow at point #453 (Litres per minute)	Total flow (Litres per minute)
700	0	0	0
680	0	750	750
670	0	1400	1400
550	1400	1400	2800
520	1600	1600	3200
490	2000	1730 (max)	3730

Notes

1) Montreal pump station PS1027 was isolated during the test.
2) This test is a snapshot at a point in time.
3) Christchurch City Council have a long-standing objective to reduce water supply pressures across its network. When and what effect this change will have is not known by Aon.

Appendix F. Preliminary Servicing Plan

G:\Jobs\53\532253\Drawings\CAD\532253 C1-C400 Three Waters

N

0 8m 16m 24m 32m 40m
1:400 [A1]

DISCLAIMER
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PACKE STREET

Hardstand Attenuation
Provided either via underground attenuation tanks or pumped to above ground attenuation tanks. Approx. 100m³ storage required for hardstand attenuation.

9 x 10,000L above ground tanks for roofwater

Proposed secondary flow paths (min. 1 in 500 grade)

12 x 30,000L above ground tanks for roofwater

Proposed secondary flow paths (min. 1 in 500 grade)

Primary Stormwater Discharge Option 1 - to existing DN375 pipeline

Wastewater Discharge:
Option 1 - Discharge into existing DN150 sewer lateral
Option 2 - Relay existing DN150 sewer lateral

Existing DN150 Wastewater Lateral. Depth approx. 0.8m (GPR survey)

Transformer Location: kiosk to be located within property boundary

Existing Stormwater: DN375 RCRRJ Council owned pipeline within 3m wide Maintenance Access Corridor and 2.4m wide easement. May need to be upsized.

Lot E Wastewater Discharge - Alternative Option - Construct new wastewater lateral subject site wastewater connection

Fire fighting WS:
- DN180 (ID 150mm) PE connection TBC by fire engineer.

Fibre extended to new pit with two new breakout connections.

LOT E
Primary Stormwater Discharge Option 1 - to existing DN375 pipeline

Fire fighting Pump Set
- Location and details TBC.

Lot E Potable WS:
- Connection pipe size to be confirmed.

LOT E
Primary Stormwater Discharge Option 2 - to existing kerb

WS Enclosure (Potable and FF):
Above ground enclosure to include backflow preventer for fire fighting supply and potable supply. Dimensions approx. 5m L x 1m W x 1.2m H (subject to product selection). Location to be confirmed at detailed design (not required directly on the boundary)

Lot E Wastewater Discharge - Preferred Option - Construct new wastewater lateral to existing Wastewater Main.

Primary Stormwater Discharge Option 2 - to existing DN375 pipeline

Fire Fighting WS:
- Connection to existing DN100 Madras Street Water Main.

Existing Water Submain (GPR), possibly abandoned?

Existing DN50 Water Submain:

Fibre extended to new pit with breakout connection to site.

Existing Stormwater: DN375 RCRRJ under kerb and channel

Potable WS:
- 63OD connection. Pipe size to be confirmed by hydraulics engineer (Protech).

Existing DN100 Water Main:

Existing DN225 Wastewater Main

Existing WWMH ID#47469 IL 12.85

Existing WWMH ID#94008 IL 12.65

Wastewater Discharge Option 3 - Construct new wastewater lateral to WWMH.

MADRAS STREET

PURCHAS STREET

Surplus Area

Lot E

PROPOSED SUPERMARKET
3550m²
(Incl. Mezz Office 200m²
Excl. Plantroom & Lobby)
+
ONLINE 150m²
FFL 15.45m

RETAIL B 495m² (APPROX.) + COMMERCIAL 495m² ABOVE (APPROX.)
CAFE 100m² (APPROX.)
LOBBY 145m²
KIOSK
RETAIL A 215m²
ONLINE 150m²
PARK 190m² (Approx.)
TRUCK TURNING CIRCLE RL 15.25
EXISTING BUILDING
EXISTING BUILDING
INDICATIVE ROOFTOP PLANT
GENSET
LOAD
CANOPY OVER
REFUSE AREA
STAFF BICYCLE PARKS 8 DP 557656
TRUCK ONLY
ENTRY
EXIT
NEW ENTRY SIGN
TO BE CONFIRMED
RETAIN EXISTING TI KOUKA CABBAGE TREE
RELOCATION SIGN REFER TO PYLON SIGN A
EL 15.30
EL 15.00
EL 14.80
EL 15.10
EL 15.15
EL 15.20

Lot 1 DP EB401220
Lot 9 DP 319522
Lot 13 DP 498939
Lot 10 DP 498939
Lot 12 DP 498939
Lot 14 DP 498939
Lot 2 DP 565530
Lot 16 DP 557656
Lot 15 DP 557656
Lot 14 DP 557656
Lot 13 DP 557656
Lot 12 DP 557656
Lot 11 DP 557656
Lot 10 DP 557656
Lot 9 DP 557656
Lot 7 DP 557656
Lot 5 DP 557656
Lot 3 DP 557656
Lot 4 DP 357905
Lot 3 DP 357905

SURVEY INFORMATION

SURVEYED	G. Bourdin
SURVEY DATE	02.07.2024
COORD SYSTEM	NZGD2000/ Mt Pleasant Circuit
DATUM	C.D.D
ORIGIN OF LEVELS	EKL9 (BM0331)

REV.	DRAWN	DATE	NOTE
B	GG	07.08.24	Revised servicing options
A	GG	24.07.24	Preliminary Issue

CLIENT
Woolworths New Zealand

DESIGNED	SCC
DRAWN	GG
REVIEWED	DK
APPROVED	24.07.24 LJJ
STATUS	PRELIMINARY
SCALE	1:400 [A1] 1:800 [A3]

PROPOSED SUPERMARKET

484 MADRAS STREET
CHRISTCHURCH 8014

PRELIMINARY SERVICING PLAN

PROJECT	SET	SHEET	REV.
532253	C1	C400	B

eliot sinclair

Appendix G. Earthworks Drawings

G:\Jobs\53\532253\Drawings\CAD\532253 C1-C100 Earthworks

N

0 8m 16m 24m 32m 40m
1:400

PACKE STREET

MADRAS STREET

PURCHAS STREET

EXISTING BUILDING

EXISTING BUILDING

Lot 1 DP 319522

Lot 9 DP 319522

Lot 13 DP 498939

Lot 10 DP 498939

Lot 12 DP 498939

Lot 14 DP 498939

Lot 1 DP 340171

Lot 2 DP 319522

Lot 2 DP 565530

Lot 100 DP 590301

Lot 16 DP 557656

Lot 15 DP 557656

Lot 14 DP 557656

Lot 13 DP 557656

Lot 12 DP 557656

Lot 11 DP 557656

Lot 10 DP 557656

Lot 9 DP 557656

Lot 8 DP 557656

Lot 7 DP 557656

Lot 6 DP 557656

Lot 5 DP 557656

Lot 4 DP 557656

Lot 3 DP 557656

Lot 1 DP 557656

Lot 4 DP 371459

Lot 3 DP 357905

Lot 66 DP 953

SURPLUS AREA 2410m² (Approx.)

LOT E 2224m² (Approx.)

PROPOSED SUPERMARKET 3550m²
FFL 15.45

RETAIL B
495m²
(APPROX.)

COMMERCIAL
495m² ABOVE
(APPROX.)

CAFE 100m²
(APPROX.)

LOBBY 145m²

KIOSK

RETAIL A
215m²

ONLINE
150m²

DISCLAIMER
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NOTES

1. Original ground surface based on topographical survey dated July 2024 by Eliot Sinclair & Partmers.
2. Drawings to be read as a complete set with Civil Packages.
3. The design surface shown is for estimating approximate earthwork volumes only.

LEGEND

- Construction Boundary
- Existing Ground Level
- Proposed finished surface major contour - 1.0 m interval
- Proposed finished surface minor contour - 0.1 m interval
- Secondary Flow Path
- Existing 3.0m wide stormwater / pipeline maintenance access corridor
- Stormwater easement
- Proposed easement (assuming stormwater pipeline ownership to remain with CCC)

SURVEY INFORMATION

SURVEYED	**G. Bourdin**
SURVEY DATE	**02.07.2024**
COORD SYSTEM	**NZGD2000/ Mt Pleasant Circuit**
DATUM	**C.D.D**
ORIGIN OF LEVELS	**EKL9 (BM0331)**

REV.	DRAWN	DATE	NOTE
A	**GG**	**07.08.24**	**Preliminary Issue**

CLIENT

Woolworths

DESIGNED	**SCC**
DRAWN	**GG**
REVIEWED	**DK**
APPROVED	**07.08.24 LJJ**
STATUS	**PRELIMINARY**
SCALE	**1:400 [A1] 1:800 [A3]**

PROPOSED SUPERMARKET

484 MADRAS STREET
CHRISTCHURCH 8014

PRELIMINARY DESIGN FINISHED SURFACE PLAN

PROJECT	SET	SHEET	REV.
532253	**C1**	**C101**	**A**

eliot sinclair

G:\Jobs\53\532253\Drawings\CAD\532253 C1-C100 Earthworks



0 8m 16m 24m 32m 40m

1:400

CUT/FILL LEGEND

CUT DEPTH	FILL DEPTH
0.10 to 0.00m	0.00 to 0.10m
0.20 to 0.10m	0.10 to 0.20m
0.30 to 0.20m	0.20 to 0.30m
0.40 to 0.30m	0.30 to 0.40m
0.50 to 0.40m	0.40 to 0.50m
0.60 to 0.50m	
0.70 to 0.60m	
0.80 to 0.70m	
0.90 to 0.80m	
1.00 to 0.90m	

SURVEY INFORMATION

SURVEYED	**G. Bourdin**
SURVEY DATE	**02.07.2024**
COORD SYSTEM	**NZGD2000/ Mt Pleasant Circuit**
DATUM	**C.D.D**
ORIGIN OF LEVELS	**EKL9 (BM0331)**

DISCLAIMER
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NOTES

1. Depths shown are calculated from existing ground level with 300mm site strip to design subgrade level.
2. Original ground surface based on topographical survey dated July 2024 by Eliot Sinclair & Partners.
3. Drawings to be read as a complete set with Civil Packages.
4. All dimensions are in metres unless noted otherwise. All levels, meterages, stations and coordinates are expressed in metres.
5. All easements, covenants and other legal instruments associated with this site may not be shown on this plan. An investigation of the most current legal records should be undertaken prior to design and construction commencing.
6. This plan is issued for a specific project and may not be altered or used for any other purpose without the prior written consent of Eliot Sinclair.
7. Cut/fill depths are based on preliminary bulk earthworks design and is subject to detailed design of the finished ground levels.
8. Any measurements taken from information which is not dimensioned on the electronic copy are at the risk of the recipient.
9. This plan has been prepared for resource consent purposes only. No liability is accepted if the plan is used for any other purposes.
10. This plan is subject to the granting of resource consents and should be treated as a proposal until such time as the necessary consents have been granted by the relevant authorities.

REV.	DRAWN	DATE	NOTE
B	**GG**	**11.09.24**	**Building EW's removed**
A	**GG**	**07.08.24**	**Preliminary Issue**

CLIENT

Woolworths

DESIGNED	**SCC**
DRAWN	**GG**
REVIEWED	**DK**
APPROVED	**07.08.24 LJJ**
STATUS	**PRELIMINARY**
SCALE	**1:400 [A1] 1:800 [A3]**

PROPOSED SUPERMARKET

484 MADRAS STREET
CHRISTCHURCH 8014

CUT/FILL FROM EXISTING GL WITH SITE STRIP TO DESIGN SUBGRADE

PROJECT	SET	SHEET	REV.
532253	**C1**	**C102**	**B**

eliot sinclair

G:\Jobs\53\532253\Drawings\CAD\532253 C1-C100 Earthworks



0 8m 16m 24m 32m 40m

1:400

CUT/FILL LEGEND

CUT DEPTH		FILL DEPTH	
0.10 to 0.00m		0.00 to 0.10m	
0.20 to 0.10m		0.10 to 0.20m	
0.30 to 0.20m		0.20 to 0.30m	
0.40 to 0.30m		0.30 to 0.40m	
0.50 to 0.40m		0.40 to 0.50m	
0.60 to 0.50m		0.50 to 0.60m	
0.70 to 0.60m			

SURVEY INFORMATION

SURVEYED	**G. Bourdin**
SURVEY DATE	**02.07.2024**
COORD SYSTEM	**NZGD2000/ Mt Pleasant Circuit**
DATUM	**C.D.D**
ORIGIN OF LEVELS	**EKL9 (BM0331)**

DISCLAIMER
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NOTES

1. Depths shown are calculated from existing ground level to design finished surface level.
2. Original ground surface based on topographical survey dated July 2024 by Eliot Sinclair & Partners.
3. Bulk earthworks quantities

Total Cut	Total Fill
4,700m³	5,600m³
Total Earthworks	Net Earthworks
10,300m³	900m³ FILL

4. Design subgrade level is based on:
   - Earthworks within 1.8m of building foundations excluded.
   - 300mm site strip.
   - 550mm pavement thickness for car park areas below design finished surface.
   - 1075mm below finished floor level for buildings.
   - 500mm below design finished surface level for proposed concrete pavements on the loading area to the north-east side of the building and at proposed vehicle entrances.
   - 700mm pavement thickness for the loading lane between the proposed northern vehicle access and the loading area.
   - 300mm below design finished surface level for non-trafficked pavements and landscaped areas.
6. Volumes are solid volumes, no adjustment for reject material, consolidation, compaction or bulking.
7. No allowance has been made for the excavation of services/utility trenches or building foundations.
8. Drawings to be read as a complete set with Civil Packages.
9. All dimensions are in metres unless noted otherwise. All levels, meterages, stations and coordinates are expressed in metres.
10. All easements, covenants and other legal instruments associated with this site may not be shown on this plan. An investigation of the most current legal records should be undertaken prior to design and construction commencing.
11. This plan is issued for a specific project and may not be altered or used for any other purpose without the prior written consent of Eliot Sinclair.
12. Cut/fill depths are based on preliminary bulk earthworks design and is subject to detailed design of the finished ground levels.
13. Any measurements taken from information which is not dimensioned on the electronic copy are at the risk of the recipient.
14. This plan has been prepared for resource consent purposes only. No liability is accepted if the plan is used for any other purposes.
15. This plan is subject to the granting of resource consents and should be treated as a proposal until such time as the necessary consents have been granted by the relevant authorities.

REV.	DRAWN	DATE	NOTE
B	**GG**	**11.09.24**	**Building EW's removed**
A	**GG**	**07.08.24**	**Preliminary Issue**

CLIENT

Woolworths

DESIGNED	**SCC**
DRAWN	**GG**
REVIEWED	**DK**
APPROVED	**07.08.24 LJJ**
STATUS	**PRELIMINARY**
SCALE	**1:400 [A1] 1:800 [A3]**

PROPOSED SUPERMARKET

484 MADRAS STREET
CHRISTCHURCH 8014

CUT / FILL FROM EXISTING GROUND TO DESIGN FINISHED SURFACE

PROJECT	SET	SHEET	REV.
532253	**C1**	**C103**	**B**

eliot sinclair

Appendix H. Christchurch City Council Correspondence

Simon Crundwell

From:	FloorLevels <FloorLevels@ccc.govt.nz>
Sent:	Wednesday, 3 July 2024 3:08 pm
To:	Simon Crundwell
Subject:	486 Madras Street - Floor Levels - 03/07/2024
Attachments:	486 Madras St 200y.png; 50 Madras St 50y.png; 486 Madras St 10y.png; 486 Madras St Ground Levels.png

Kia Ora Simon

Please find below a finished floor level (FFL) and flood assessment for 486 Madras Street. Please note due to the nature of the large site I have provided flood and floor levels at two locations, indicated on the screenshots attached.

Finished Floor Levels Requirements

NZ Building Code:

Minimum FFL required for compliance with Clause E1 of the New Zealand Building Code based on providing protection from a 1 in 50 year flood event with sea level rise allowance (0.45m or 0.5m) and 400mm freeboard.
This FFL may not be required for all structures and is for building code performance purposes only. Where a specific FFL is not required, compliance with the Building Code can be established using the solutions in E1/AS1.

The FFL requirement is currently:
- For x1, 15.33 m RL.
- For x2, 15.43 m RL.

Please contact the duty Building Consent Officer dutyBCO@ccc.govt.nz for more information.

Christchurch District Plan:

Property or parts of it in District Plan Flood Management Area: Yes
Property or parts of it in District Plan Fixed Minimum Floor Level Overlay: No

Minimum FFL required for compliance with Chapter 5.4 Flood Hazard Rules of the District Plan for properties located within the Flood Management Area. Resource consent is required if the minimum FFL is not met. A limited number of structures are exempt from meeting this FFL.

The FFL requirement is currently:
- For x1, 15.36 m RL.
- For x2, 15.45 m RL.

Flood Management Area FFLs are set using criteria set out in Chapter 5.4 of the Christchurch District Plan. Please contact the Duty Planner (03 941 8999 or dutyplanner@ccc.govt.nz) for more information.

Predicted Flood Levels

Predicted 1 in 10 year water level:
- For x1, 14.88 m RL.
- For x2, 15.01 m RL.

This is the predicted maximum water level in a 1 in 10 year flood event. The prediction does not include sea level rise nor an increase in rainfall intensities as a result of climate change. This estimation is based on the current flood hazard information and may be updated once new data becomes available. The level is not considered for FFL purposes. The management of this more

frequent floodplain displacement is subject to stricter regulations under the Building Act and Stormwater and Land Drainage Bylaw 2022. Therefore guidance is required from a CCC Stormwater Planner (Sheryl Keenan sheryl.keenan@ccc.govt.nz) if the property is affected by the 1 in 10 year flood event.

Predicted 1 in 50 year water level:

- For x1, 14.93 m RL.
- For x2, 15.03 m RL.

This is the predicted maximum water level in a 1 in 50 year flood event. The prediction allows for sea level rise(0.45m or 0.5m) and an increase in rainfall intensities as a result of climate change. This level is based on the current flood hazard information and may be updated once new data becomes available.

Predicted 1 in 200 year water level:

- For x1, 14.96 m RL.
- For x2, 15.05 m RL.

This is the predicted maximum water level in a 1 in 200 year flood event. The prediction allows for 1.0 m sea level rise and an increase in rainfall intensities as a result of climate change. This level is based on the current flood hazard information and maybe updated once new data becomes available.

Estimated Ground Levels

Our latest LiDAR information indicates that the average ground elevation are: I have attached a screenshot noting the different properties as your proposed area spans multiple existing properties.

Disclaimer

i. All levels are provided in Christchurch Drainage Datum.
ii. Please note that any Flood Level estimate(s) may differ from observed levels in previous or future events.
iii. The FFL assessment is for flood limitation purposes only, and does not include consideration for other building consent aspects such as on-site drainage or service connections.
iv. Any consent application lodged for this site will be assessed based on the most recent flood modelling information available at the time of lodgement, and the above level is subject to change if the flood modelling information for this area is updated.
v. The content of this email does not constitute a 'Minimum Floor Level Certificate' as defined in the District Plan (Rule 5.4.1.2). To request one, submit a P-022 form, located within the District Plan Certificates tab here.

Further information regarding floor level requirements, flooding and floor levels map is available on the CCC website. If you have any further floor level queries, contact the team at floorlevels@ccc.govt.nz.

Ngā mihi,

Sofie Thielemans

Planning Engineer (Contractor)
Asset Planning - Stormwater & Waterways
(she/her)

03 941 8999
Sofie.Thielemans@ccc.govt.nz
Te Hononga Civic Offices, 53 Hereford Street, Christchurch
PO Box 73014, Christchurch 8154

Christchurch City Council

From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Tuesday, July 2, 2024 9:25 AM
To: FloorLevels <FloorLevels@ccc.govt.nz>
Cc: Liam Jagvik <LJJ@eliotsinclair.co.nz>
Subject: FW: [#532253] Confidential: 486 Madras St - Stormwater investigations

Hi There,

Can you please confirm the required floor levels and confirm building platform requirements for the proposed development (i.e. to avoid a hazard notice) for the site described below?

Cheers,

eliot sinclair

Simon Crundwell
CIVIL ENGINEER
BE(Hons) Civil
+64 3 379 4014 ext. 192
eliotsinclair.co.nz
Christchurch | Rangiora| Wānaka
Queenstown | Hokitika | Nelson

Caution: This email (including any attachments) may contain confidential and privileged information. If you have received it in error, please 1) notify the sender by return email (or telephone) and then delete this email, together with all attachments and your reply and 2) do not act on this email in any other way. Please visit https://www.eliotsinclair.co.nz/terms-conditions for important information concerning this message. Thank you.

From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Tuesday, July 2, 2024 9:14 AM
To: StormwaterApprovals <Stormwater.Approvals@ccc.govt.nz>
Subject: [#532253] Confidential: 486 Madras St - Stormwater investigations

Hi there,

Eliot Sinclair has been engaged by our client to carry out due diligence for a proposed commercial development (including a supermarket, various commercial and retail buildings, carpark and a café) located at 486 Madras Street.

The site has previously been utilised by Orion as a hardstand sealed storage yard and as a grazing paddock for livestock (as shown in the image below on the left hand side). The site is currently covered by long grass, trees, concreted areas and is relatively flat (as shown in the image below on the right hand side).



2000-2004 Canterbury historical aerial imagery

Curren

There is an existing DN375 RCRR CCC owned stormwater pipeline crossing the site in a north-south direction. The site is subject to a right (in gross) to drain water in favour of the Christchurch City Council created by Transfer 42371. Within the subject site there are field sumps and private drainage networks that connect to this pipeline. We anticipate that CCC will require any development of the site to include discharging all site runoff into the existing DN375 pipe.



The site is located within a Christchurch City flood management area. Our understanding of the site is that:

- The predicted 1 in 200 year water level is 15.05m RL
- The FFL requirement is currently 15.45m RL for residential and 15.35m RL for commercial
- CCC LiDAR information (dated 2018-2019) indicates that the average ground level at the property is approximately 15.25m RL and ranges between 14.77 to 15.67m RL.

ENGEO has carried out a DSI for this site. Their report identified historical activities included on the HAIL register. Their report provides recommendations if the proposed redevelopment is to go ahead.

We anticipate that CCC will require the following:

- Site runoff flow to be restricted to no more than pre-development rates
- Trafficable hardstand areas to be treated as per the district plan
- Flood storage volume assessment

Can you please provide answers to the following questions:

- Please confirm if a flood displacement and compensatory storage assessment will be required (including the flood events and levels associated with this assessment).
- Please confirm the stormwater quantity requirements for this site (i.e. which rainfall events and durations require attenuation)?
- We will determine the pre-development site coverage based on the original Orion storage yard historical imagery. Please confirm this approach is acceptable.
- Please provide CCCs stormwater quality requirements for this site. Note that we anticipate using proprietary treatment device(s) (i.e. Stormwater 360 or Atlan products)
- Please confirm acceptable connection points to existing CCC SW infrastructure for both primary and secondary flow.

- Note that we anticipate treatment, detained and primary flows will be discharged to the existing DN375 pipe crossing centrally through the site. Do Council have a predicted 1 in 10 year hydraulic grade line for this pipeline, or predicted HGLs for any other rainfall events?
- Please confirm that this site will be covered under the CCC global consents for construction and operational phase (assuming an environmental assessment is provided under the NES and any necessary site remediation is carried out).
- Please advise any restrictions around construction within the existing stormwater easement (in gross) including any surfacing requirements.
- We may need to consider subsoil drainage for this site due to high groundwater. Would the Council accept subsoil drainage under the operational phase discharge approval within a future carpark area?

Please let me know if you require any further information.

Cheers,

Simon Crundwell

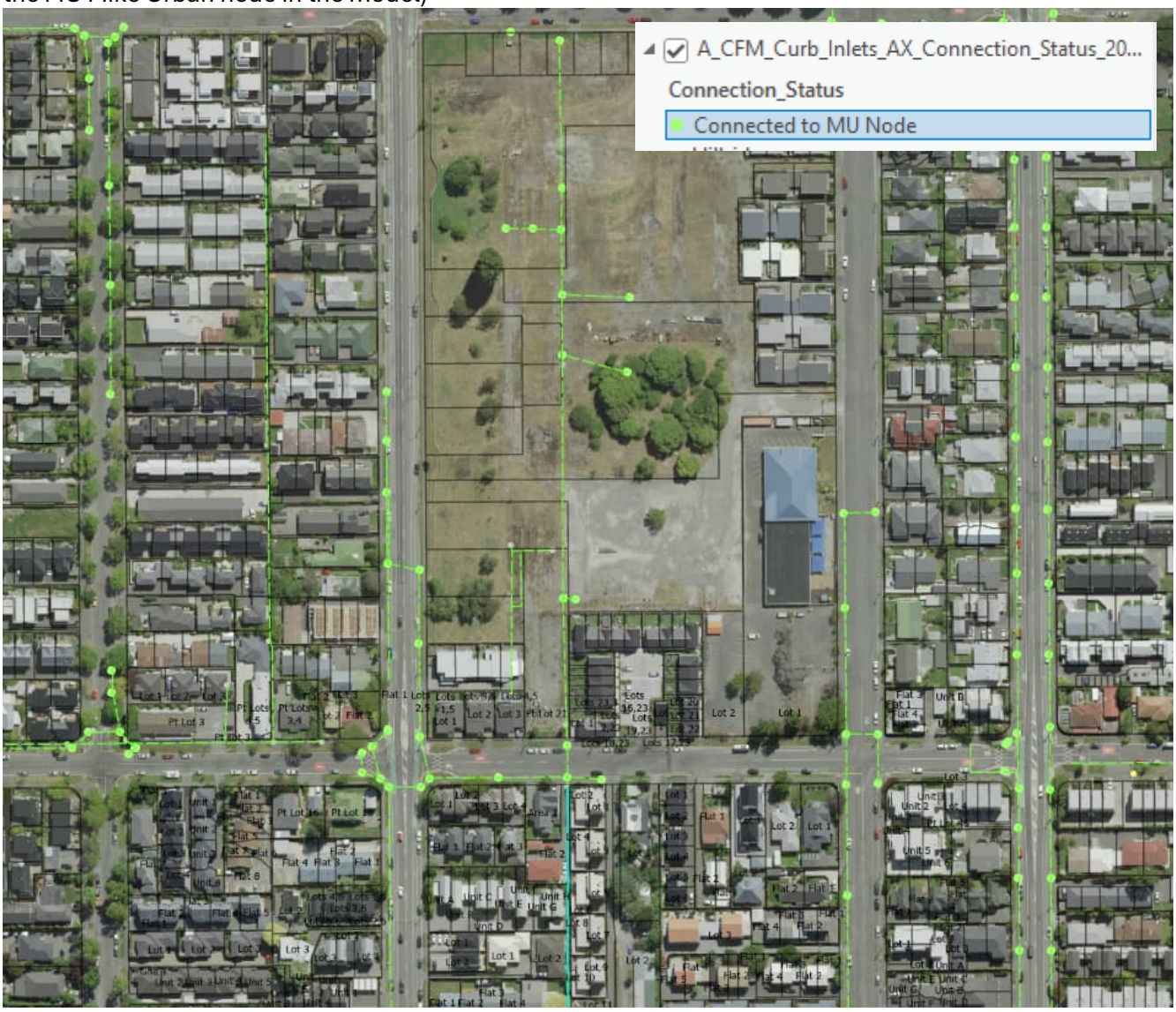
From: FloorLevels <FloorLevels@ccc.govt.nz>
Sent: Monday, 5 August 2024 3:24 pm
To: Simon Crundwell
Cc: Keenan, Sheryl; Duncan Kemsley
Subject: 486 Madras Street - Floor Levels - 05/08/2024

[EXTERNAL EMAIL: Always check the FROM address of an email and treat links and attachments with caution. Check with Helpdesk if unsure.]

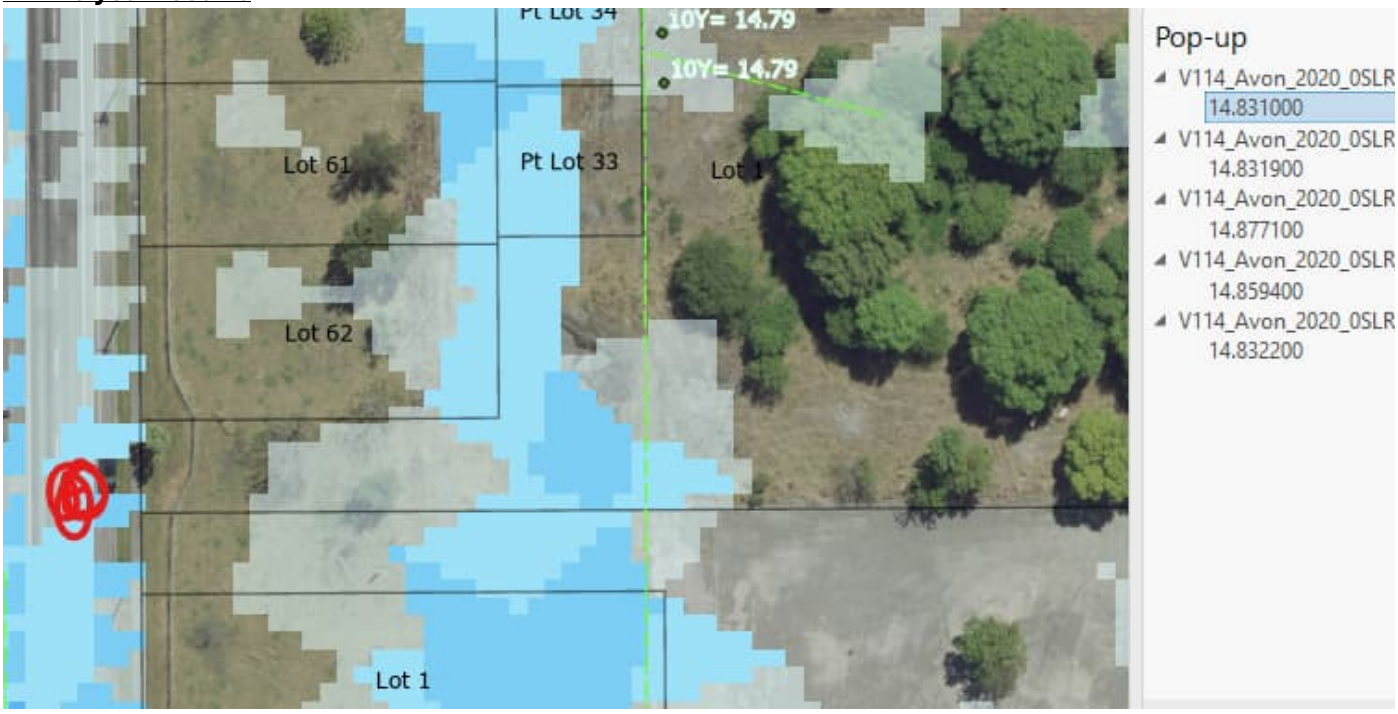
Kia Ora Simon

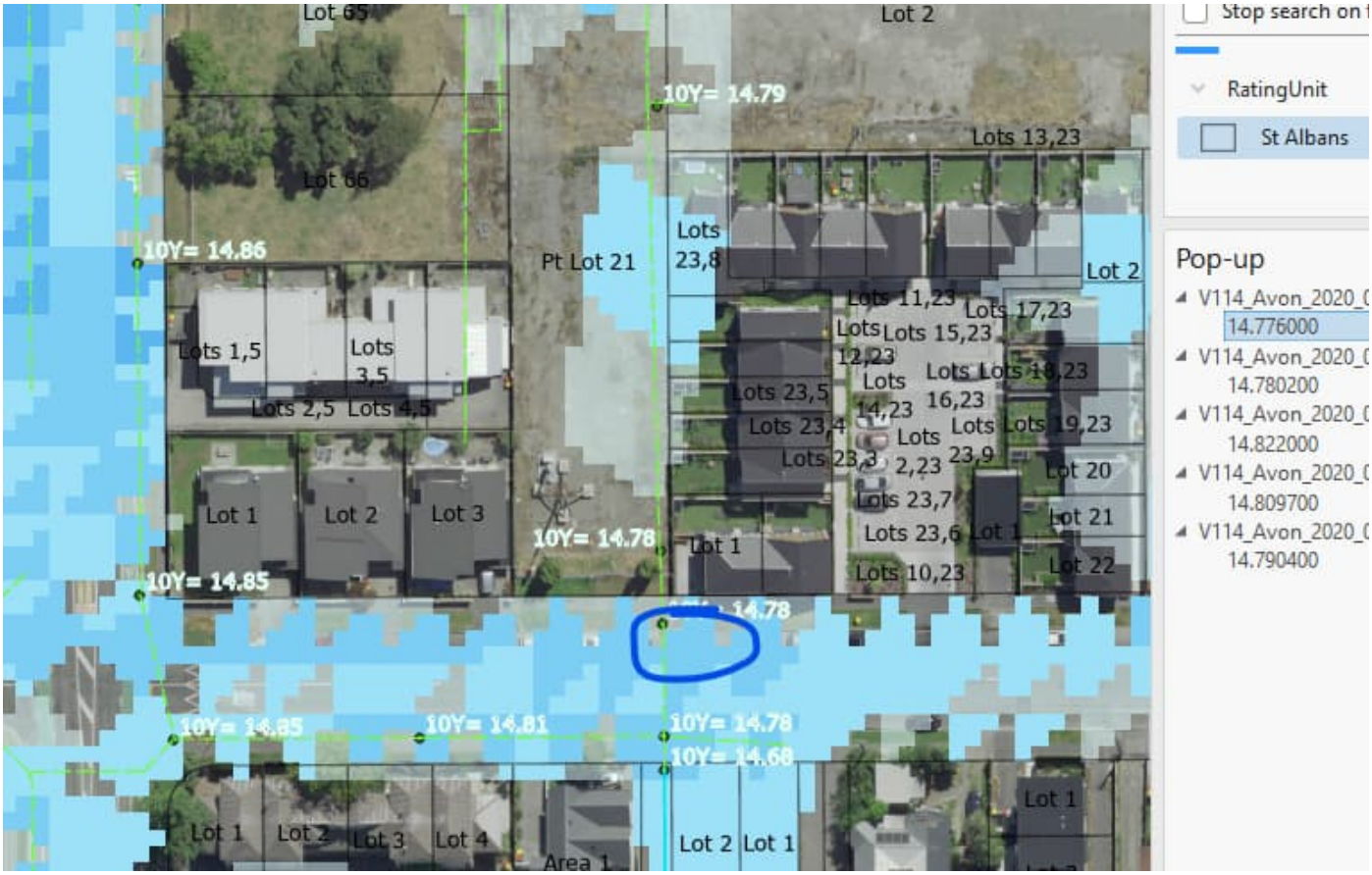
Thanks for your email. I have provided some screenshots below of the 2d modelling results for the durations we have available. I note Sheryl has previously provided the 1D TWL on Purchas St and commentary on the modelling in this area.

In addition to Sheryl's commentary and in response to your question about the council SW pipes - yes, the flood models include all stormwater pipes >300mm diameter. See below the stormwater network incorporated into the flood model in your area of interest (note the green circle indicates it is connected into the MU Mike Urban node in the model)



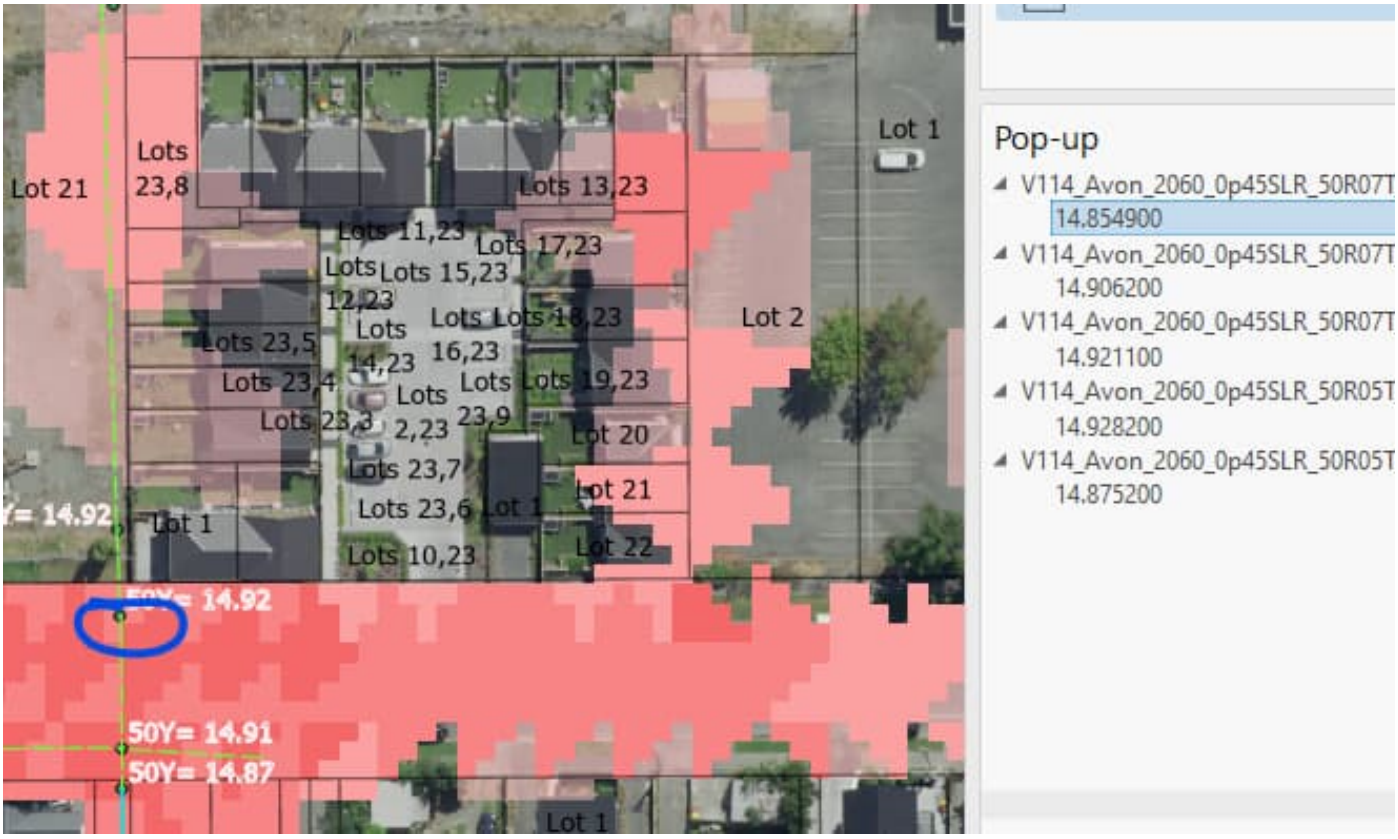
1 in 10 year results





1 in 50 year results





I hope that helps and please let us know if you have any more questions.

Ngā mihi,

Sofie Thielemans

Planning Engineer (Contractor)
Asset Planning - Stormwater & Waterways
(she/her)

03 941 8999

Sofie.Thielemans@ccc.govt.nz

Te Hononga Civic Offices, 53 Hereford Street, Christchurch

PO Box 73014, Christchurch 8154

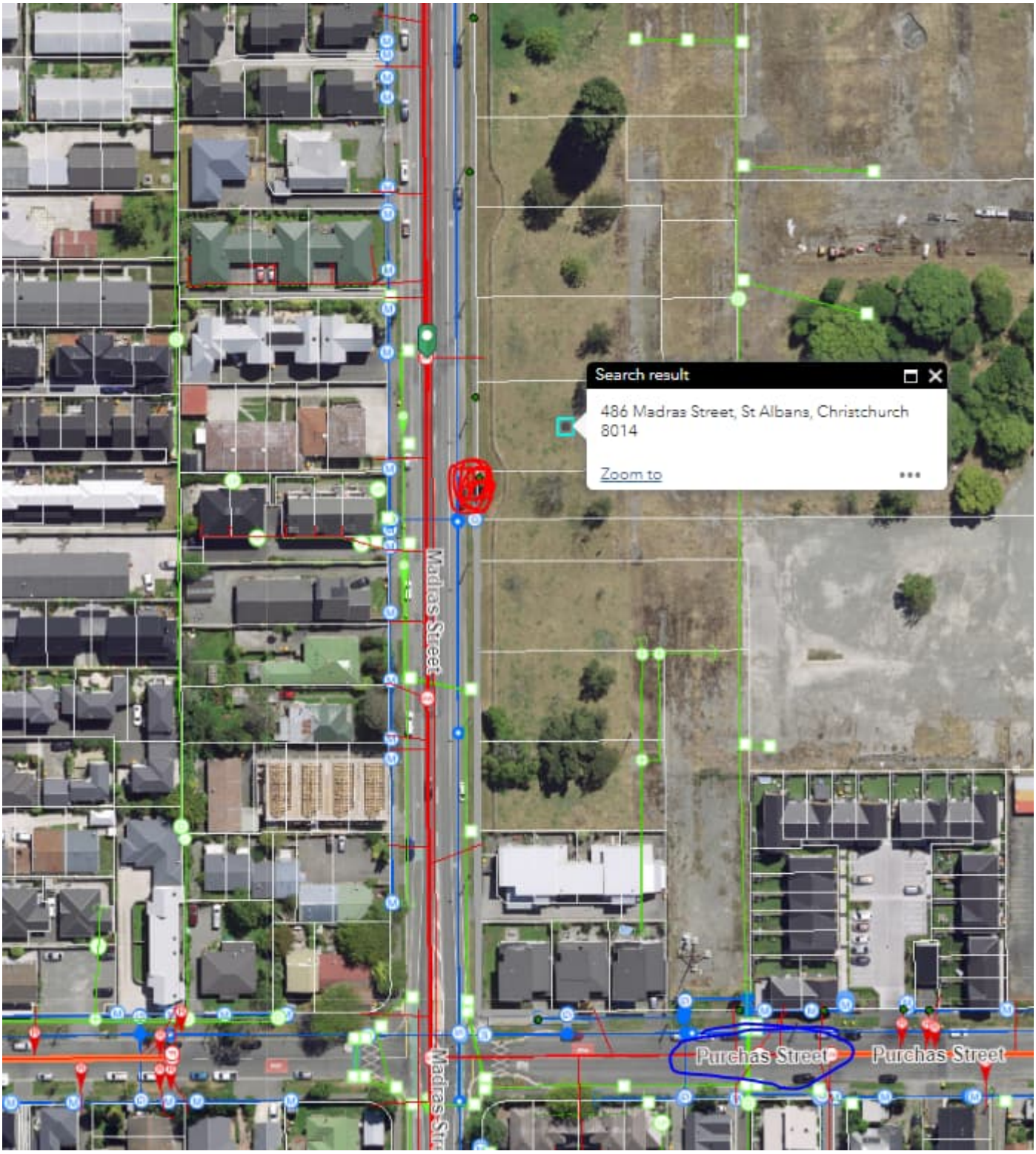
ccc.govt.nz

Christchurch City Council

From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Tuesday, July 30, 2024 12:14 PM
To: FloorLevels <FloorLevels@ccc.govt.nz>
Cc: Keenan, Sheryl <Sheryl.Keenan@ccc.govt.nz>; Duncan Kemsley <djk@eliotsinclair.co.nz>
Subject: [#532253] 486 Madras Street - Floor Levels - 03/07/2024

Hi Sofie,

I am working on the stormwater design for a proposed development at 486 Madras Street. There is an existing DN375 pipe which runs through the site and crosses Purchas Street (refer blue circle in screenshot below).



We are likely to discharge site stormwater via this existing pipeline. As an alternative, we could potentially discharge part or all of the side to the Madras Street kerb (red circle above).

We need to provide stormwater attenuation for the site for all events up to and including the 50 year 24 hour event. In order to determine the hydraulics for the proposed stormwater system, we need to understand tailwater levels for various events. Could you please provide the following information for both Madras Street (red circle) and Purchase Street (blue circle):

- 10 year predicted flood levels for 10minute, 30minute, 1 hour, 6 hour, 12 hour and 24 hour events
- 50 year predicted flood levels for 10minute, 30minute, 1 hour, 6 hour, 12 hour and 24 hour events

Out of interest, can you confirm if the CCC flood model accounts for the hydraulic capacity of the Council SW pipelines in this area?

Cheers,

Simon Crundwell
CIVIL ENGINEER
BE(Hons) Civil
+64 3 379 4014 ext. 192
eliotsinclair.co.nz
Christchurch | Rangiora | Wānaka
Queenstown | Hokitika | Nelson

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From: FloorLevels <FloorLevels@ccc.govt.nz>
Sent: Wednesday, July 3, 2024 3:08 PM
To: Simon Crundwell <sc@eliotsinclair.co.nz>
Subject: 486 Madras Street - Floor Levels - 03/07/2024

Kia Ora Simon

Please find below a finished floor level (FFL) and flood assessment for 486 Madras Street. Please note due to the nature of the large site I have provided flood and floor levels at two locations, indicated on the screenshots attached.

Finished Floor Levels Requirements

NZ Building Code:

Minimum FFL required for compliance with Clause E1 of the New Zealand Building Code based on providing protection from a 1 in 50 year flood event with sea level rise allowance (0.45m or 0.5m) and 400mm freeboard.
This FFL may not be required for all structures and is for building code performance purposes only. Where a specific FFL is not required, compliance with the Building Code can be established using the solutions in E1/AS1.

The FFL requirement is currently:
- For x1, 15.33 m RL.
- For x2, 15.43 m RL.

Please contact the duty Building Consent Officer dutyBCO@ccc.govt.nz for more information.

Christchurch District Plan:

Property or parts of it in District Plan Flood Management Area: Yes
Property or parts of it in District Plan Fixed Minimum Floor Level Overlay: No

Minimum FFL required for compliance with Chapter 5.4 Flood Hazard Rules of the District Plan for properties located within the Flood Management Area. Resource consent is required if the minimum FFL is not met. A limited number of structures are exempt from meeting this FFL.

The FFL requirement is currently:
- For x1, 15.36 m RL.
- For x2, 15.45 m RL.

Flood Management Area FFLs are set using criteria set out in Chapter 5.4 of the Christchurch District Plan. Please contact the Duty Planner (03 941 8999 or dutyplanner@ccc.govt.nz) for more information.

Predicted Flood Levels

Predicted 1 in 10 year water level:

- For x1, 14.88 m RL.
- For x2, 15.01 m RL.

This is the predicted maximum water level in a 1 in 10 year flood event. The prediction does not include sea level rise nor an increase in rainfall intensities as a result of climate change. This estimation is based on the current flood hazard information and may be updated once new data becomes available. The level is not considered for FFL purposes. The management of this more frequent floodplain displacement is subject to stricter regulations under the Building Act and Stormwater and Land Drainage Bylaw 2022. Therefore guidance is required from a CCC Stormwater Planner (Sheryl Keenan sheryl.keenan@ccc.govt.nz) if the property is affected by the 1 in 10 year flood event.

Predicted 1 in 50 year water level:

- For x1, 14.93 m RL.
- For x2, 15.03 m RL.

This is the predicted maximum water level in a 1 in 50 year flood event. The prediction allows for sea level rise(0.45m or 0.5m) and an increase in rainfall intensities as a result of climate change. This level is based on the current flood hazard information and may be updated once new data becomes available.

Predicted 1 in 200 year water level:

- For x1, 14.96 m RL.
- For x2, 15.05 m RL.

This is the predicted maximum water level in a 1 in 200 year flood event. The prediction allows for 1.0 m sea level rise and an increase in rainfall intensities as a result of climate change. This level is based on the current flood hazard information and maybe updated once new data becomes available.

Estimated Ground Levels

Our latest LiDAR information indicates that the average ground elevation are: I have attached a screenshot noting the different properties as your proposed area spans multiple existing properties.

Disclaimer

i. All levels are provided in Christchurch Drainage Datum.
ii. Please note that any Flood Level estimate(s) may differ from observed levels in previous or future events.
iii. The FFL assessment is for flood limitation purposes only, and does not include consideration for other building consent aspects such as on-site drainage or service connections.
iv. Any consent application lodged for this site will be assessed based on the most recent flood modelling information available at the time of lodgement, and the above level is subject to change if the flood modelling information for this area is updated.
v. The content of this email does not constitute a 'Minimum Floor Level Certificate' as defined in the District Plan (Rule 5.4.1.2). To request one, submit a P-022 form, located within the District Plan Certificates tab here.

Further information regarding floor level requirements, flooding and floor levels map is available on the CCC website. If you have any further floor level queries, contact the team at floorlevels@ccc.govt.nz.

Ngā mihi,

Sofie Thielemans
Planning Engineer (Contractor)
Asset Planning - Stormwater & Waterways
(she/her)

03 941 8999
Sofie.Thielemans@ccc.govt.nz
Te Hononga Civic Offices, 53 Hereford Street, Christchurch
PO Box 73014, Christchurch 8154
ccc.govt.nz

Christchurch City Council

From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Tuesday, July 2, 2024 9:25 AM
To: FloorLevels <FloorLevels@ccc.govt.nz>
Cc: Liam Jagvik <LJJ@eliotsinclair.co.nz>
Subject: FW: [#532253] Confidential: 486 Madras St - Stormwater investigations

Hi There,

Can you please confirm the required floor levels and confirm building platform requirements for the proposed development (i.e. to avoid a hazard notice) for the site described below?

Cheers,

Simon Crundwell
CIVIL ENGINEER
BE(Hons) Civil
+64 3 379 4014 ext. 192
eliotsinclair.co.nz
Christchurch | Rangiora| Wānaka
Queenstown | Hokitika | Nelson

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From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Tuesday, July 2, 2024 9:14 AM
To: StormwaterApprovals <Stormwater.Approvals@ccc.govt.nz>
Subject: [#532253] Confidential: 486 Madras St - Stormwater investigations

Hi there,

Eliot Sinclair has been engaged by our client to carry out due diligence for a proposed commercial development (including a supermarket, various commercial and retail buildings, carpark and a café) located at 486 Madras Street.

The site has previously been utilised by Orion as a hardstand sealed storage yard and as a grazing paddock for livestock (as shown in the image below on the left hand side). The site is currently covered by long grass, trees, concreted areas and is relatively flat (as shown in the image below on the right hand side).



2000-2004 Canterbury historical aerial imagery

Curren

There is an existing DN375 RCRR CCC owned stormwater pipeline crossing the site in a north-south direction. The site is subject to a right (in gross) to drain water in favour of the Christchurch City Council created by Transfer 42371. Within the subject site there are field sumps and private drainage networks that connect to this pipeline. We anticipate that CCC will require any development of the site to include discharging all site runoff into the existing DN375 pipe.



The site is located within a Christchurch City flood management area. Our understanding of the site is that:

- The predicted 1 in 200 year water level is 15.05m RL
- The FFL requirement is currently 15.45m RL for residential and 15.35m RL for commercial
- CCC LiDAR information (dated 2018-2019) indicates that the average ground level at the property is approximately 15.25m RL and ranges between 14.77 to 15.67m RL.

ENGEO has carried out a DSI for this site. Their report identified historical activities included on the HAIL register. Their report provides recommendations if the proposed redevelopment is to go ahead.

We anticipate that CCC will require the following:

- Site runoff flow to be restricted to no more than pre-development rates
- Trafficable hardstand areas to be treated as per the district plan
- Flood storage volume assessment

Can you please provide answers to the following questions:

- Please confirm if a flood displacement and compensatory storage assessment will be required (including the flood events and levels associated with this assessment).
- Please confirm the stormwater quantity requirements for this site (i.e. which rainfall events and durations require attenuation)?
- We will determine the pre-development site coverage based on the original Orion storage yard historical imagery. Please confirm this approach is acceptable.
- Please provide CCCs stormwater quality requirements for this site. Note that we anticipate using proprietary treatment device(s) (i.e. Stormwater 360 or Atlan products)
- Please confirm acceptable connection points to existing CCC SW infrastructure for both primary and secondary flow.

- Note that we anticipate treatment, detained and primary flows will be discharged to the existing DN375 pipe crossing centrally through the site. Do Council have a predicted 1 in 10 year hydraulic grade line for this pipeline, or predicted HGLs for any other rainfall events?
- Please confirm that this site will be covered under the CCC global consents for construction and operational phase (assuming an environmental assessment is provided under the NES and any necessary site remediation is carried out).
- Please advise any restrictions around construction within the existing stormwater easement (in gross) including any surfacing requirements.
- We may need to consider subsoil drainage for this site due to high groundwater. Would the Council accept subsoil drainage under the operational phase discharge approval within a future carpark area?

Please let me know if you require any further information.

Cheers,

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Simon Crundwell

From:	StormwaterApprovals <Stormwater.Approvals@ccc.govt.nz>
Sent:	Tuesday, 16 July 2024 3:43 pm
To:	Simon Crundwell
Cc:	Mthamo, Victor
Subject:	RE: [#532253] Confidential: 486 Madras St - Stormwater investigations
Attachments:	486 Madras Street - Floor Levels - 03/07/2024; RMA 2021 3901 Approved consent plans.PDF
Follow Up Flag:	Follow up
Flag Status:	Flagged

[EXTERNAL EMAIL: Always check the FROM address of an email and treat links and attachments with caution. Check with Helpdesk if unsure.]

Hi Simon

Expect a separate email from Victor on the stormwater discharge approval and connection matters.

Re the Council pipe, there is a setback requirement under the Stormwater and Land Drainage Bylaw, but there's also potential to avoid this in this case if this causes issues for your client. I understand that there has been some discussion with the applicant to the north to remove the section in their site (approved RC plans attached). If this occurs, and your client has the top end of the remaining pipe crossing their site, then as long as no other property is impacted by this (probably unlikely for the majority of the site anyway, with my understanding of the ownerships in this area, however your site area shown appears to exclude the northern portion in your client's ownership?), there would be the potential to discuss abandoning this, partially abandoning this or privatising this in your site also. Please note that this would come at a cost as Council is likely to require compensation for the remaining book value of the asset in addition to covering the costs (legal and physical works etc) of removal. If you are interested in considering this, it might pay to initially make contact with the northern neighbour to better understand where they are at with their proposal in relation to the CCC main.

If this pipe remains in place, then the setback is calculated based on the criteria below and the physical location of the asset on site. ODs can be estimated based on general concrete pipe dimension data and trench base can be estimated to be 150mm below the base of the pipe.

5. Where the Council's infrastructure or asset is a pipe, the Maintenance Access Corrido
   Council as the greater of either:
   a. twice the buried depth of the pipe (surface to trench base), plus the outside
   b. 1.5 metres from either side of the centre of the pipe
6. Where the infrastructure or asset is not a pipe, the Maintenance Access Corridor is on
   border in all directions (e.g. a manhole).

Within the easement and within the Bylaw Maintenance Access Corridor, we would expect no structures (including eaves, gravel rafts, minor landscaping structures etc), private services (except necessary crossings), trees, tree roots, decorative hardstand or pavers (basic asphalt or plain unreinforced concrete acceptable) etc.

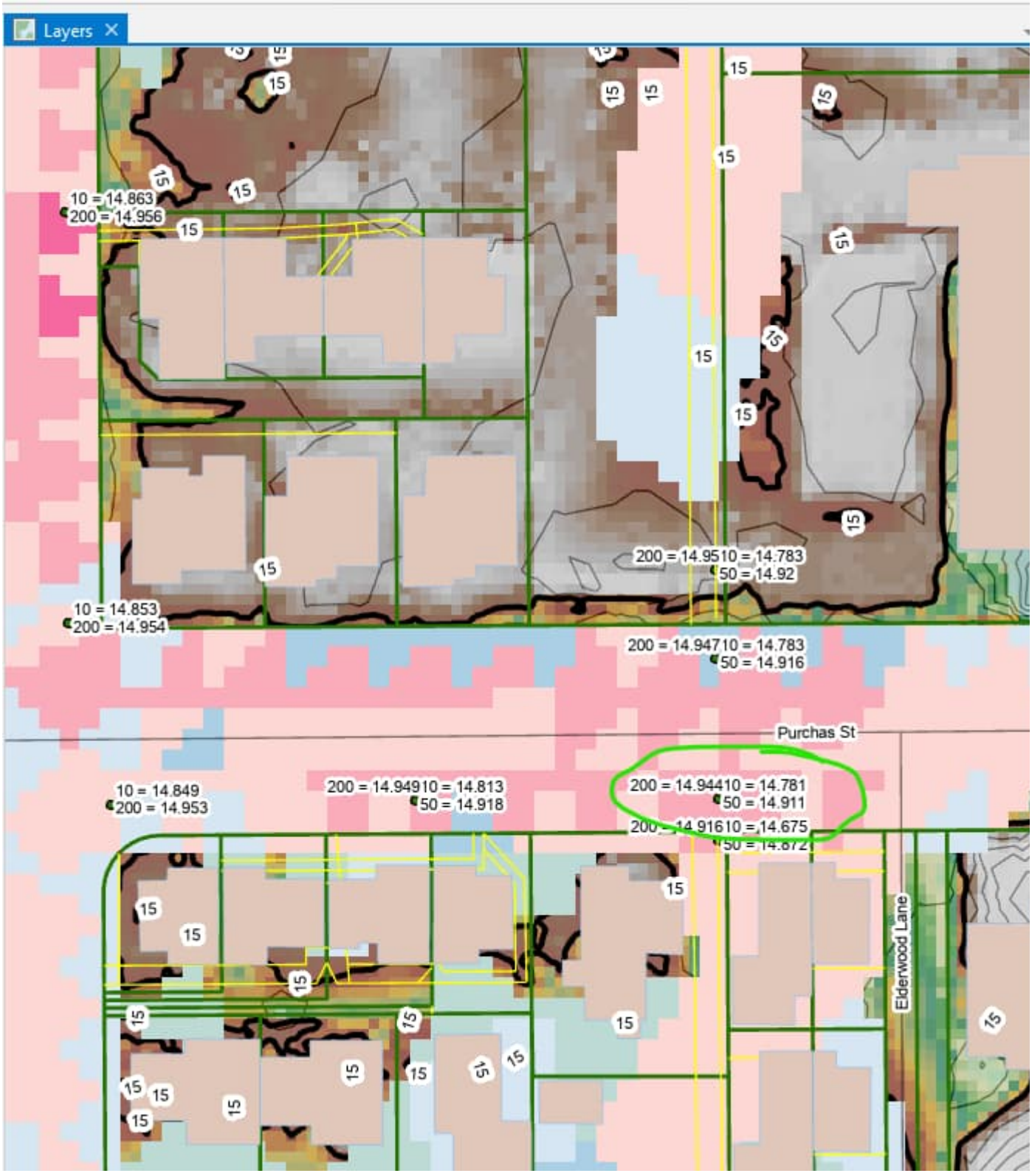
There is no distinction made in the District Plan Flood Management Area rules between commercial and residential FFL requirements. If the proposed building is partially in the FMA (based on

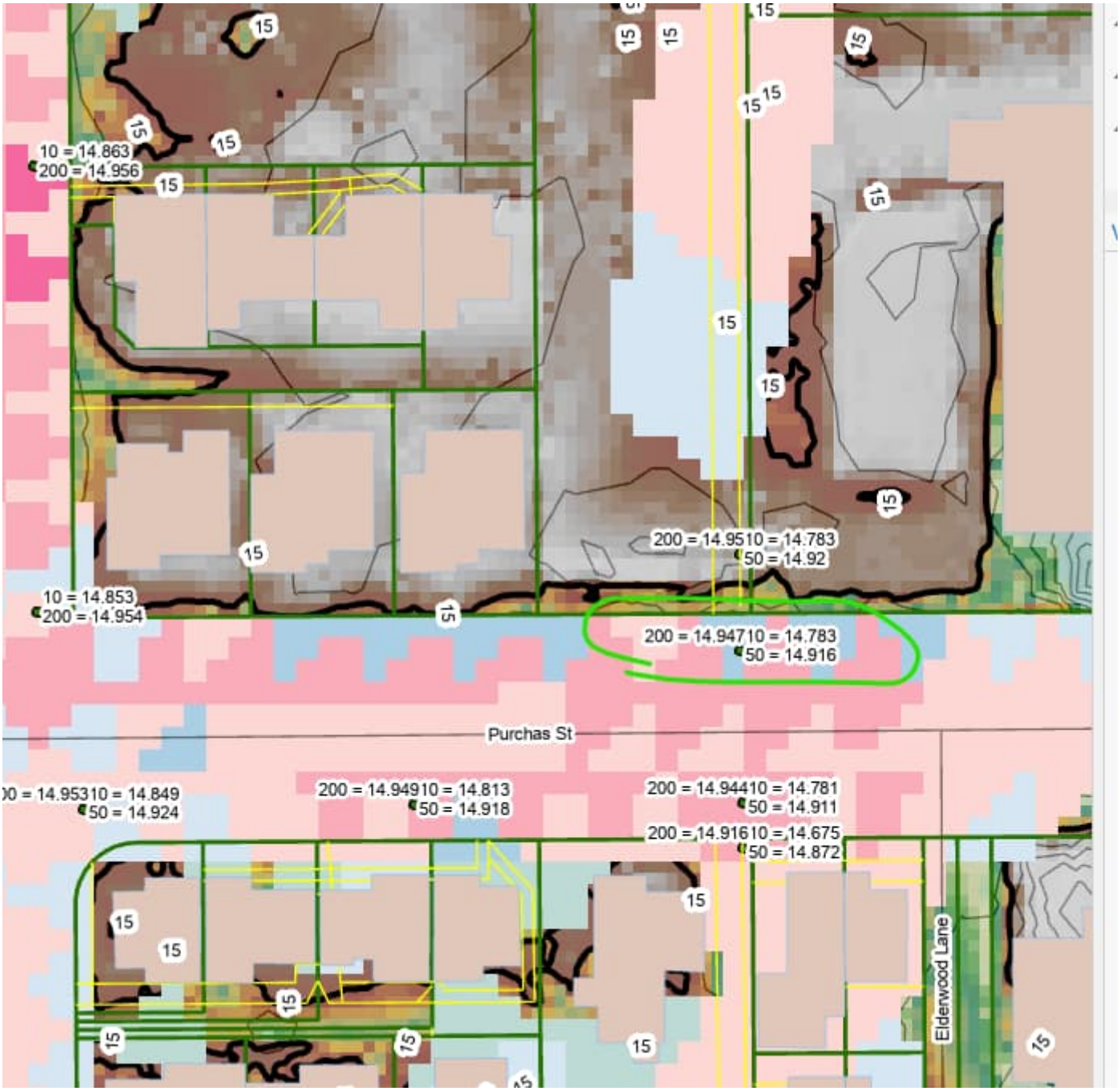
https://districtplan.ccc.govt.nz/PropertySearch/PropertySearchContainer.html), then either a 400mm freeboard above the 1 in 200 year modelled flood level should be achieved, or an application will need to be made to go below this, with assessment of the effects/material damage and likelihood of inundation. Alternatively, if your site reshaping and conveyance calcs remove the 'x2' pond area identified in Sofie's email, then we could possibly set the FMA FFLs off the 'x1' area. If the proposed building is outside the FMA, then as I understand it, there are no FFL requirements for commercial buildings under the Building Code, but durability might need to be assessed.

For floodplain displacement, as the modelling of this is probably quite limited accuracy where this exceeds neighbouring flood levels, and this appears quite shallow and limited area (when compared to permitted baseline site coverages etc), I'm not concerned about this subject to no nuisance being caused to neighbouring property, particularly anything also located in that localised low lying 'x2' area around the pipe corridor.

Re the pipe flows/HGL, our modelling probably doesn't well represent this (limited local catchment, with private connections not well modelled) and also, with the discussions about potential abandonment of the northern section of the pipe, your client might end up the only, or at least the majority) user of this? I've copied below some data from the model for the nodes in Purchas St. The modelled peaks in the infrastructure in the site actually don't differ much from this at all, so without pulling up the timeseries flow data etc, I suspect the majority of this is just simply representing backflooding from the downstream network.

There is no good secondary flow corridor away from this site, so the best option is probably simply to try to maintain similar patterns/distribution to the existing site if possible.


Layers
10 = 14.863
200 = 14.956
200 = 14.95
10 = 14.783
50 = 14.92
10 = 14.853
200 = 14.954
200 = 14.947
10 = 14.783
50 = 14.916
Purchas St
10 = 14.849
200 = 14.953
200 = 14.949
10 = 14.813
50 = 14.918
200 = 14.944
10 = 14.781
50 = 14.911
200 = 14.916
10 = 14.675
Elderwood Lane



Regards

Sheryl Keenan

Planning Engineer – Surface Water
Asset Planning - Stormwater & Waterways

03 941 5298

Sheryl.Keenan@ccc.govt.nz

Te Hononga Civic Offices, 53 Hereford Street, Christchurch

PO Box 73014, Christchurch 8154

ccc.govt.nz

Christchurch City Council

From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Tuesday, July 2, 2024 9:14 AM
To: StormwaterApprovals <Stormwater.Approvals@ccc.govt.nz>
Subject: [#532253] Confidential: 486 Madras St - Stormwater investigations

Hi there,

Eliot Sinclair has been engaged by our client to carry out due diligence for a proposed commercial development (including a supermarket, various commercial and retail buildings, carpark and a café) located at 486 Madras Street.

The site has previously been utilised by Orion as a hardstand sealed storage yard and as a grazing paddock for livestock (as shown in the image below on the left hand side). The site is currently covered by long grass, trees, concreted areas and is relatively flat (as shown in the image below on the right hand side).



2000-2004 Canterbury historical aerial imagery

Curren

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- The FFL requirement is currently 15.45m RL for residential and 15.35m RL for commercial
- CCC LiDAR information (dated 2018-2019) indicates that the average ground level at the property is approximately 15.25m RL and ranges between 14.77 to 15.67m RL.

ENGEO has carried out a DSI for this site. Their report identified historical activities included on the HAIL register. Their report provides recommendations if the proposed redevelopment is to go ahead.

We anticipate that CCC will require the following:

- Site runoff flow to be restricted to no more than pre-development rates
- Trafficable hardstand areas to be treated as per the district plan
- Flood storage volume assessment

Can you please provide answers to the following questions:

- Please confirm if a flood displacement and compensatory storage assessment will be required (including the flood events and levels associated with this assessment).
- Please confirm the stormwater quantity requirements for this site (i.e. which rainfall events and durations require attenuation)?
- We will determine the pre-development site coverage based on the original Orion storage yard historical imagery. Please confirm this approach is acceptable.

- Please provide CCCs stormwater quality requirements for this site. Note that we anticipate using proprietary treatment device(s) (i.e. Stormwater 360 or Atlan products)
- Please confirm acceptable connection points to existing CCC SW infrastructure for both primary and secondary flow.
- Note that we anticipate treatment, detained and primary flows will be discharged to the existing DN375 pipe crossing centrally through the site. Do Council have a predicted 1 in 10 year hydraulic grade line for this pipeline, or predicted HGLs for any other rainfall events?
- Please confirm that this site will be covered under the CCC global consents for construction and operational phase (assuming an environmental assessment is provided under the NES and any necessary site remediation is carried out).
- Please advise any restrictions around construction within the existing stormwater easement (in gross) including any surfacing requirements.
- We may need to consider subsoil drainage for this site due to high groundwater. Would the Council accept subsoil drainage under the operational phase discharge approval within a future carpark area?

Please let me know if you require any further information.

Cheers,

Simon Crundwell
CIVIL ENGINEER
BE(Hons) Civil
+64 3 379 4014 ext. 192
eliotsinclair.co.nz
Christchurch | Rangiora | Wānaka
Queenstown | Hokitika | Nelson

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To help protect your privacy, Microsoft Office prevented automatic download of this picture from the Internet.
Christchurch City Council logo

Simon Crundwell

From:	StormwaterApprovals <Stormwater.Approvals@ccc.govt.nz>
Sent:	Sunday, 4 August 2024 3:11 pm
To:	Simon Crundwell
Cc:	Duncan Kemsley
Subject:	RE: [#532253] Stormwater Comments - 486 Madras St - Stormwater investigations (SA158299)

[EXTERNAL EMAIL: Always check the FROM address of an email and treat links and attachments with caution. Check with Helpdesk if unsure.]

Hi Simon,

If the contaminant level is less than 3 x the ANZECC guidelines for at least 90% protection we will. We would also prefer for the flows to pass through the treatment system prior to discharge.

Please note that the roading team does not want subsoil drainage being discharged onto the roads as this causes maintenance issues and algal formations on the road.

Kind Regards,
Victor

From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Wednesday, July 31, 2024 10:19 AM
To: StormwaterApprovals <Stormwater.Approvals@ccc.govt.nz>
Cc: Duncan Kemsley <djk@eliotsinclair.co.nz>
Subject: RE: [#532253] Stormwater Comments - 486 Madras St - Stormwater investigations (SA158299)

Hi Victor.

Thanks for your response. Understood regarding stormwater treatment and attenuation.

Note that we may need to consider subsoil drainage for this site due to high groundwater. Would the Council accept subsoil drainage under the operational phase discharge approval within a future carpark area (i.e. under CCCs global SW discharge consent)?

Cheers,

Simon Crundwell
CIVIL ENGINEER
BE(Hons) Civil
+64 3 379 4014 ext. 192
eliotsinclair.co.nz
Christchurch | Rangiora | Wānaka
Queenstown | Hokitika | Nelson

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From: StormwaterApprovals <Stormwater.Approvals@ccc.govt.nz>
Sent: Tuesday, July 30, 2024 12:34 PM

To: Simon Crundwell <sc@eliotsinclair.co.nz>
Subject: [#532253] Stormwater Comments - 486 Madras St - Stormwater investigations (SA158299)

[EXTERNAL EMAIL: Always check the FROM address of an email and treat links and attachments with caution. Check with Helpdesk if unsure.]

Hi Simon,

The site is considered to be greenfield. The buildings here were long gone before the earthquakes (sometime between 2004 and 2007), plus the site is poorly serviced. Onsite stormwater attenuation and treatment would be required.

The following is a list of the treatment systems:

Systems Approved for Basic Treatment (private ownership and operation)	
Atlan Filter	5mm/hr
Atlan Flowfilter	5mm/hr
Atlan Flowguard	5mm/hr
Hynds Up-Flo Filter with CPZ Media	5mm/hr
Oldcastle/Austin Bluewater Perk Filter	5mm/hr
Oldcastle/Austin Bluewater Biopod	5mm/hr
Stormwater360 Filterra/Bioscape	5mm/hr
Stormwater360 Jellyfish	5mm/hr
Stormwater360 Stormfilter with ZPG Media	5mm/hr

Systems Approved for Enhanced Treatment (private ownership and operation)	
CCC Rain Garden	20mm
Oldcastle/Austin Bluewater Biopod	5mm/hr
Stormwater360 Filterra/Bioscape	5mm/hr
StormwateRx Aquip	5mm/hr

Systems Approved for Public Treatment (owned and operated by CCC)	
First Flush Basin + Stormwater Wetland Treatment Train	25mm
Soil Adsorption Basin	25mm
Hynds Up-Flo Filter with CPZ Media*	5mm/hr
Stormwater360 Filterra/Bioscape*	5mm/hr
Stormwater360 Stormfilter with ZPG Media*	5mm/hr

Kind Regards,
Victor

From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Monday, July 22, 2024 11:01 AM
To: StormwaterApprovals <Stormwater.Approvals@ccc.govt.nz>
Cc: Keenan, Sheryl <Sheryl.Keenan@ccc.govt.nz>
Subject: RE: [#532253] Stormwater Comments - 486 Madras St - Stormwater investigations (SA158299)

Hi Victor,

I've tried to give you a call to discuss your email below, but couldn't get through. Can you please give me a call to discuss the background to your concern regarding the poor drainage network in and around the site?

From my perspective, there are potentially mitigating circumstances that may alleviate your concerns, as follows:

- I understand from Sheryl that the developer who owns the site to the north of this proposed development potentially may remove their section of the existing DN375 pipe which runs through #486 Madras Street (refer to the approved RD plans attached). The only way to achieve this would be to redirect their surface runoff to Madras Street. This would significantly reduce the catchment area which drains via the existing DN375 CCC pipe and would also reduce flooding potential within #486 Madras Street.
- At this stage, we are proposing to raise the site levels at #486 Madras Street due to FFL requirements and also to provide secondary flow paths to Madras Street. Note that there may be some existing secondary flow paths which will need to be captured around the perimeter of our site and piped to the existing DN375 pipeline.
- The existing DN375 pipeline may not be included in Councils flood models?

It would be good to get a better understanding of your concerns and to determine if the potential changes to the overall catchment levels and catchment flow paths will improve drainage in and around the site.

Cheers,

Simon Crundwell
CIVIL ENGINEER
BE(Hons) Civil
+64 3 379 4014 ext. 192
eliotsinclair.co.nz
Christchurch | Rangiora | Wānaka
Queenstown | Hokitika | Nelson

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From: StormwaterApprovals <Stormwater.Approvals@ccc.govt.nz>
Sent: Friday, July 19, 2024 12:38 PM
To: Simon Crundwell <sc@eliotsinclair.co.nz>
Cc: Keenan, Sheryl <Sheryl.Keenan@ccc.govt.nz>
Subject: Stormwater Comments - 486 Madras St - Stormwater investigations (SA158299)

[EXTERNAL EMAIL: Always check the FROM address of an email and treat links and attachments with caution. Check with Helpdesk if unsure.]

Hi Simon,

The site has come up for possible development several times over the years. Our requirement has been to assume it was greenfield even though it was well developed preEQ. The reason for this is because of the poor drainage network in and around the site. Thus mitigation should be based on achieving stormwater neutrality for the 50 Year 24 hr storms assuming greenfield conditions for the predeveloped state.

Your proposed treatment options are acceptable.

As the site is contaminated the construction phase will require an ECan consent unless remediation is carried out and the SVR shows contaminant levels at or below the ANZECC values in which case we would cover it under the CCC consent.

I have copied in Sheryl to assist with the flood mitigation questions.

Kind Regards,
Victor

From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Tuesday, July 2, 2024 9:14 AM
To: StormwaterApprovals <Stormwater.Approvals@ccc.govt.nz>
Subject: [#532253] Confidential: 486 Madras St - Stormwater investigations

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2000-2004 Canterbury historical aerial imagery

Curren

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- We may need to consider subsoil drainage for this site due to high groundwater. Would the Council accept subsoil drainage under the operational phase discharge approval within a future carpark area?

Please let me know if you require any further information.

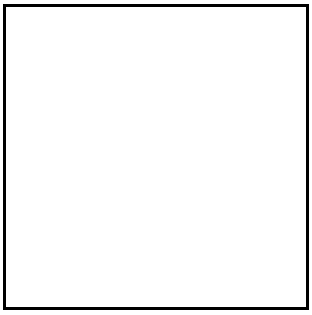
Cheers,

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Simon Crundwell

From: Wastewater Capacity <WastewaterCapacity@ccc.govt.nz>
Sent: Thursday, 11 July 2024 11:22 am
To: Simon Crundwell
Cc: Liam Jagvik
Subject: Wastewater Capacity Comments - 486 Madras Street

[EXTERNAL EMAIL: Always check the FROM address of an email and treat links and attachments with caution. Check with Helpdesk if unsure.]

Hi Simon,

Thanks for the enquiry. 486 Madras Street in St Albans does not fall in a wastewater capacity constraint area. Wastewater capacity can however only be confirmed once the extent of development is known. Can you please provide us an expected flow (L/s) from this development. I'm sure there will be capacity in the network, however, we need to know flow rate before confirming the capacity. Thanks

Kind Regards,

Thomas Joshi Vithayathil

Assistant Engineer
Asset Planning- Water & Wastewater

Disclaimer:
While the water and wastewater capacity advice is considered to be true and correct at the date of the advice being provided, development uptake elsewhere in the network, changes to operational circumstances or data availability may change our water and wastewater capacity assessment and advice. The Christchurch City Council water and wastewater capacity information may change without notice (unless when confirmed by Christchurch City Council stamped plans and engineering acceptance https://ccc.govt.nz/consents-and-licences/construction-requirements/engineering-plan-acceptance-for-three-waters-assets) and therefore the Christchurch City Council provides this water and wastewater capacity advice to you (the Recipient) on the following basis:

a. *The Council makes no representation and provides no warranty, express or implied, regarding the accuracy, adequacy, reasonableness or completeness of the information contained or referred to in this advice.*

b. *To the maximum extent permitted by law, Council disclaims and is excluded from, and the Recipient releases Council from, all liability and responsibility (whether in tort, contract or under statute or otherwise) in relation to information, including for any direct or indirect loss or damage which may be suffered by any recipient of information, through use of or reliance on or in connection with anything contained in, or omitted from, this information.*

From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Wednesday, July 10, 2024 11:01 AM
To: Wastewater Capacity <WastewaterCapacity@ccc.govt.nz>
Cc: Liam Jagvik <LJJ@eliotsinclair.co.nz>
Subject: RE: [#532253] Wastewater Capacity Comments - 486 Madras Street

Thanks Thomas,

Can you please confirm if there are any capacity constraints on Councils wastewater reticulation in this location which would prevent this proposed development connecting into the Council wastewater network?

Cheers,

Simon Crundwell
CIVIL ENGINEER
BE(Hons) Civil
+64 3 379 4014 ext. 192
eliotsinclair.co.nz
Christchurch | Rangiora | Wānaka
Queenstown | Hokitika | Nelson

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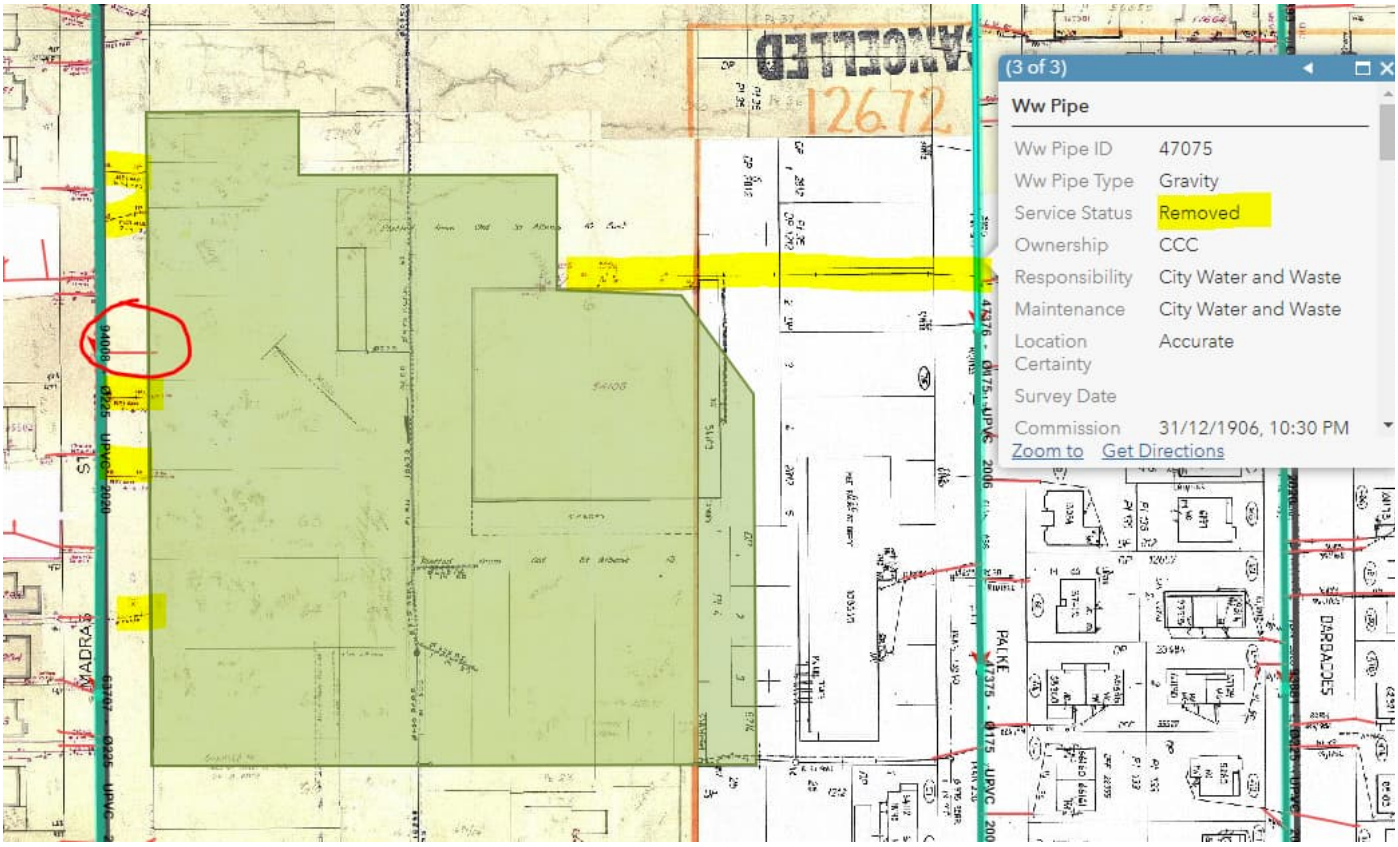
From: Wastewater Capacity <WastewaterCapacity@ccc.govt.nz>
Sent: Tuesday, July 9, 2024 10:55 AM
To: Simon Crundwell <sc@eliotsinclair.co.nz>
Cc: Liam Jagvik <LJJ@eliotsinclair.co.nz>
Subject: Wastewater Capacity Comments - 486 Madras Street

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Hi Simon/Liam,

Thanks for your mails. Please see the image below. I had a check into the private drainage layer and found that the highlighted laterals (both to Madras Street and Packe Street) from the mentioned lots are abandoned. There are WW mains removed/abandoned in both Madras Street and Packe street and I believe these highlighted laterals are connecting into these abandoned/removed WW mains.

The only live sewer lateral is the DN150 outfall from the lot 492 Madras Street which is circled in the image below. Thanks



Cheers,
Thomas Joshi Vithayathil
Water & Wastewater Asset Planning

From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Monday, July 8, 2024 9:25 AM
To: Wastewater Capacity <WastewaterCapacity@ccc.govt.nz>
Cc: Liam Jagvik <LJJ@eliotsinclair.co.nz>
Subject: RE: [#532253] Wastewater Capacity Comments - 486 Madras Street

Hi Thomas,

Sorry I just realised that Liam has already responded to your email. Please ignore my email below.

Cheers

Simon Crundwell
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From: Simon Crundwell
Sent: Monday, July 8, 2024 9:15 AM

To: 'Wastewater Capacity' <WastewaterCapacity@ccc.govt.nz>
Cc: Liam Jagvik <LJJ@eliotsinclair.co.nz>
Subject: RE: [#532253] Wastewater Capacity Comments - 486 Madras Street

Hi Thomas,

The proposed development is shown below in red. There are also proposed developments to the north by others shown in blue.



Cheers,

From: Wastewater Capacity <WastewaterCapacity@ccc.govt.nz>
Sent: Friday, July 5, 2024 12:26 PM
To: Simon Crundwell <sc@eliotsinclair.co.nz>
Cc: Liam Jagvik <LJJ@eliotsinclair.co.nz>
Subject: Wastewater Capacity Comments - 486 Madras Street

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Hi Simon,

Thanks for your mail. I'm in discussion with my colleague regarding the water capacity for this site and I will get back to you once I heard from my colleague.

Regarding WW Capacity, Can you please sketch/highlight the lots (or lot addresses) on the image below to show me where the development is happening? I can respond you better once I know the lots. I'm a bit confused by the aerial plan you provided; it looks like there is an existing outfall (492 Madras Street) to the council manhole in Madras Street. Thanks



Cheers,
Thomas Joshi Vithayathil
Water & Wastewater Asset Planning

From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Tuesday, July 2, 2024 9:10 AM
To: Wastewater Capacity <WastewaterCapacity@ccc.govt.nz>
Cc: Liam Jagvik <LJJ@eliotsinclair.co.nz>
Subject: [#532253] Confidential: WWNZ Madras St - Wastewater due diligence

Hi there,

Eliot Sinclair has been engaged by our client to carry out due diligence for a proposed commercial development (including a supermarket, various commercial and retail buildings, carpark and a café) located at 486 Madras Street.

The CCC 3 waters GIS indicates the following existing wastewater reticulation:

- Packe Street wastewater – A DN175 uPVC sewer is located under the centreline of Packe Street. The pipe is approximately 1.65m deep
- Madras Street wastewater – A DN225 uPVC sewer is located beyond the road centreline at a depth of 2.2m.



There are no existing wastewater lateral connections shown on the CCC 3 water network asset map from the site into either the Madras St or Packe St wastewater mains. The "PrivateDrainagePlan" layer also does not provide further information. Do council have property file information that contains existing wastewater lateral plans for this site?

Also, could you please let me know if there are any capacity constraints on Councils wastewater reticulation in this location which would prevent this proposed development connecting into the Council wastewater network?

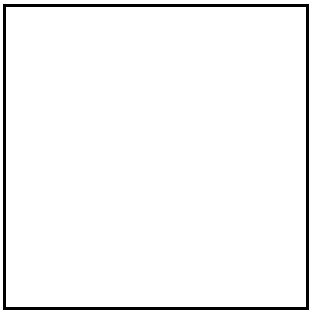
Please let me know if you require any further information.

Cheers,

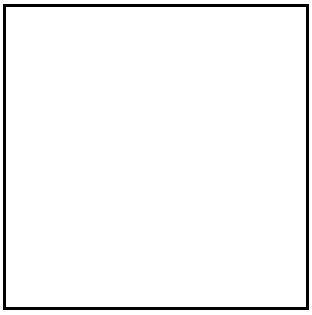
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Simon Crundwell

From:	WaterCapacity <WaterCapacity@ccc.govt.nz>
Sent:	Thursday, 11 July 2024 11:15 am
To:	Simon Crundwell
Cc:	Liam Jagvik; Johnson, Ian
Subject:	[#532253] Water Capacity Comments - 486 Madras Street

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Hi Simon,

Thanks for your patience. Please see my comments in the email below;

Cheers,
Thomas Joshi Vithayathil
Water & Wastewater Asset Planning

From: Simon Crundwell <sc@eliotsinclair.co.nz>
Sent: Tuesday, July 2, 2024 9:09 AM
To: WaterCapacity <WaterCapacity@ccc.govt.nz>
Cc: Liam Jagvik <LJJ@eliotsinclair.co.nz>
Subject: FW: [#532253] Confidential: WWNZ Madras St - Water Supply due diligence

Hi there,

Eliot Sinclair has been engaged by our client to carry out due diligence for a proposed commercial development (including a supermarket, various commercial and retail buildings, carpark and a café) located at 486 Madras Street.

The CCC 3 waters GIS indicates the following existing water supply reticulation:

- Packe Street – A DN150 watermain is located under the road carriageway on the eastern side of the road. This main also feeds submains serving houses on Packe Street.
- Madras Street – A DN100 watermain is located under the road carriageway on the east side of the road. This watermain feeds a 50mm galvanised steel submain serving properties along the east of Madras Street.



The fire demands for the site will need to be confirmed with the project fire engineer. Based on the Fire Code, the supermarket will likely have a fire hazard category of FHC 4. The proposed supermarket has a plan area of 3550m^2. Assuming the largest firecell exceeds 1000m^2 (which seems likely), then the water supply classification will be FW7. Therefore, the site fire fighting demand is likely to be greater than 200L/s and will require a specific fire engineering assessment.

The pipework in this area is too small to accommodate an FW7 fire classification. The applicant has other options such as fire sprinkler systems which would reduce the fire classification or the likes of on-site storage – the applicant could contact FENZ for advice on Canterbury-RRTeam@fireandemergency.nz.

Please note that I have confirmed with my TL that there is no council WS main upgrade planned here in the Madras street.

We anticipate the following:

- We will need to consult with FENZ on how to meet onsite fire fighting needs
- We will need to provide commercial sized water meter(s) and backflow prevention device(s)

Could you please confirm potential water supply capacity available for the proposed development? In particular, could you please confirm:

- Is there capacity available in both the water supply mains to service this site?

Please note that this site is on the ECAN Listed Land Use Register as a contaminated site. All water pipes will need to be protected against contamination with barrier pipe such as PE-AL-PE unless other contamination mitigation measures address the issue to the Building Consent Authority's satisfaction.

We can confirm that the Council water supply network can support your proposal. Details regarding submains, commercial water meters and connection must be addressed through the WS1 Water Connections process during the

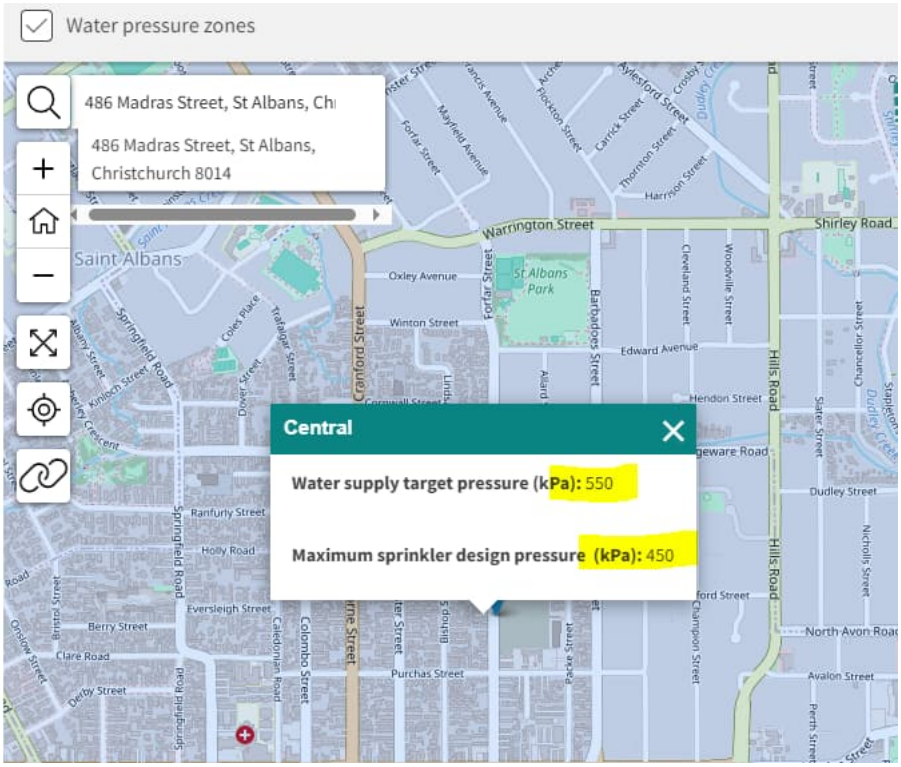
building consent stage. A backflow prevention device will also be required—please contact Backflow@ccc.govt.nz for details.

- What supply pressure can we assume is available in the water mains?

The mentioned site is in a Medium Pressure water supply zone. Please have a look into this link for you to check the water pressure and sprinkler pressure of each zones; https://ccc.govt.nz/services/water-and-drainage/water-supply/about-the-water-supply/water-pressure/

- Do the Council have fire hydrant pressure testing and / or water supply hydraulic modelling or will this be be required to be completed by the applicant to confirm the above?

If the applicant elects for a sprinkler system, fire sprinkler system design parameters (flow and pressure) that are supported by hydraulic tests shall be submitted to Christchurch City Council's Three Waters Unit, to enable the confirmation of the water supply network adequacy for the sprinkler system proposed, prior to the lodgement of the building consent application, via email to WaterCapacity@ccc.govt.nz Any required changes to design flows or pressures identified by the Three Waters Unit shall be incorporated into the final design of the sprinkler system and included in the building consent application.



Please let me know if you require any further information.

Cheers,

Simon Crundwell
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Christchurch City Council logo

Appendix I. Electrical Consulting Services Ltd Correspondence

Simon Crundwell

From:	Dave McKenzie <dmckenzie@ecservices.co.nz>
Sent:	Tuesday, 6 August 2024 9:46 am
To:	Liam Jagvik
Cc:	Simon Crundwell; Daniel Shao; Duncan Kemsley
Subject:	Re: [#532253] WWNZ Madras St - Power and fibre supply
Attachments:	Outlook-Descriptio; Outlook-jfixnfw0; 28701-MPB9010_NZ_Ruggedised_RevD.pdf; 28701-N-MPB3020+_en_Hexatronic_13239.pdf; Madras Street Development Maximum Demand Calculations 050824.pdf; Madras Street Development Power and Fibre Optic sketches 050824.pdf

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Liam,

Find attached:

1. Load profile analysis
2. Enable Fibre Optic requirements
3. Proposed sketch plans for power and fibre

We have reviewed the proposed tenancy mix, supermarket and Lot E (Residential) to develop the Electrical Load Analysis.

Our recommendation is a 1MVA(1000KVA) single transformer at the boundary of Lot E and the Proposed Retail / Supermarket site.

Diversity will play a major role in this load profile, where heating and final tenancy mix may see a reduction to a 750KVA transformer being adequate to service the project.

Enable Fibre Network

Info received from Eliot Sinclair that Lot E will be (2 or 3 levels high) @ 20-30 Residential apartment units total.

WW Supermarket is 24F (2x12F) - Online part of WW Store.
Retail and Commercial - sizes as shown (2F each, bank will require 8F)
(Cafe, Gym, Commercial offices etc) 2F each

Network needs to come from Madras Street only.
(Possible Mike Greer Holmes development on 2410m2 portion - by others)

Primary – small network extension to property boundary south towards Purchase

Secondary - network extension on Madras St, plus 2 short linking network extensions to make this fibre path back t St Albans central Office an unfolded path until reaching the central office (CO)

Residential Lot E next adjacent – will be fed from Madras St

Both paths, UFB and Dark fibre / higher order services are available

Both connections can be quoted for developer contribution just let me know



Ducting - Woolworths

For on property both primary and secondary would be 50mm red PVC duct from boundary location across the lot to the floor slab – to comms Demarcation room

Single red ruggedized duct from boundary to CDP location inside the 50mm red duct

Ducting commercial - CDP and internal fibre path

- internal fibre backbone 1 tube per tenancy usually installed by building contractors Electrical contractor from each tenancy back to a utility area

LSHZ single tube to each tenancy

- fibre termination CDP in utility area

Ducting commercial - External path

- fibre PED on boundary

- single way red ruggedized tube direct buried to each unit from the PED via developer trench and 50mm pipe installed in floor slab to back of house

I'm on the road to Tauranga today, back in the office tomorrow for any questions or amendments.
(please call to discuss if necessary)

R

Dave McKenzie
✉ dmckenzie@ecservices.co.nz
Mobile 0274 489 477
DDI 6005354

ELECTRICAL CONSULTING SERVICES LTD

Level 3, 65 Upper Queen Street, Eden Terrace, Auckland 1010,
P.O Box 911140, Victoria Street West,
Auckland 1142, New Zealand.
T 09 309 0640 **F** 09 309 5410
E inquiries@ecservices.co.nz **W** www.ecservices.co.nz

From: Liam Jagvik <LJJ@eliotsinclair.co.nz>
Sent: Friday, August 2, 2024 4:10 PM
To: Dave McKenzie <dmckenzie@ecservices.co.nz>
Cc: Simon Crundwell <sc@eliotsinclair.co.nz>; Daniel Shao <daniel.shao@woolworths.co.nz>; Duncan Kemsley <djk@eliotsinclair.co.nz>
Subject: RE: [#532253] WWNZ Madras St - Power and fibre supply

Hi Dave

Can you please give us an update on this? We are needing to finalise the RC drawings for WWNZ by Wednesday next week.

Kind regards

eliot sinclair

Liam Jagvik
SURVEYOR | DIRECTOR
BSurv MNZIS LCS

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From: Liam Jagvik
Sent: Friday, July 19, 2024 3:21 PM
To: Dave McKenzie <dmckenzie@ecservices.co.nz>
Cc: Simon Crundwell <sc@eliotsinclair.co.nz>; Daniel Shao <daniel.shao@woolworths.co.nz>
Subject: RE: [#532253] WWNZ Madras St - Power and fibre supply

Hi Dave

I've just come out of a Woolworths meeting and the team are interested to get some feedback from you. Have you managed to make some progress with this one?

Cheers

From: Liam Jagvik
Sent: Monday, July 8, 2024 8:36 PM
To: Dave McKenzie <dmckenzie@ecservices.co.nz>; Daniel Shao <daniel.shao@woolworths.co.nz>
Cc: Simon Crundwell <sc@eliotsinclair.co.nz>
Subject: [#532253] WWNZ Madras St - Power and fibre supply

Hi Dave

We are working with Woolworths on another one of their projects at 486 Madras Street, St Albans in Christchurch. I'm not sure if you have been involved previously.

I'm reaching out to you as Daniel has asked if you are able to provide us some advice in respect of the Enable fibre and Orion power supply demands for a proposed Woolworths supermarket and commercial tenancies.

I have attached the current bulk and location drawing for reference. Some other commercial sites within the development are proposed. A separate, but future development area "E" is proposed in the future. A typical multi residential type development is proposed and would also require power & fibre servicing.

What we are needing is some preliminary guidance on the demands and number of breakouts for the fibre connection to the site boundary. It would also be helpful if you could identify the particular location(s) which are suitable. It would also be helpful to understand if any power transformers would be required and the ideal location for these. This is a similar principle to the Halswell project where you marked up a drawing showing the schematic layout.

All servicing will be required off the Madras Street frontage as that will be the legal access to the site.

As far as I'm aware no consultation with Enable or Orion has occurred.

@Daniel Shao is there a requirement or desire from WWNZ to underground the overhead power lines along the frontage of the development for aesthetics?

Could you please let us know if you need anything further and either Daniel or I will be able to assist.

Please liaise with Daniel for the engagement side of things.

Kind regards