

GRIFFIOEN.

LAND INFORMATION MEMORANDUM

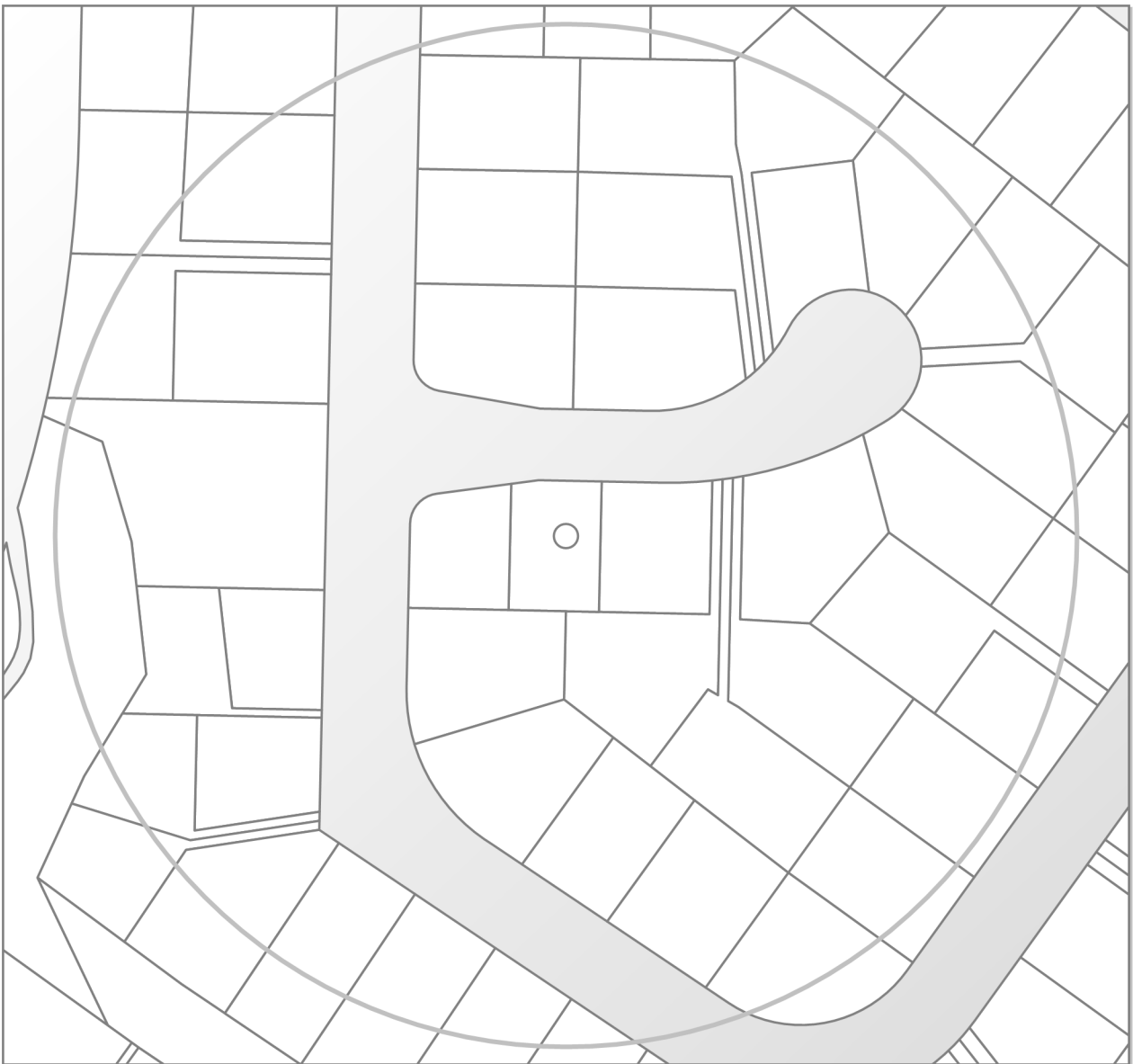
Statement of Passing Over: This building inspection has been supplied by the vendor in good faith. GRIFFIOEN. (Powered by Ownly Limited, Licensed REAA 2008) is merely passing over this information as supplied to us.

We cannot guarantee its accuracy as we have not checked, audited, or reviewed the information and all intending purchasers are advised to seek your own advice as to the information contained in this document.

Please note this LIM report is provided for informational purposes only. There may be matters relating to pre-1992 consents or permits which may need further investigation in order to determine their relevance.

To the maximum extent permitted by law we do not accept any responsibility to any party for the accuracy or use of the information herein.

Land Information Memorandum



Property address:

2 Mallard Place

LIM number: H09338949

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Christchurch City Council

53 Hereford Street, PO Box 73015

Christchurch 8154, New Zealand

Tel 64 3 941 8999

Fax 64 3 941 8984

www.ccc.govt.nz

Application details

Date issued 5 October 2025
Date received 24 September 2025

Property details

Property address 2 Mallard Place, Woolston, Christchurch
Valuation roll number 22460 69000
Valuation information Capital Value: \$700,000
Land Value: \$295,000
Improvements Value: \$405,000
Please note: these values are intended for Rating purposes
Legal description Lot 2 DP 77858
Existing owner Sanjay Ari Segaran
Christopher William James Fogarty
322 Riccarton Road
Christchurch 8041

Council references

Rate account ID 73070222
LIM number H09338949
Property ID 1075694

Property address:

2 Mallard Place

LIM number: H09338949

Document information

This Land Information Memorandum (LIM) has been prepared for the purpose of section 44A of the Local Government Official Information and Meetings Act 1987 (LGOIMA). It is a summary of the information that we hold on the property. Each heading or "clause" in this LIM corresponds to a part of section 44A.

Sections 1 to 10 contain all of the information known to the Christchurch City Council that must be included under section 44A(2) LGOIMA. Any other information concerning the land as the Council considers, at its discretion, to be relevant is included at section 11 of this LIM (section 44A(3) LGOIMA). If there are no comments or information provided in these sections this means that the Council does not hold information on the property that corresponds to that part of section 44A.

The information included in this LIM is based on a search of Council records only and there may be other information relating to the land which is unknown to the Council. Please note that other agencies may also hold information relevant to the property, or administer legislation relevant to the use of the land, for example, the Regional Council (Ecan), Heritage New Zealand Pouhere Taonga, and Land Information New Zealand.

Council records may not show illegal or unauthorised building or works on the property. The applicant is solely responsible for ensuring that the land is suitable for a particular purpose.

A LIM is only valid at the date of issue as information is based only upon information the Council held at the time of that LIM request being made. It is essential that the applicant undertakes their own due diligence to verify the suitability of the property for their intended use.

Property file service

This Land Information Memorandum does not contain all information held on a property file. Customers may request property files by phoning the Council's Customer Call Centre on (03) 941 8999, or visiting any of the Council Service Centres. For further information please visit www.ccc.govt.nz.

To enable the Council to measure the accuracy of this LIM document based on our current records, we would appreciate your response should you find any information contained therein which may be considered to be incorrect or omitted. Please telephone the Customer Call Centre on (03) 941 8999.

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A search of records held by the Council has revealed the following information:

1. Special features and characteristics of the land

Section 44A(2)(a) LGOIMA. This is information known to the Council but not apparent from the district scheme under the Town and Country Planning Act 1977 or a district plan under the Resource Management Act 1991. It identifies each (if any) special feature or characteristic of the land concerned, including but not limited to potential erosion, avulsion, falling debris, subsidence, slippage, alluvion, or inundation, or likely presence of hazardous contaminants.

☎ For enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

Natural Hazards

(a) Coastal Hazards

- Coastal Hazard Inundation

The Council has a report, Coastal Hazard Assessment for Christchurch District (2021), which indicates this area may be susceptible to coastal flooding. The 2021 report considers areas that might be at risk over the next 100 years and beyond as a result of sea level rise. To find out how your area might be affected go to www.ccc.govt.nz/coastalhazards.

(b) Earthquakes

- Liquefaction Assessment

Christchurch City Council holds indicative information on liquefaction hazard for Christchurch. Information on liquefaction, including an interactive web tool, can be found on the Council website at ccc.govt.nz/liquefaction. Depending on the liquefaction potential of the area that the property is in, the Council may require site-specific investigations before granting future subdivision or building consent for the property.

(c) Flooding

- Flood Assessment

Council is currently updating the flood map database. For information relating to flooding at this address please email floorlevels@ccc.govt.nz.

(d) Landslides

As at the date of this LIM, Council research found no information under this heading.

(e) Subsidence

- Consultant Report Available

Land Information New Zealand (LINZ) engaged Tonkin and Taylor to provide a Geotechnical Report on Ground Movements that occurred as a result of the Canterbury Earthquake Sequence. The report indicates this property may have been effected by a degree of earthquake induced subsidence. The report obtained by LINZ can be accessed on their website at <https://www.linz.govt.nz> and search Information for Canterbury Surveyors.

(f) Tsunamis

- Property located in Tsunami Risk Zone

This property may be affected by flooding by some tsunami scenarios as shown in reports by GNS and NIWA commissioned by ECan and CCC. Links to reports can be found at <https://ccc.govt.nz/tsunami-evacuation-zones-and-routes/> and on ECan's web site <https://www.ecan.govt.nz> by searching for the terms tsunami hazard.

(g) Volcanic and Geothermal Hazards

As at the date of this LIM, Council research found no information under this heading.

(h) Wind

As at the date of this LIM, Council research found no information under this heading.

(i) Any Other Natural Hazards

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As at the date of this LIM, Council research found no information under this heading.

(j) District Plan Natural Hazard Information

Please refer to *Section 8. Land use and conditions* of this report for District Plan related natural hazard information.

(k) Building Notices

Please refer to *Section 5. Consents, certificates, notices, orders, or requisitions affecting the land and buildings* of this report for Building Act notice information.

Other Special Features or Characteristics of the Land

- Fill

This property is located in an area known to have been filled. The year the fill occurred is Unknown. The filling was, according to the Councils records carried out in a controlled manner and comprises Unknown Material.

Related Information

- The latest soil investigation report for this property is attached for your information

2. Private and public stormwater and sewerage drains

Section 44A(2)(b) LGOIMA. This is information about private and public stormwater and sewerage drains as shown in the Council's records.

 For stormwater and sewerage enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

Related Information

- This property is shown to be served by Christchurch City Council Sewer and Stormwater.
- Attached are all drainage plans that Council hold for details of private and public drainage. Not all plans provided are verified by Council, and therefore Council cannot be liable for inaccuracies. Site investigation will be required by owners to determine exact layouts.

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3. Drinking Water Supply

Section 44A(2)(ba) and (bb) LGOIMA. This is information notified to the Council about whether the land is supplied with drinking water, whether the supplier is the owner of the land or a networked supplier, any conditions that are applicable, and any information the Council has about the supply.

Please note the council does not guarantee a particular water quality to its customers. If you require information on current water quality at this property please contact the Three Waters & Waste Unit.

☎ For water supply queries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

Water supply

Christchurch City Council is the networked supplier of water to this property. This property is connected to the Christchurch City Council Water Supply. The conditions of supply are set out in the Christchurch City Council Water Supply and Wastewater Bylaw (2022), refer to www.ccc.govt.nz.

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4. Rates

Section 44A(2)(c) LGOIMA. This is information on any rates owing in relation to the land.

☎ For rates enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

(a) Annual rates

Annual rates to 30/06/2026: \$4,260.82

	Instalment Amount	Date Due
Instalment 1	\$1,065.13	15/09/2025
Instalment 2	\$1,065.13	15/12/2025
Instalment 3	\$1,065.13	15/03/2026
Instalment 4	\$1,065.43	15/06/2026

Rates owing as at 05/10/2025: \$1,408.56

(b) Excess Water Rates

For excess water charge enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz/contact-us.

(c) Final water meter reading required at settlement?

Property settlements must ensure all water usage and outstanding debts are accurately accounted for.

To advise of a property settlement, please complete the request for settlement information form at www.ccc.govt.nz/services/rates-and-valuations/solicitors-request.

A settlement statement of accounts will be provided on the expected settlement date advised.

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5. Consents, certificates, notices, orders, or requisitions affecting the land and buildings

Section 44A(2)(d) LGOIMA. This is information concerning any consent, certificate, notice, order, or requisition, affecting the land or any building on the land, previously issued by the Council. The information in this section may also cover building consent and/or code compliance information issued by building certifiers under the Building Act 1991 and building consent authorities that are not the Council under the Building Act 2004.

You can check the property file to identify whether any consent or certificate was issued by a building certifier under the Building Act 1991.

Section 44A(2)(da) LGOIMA. The information required to be provided to a territorial authority under section 362T(2) of the Building Act 2004. There is currently no information required to be provided by a building contractor to a territorial authority under section 362T(2) of the Building Act 2004. The Building (Residential Consumer Rights and Remedies) Regulations 2014 only prescribed the information that must be given to the clients of a building contractor.

Sections 71 to 74 of the Building Act 2004 require the Building Consent Authority to consider natural hazards when it receives a building consent application for the construction or major alteration of a building on land that is subject to, or likely to be subject to, a natural hazard. A building consent for this property may have been issued subject to a section 72 or 73 notice. This means at the time of building consent the Building Consent Authority was not satisfied that adequate provision would be made to protect the building and land from the natural hazard and was subsequently required to notify the Registrar-General of Land to record the natural hazard on the Record of Title. The Building Act 2004 defines natural hazards as erosion (including coastal erosion, bank erosion, and sheet erosion), falling debris (including soil, rock, snow, and ice), subsidence, inundation (including flooding, overland flow, storm surge, tidal effects, and ponding), and slippage.

If your property contains a notice under s73 of the Building Act 2004, this will be identified on the building consent decision below (decision under s72 of the Building Act 2004) and on the properties' Record of Title. The Record of Title may also record this as a s36 notice under the Building Act 1991, or a s641A notice under the Local Government Act 1974.

☎ For building enquiries, please phone (03) 941 8999, email EPADutyBCO@ccc.govt.nz or visit www.ccc.govt.nz.

(a) Consents

- BCN/1997/7459 Applied: 07/10/1997 Status: Completed
2 Mallard Place Woolston
Accepted for processing 07/10/1997
Building consent granted 06/11/1997
Building consent issued 13/11/1997
Code Compliance Certificate Granted 30/09/2004
Code Compliance Certificate Issued 30/09/2004
2ND DWELLING WITH ATTACHED GARAGE- Historical Reference CON97008397
- BCN/2013/10444 Applied: 19/11/2013 Status: Completed
2 Mallard Place Woolston
Accepted for processing 20/11/2013
PIM Granted 26/11/2013
PIM Issued 26/11/2013
Building consent granted 29/01/2014
Building consent issued 29/01/2014
Code Compliance application not accepted 11/12/2014
Code Compliance Certificate Issued 20/01/2015
Dwelling with attached garage

(b) Certificates

Note: Code Compliance Certificates were only issued by the Christchurch City Council since January 1993.

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(c) Notices

- Placards issued under the Civil Defence Emergency Management Act 2002 as a result of the 4 September 2010 and 22 February 2011 earthquakes have now expired (by 12 July 2011 if not before). Some civil defence placards were replaced with dangerous building notices issued under section 124 Building Act 2004, and where this has happened the section 124 notice is separately recorded. Many other buildings, although not issued with a section 124 notice, may require structural work or other repairs before they can be occupied again. It is the building owners responsibility to make sure the building is safe for any occupier or visitor. Detailed structural engineering assessments may still be required to be carried out.
- CDB75064305 03/03/2011 2B Mallard Place
Building Evaluation : Building Inspected Under Civil Defence Emergency , Green Placard Issued (a deemed Building Act notice)

(d) Orders

(e) Requisitions

Related Information

- Please find an electrical & gas fitters certificates attached relating to works that have been carried out on the current building/dwelling at this address.

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6. Certificates issued by a building certifier

Section 44A(2)(e) LGOIMA. This is information notified to the Council concerning any certificate issued by a building certifier pursuant to the Building Act 1991 or the Building Act 2004.

☎ For building enquiries, please phone (03) 941 8999, email EPADutyBCO@ccc.govt.nz or visit www.ccc.govt.nz.

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7. Weathertightness

Section 44A(2)(ea) LGOIMA. This is information notified to the Council under section 124 of the Weathertight Homes Resolution Services Act 2006.

 For weathertight homes enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

If there is no information below this means Council is unaware of any formal Weathertight Homes Resolution Services claim lodged against this property.

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8. Land use and conditions

Section 44A(2)(f) LGOIMA. This is information relating to the use to which the land may be put and conditions attached to that use. The planning information provided below is not exhaustive and reference to the Christchurch District Plan and any notified proposed changes to that plan is recommended: <https://ccc.govt.nz/the-council/plans-strategies-policies-and-bylaws/plans/christchurch-district-plan/>.

There may be some provisions of the Christchurch City Plan or Banks Peninsula District Plan that affect this property that are still operative.

☎ For planning queries, please phone (03) 941 8999, email DutyPlanner@ccc.govt.nz or visit www.ccc.govt.nz.

- **Regional plan or bylaw**

There may be objectives, policies or rules in a regional plan or a regional bylaw that regulate land use and activities on this site. Please direct enquiries to Canterbury Regional Council (Environment Canterbury).

(a)(i) Christchurch City Plan & Banks Peninsula District Plan

(ii) Christchurch District Plan

- **Qualifying Matter**

Property or part of property within the Coastal Hazard Medium Risk Management Area qualifying matter, which has been publicly notified

- **Qualifying Matter**

Property or part of property within the Low Public Transport Accessibility Area qualifying matter, which has been publicly notified

- **Qualifying Matter**

Property or part of property within the Tsunami Management Area qualifying matter, which has been publicly notified

- **Liquefaction Management Area (LMA)**

Property or part of property within the Liquefaction Management Area (LMA) Overlay, which is operative.

- **District Plan Zone**

Property or part of property within the Residential Suburban Zone, which is operative.

- **Flood Management Area**

Property or part of property within the Flood Management Area (FMA) Overlay which is operative.

- **Fixed Minimum Floor Overlay**

This property or parts of the property are located within the Fixed Minimum Floor Overlay level in the Christchurch District Plan, which is operative. Under this plan pre-set minimum floor level requirements apply to new buildings and additions to existing buildings. The fixed minimum floor level can be searched at <http://ccc.govt.nz/floorlevelmap>. For more information please contact a CCC duty planner on 941 8999.

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(b) Resource consents

If there are any land use resource consents issued for this property the Council recommends that you check those resource consents on the property file. There may be conditions attached to those resource consents for the property that are still required to be complied with.

- RMA/1994/2270 - Subdivision Consent
Fee Simple SUBDIVISION - Historical Reference RMA13258
Status: Processing complete
Applied 23/12/1994
- RMA/1995/5536 - Subdivision Consent
Fee Simple SUBDIVISION - Historical Reference RMA9530
Status: Processing complete
Applied 22/12/1995
- RMA/1996/3684 - Subdivision Consent
Fee Simple SUBDIVISION - Historical Reference RMA3696
Status: Processing complete
Applied 23/10/1996
- RMA/1997/3769 - Subdivision Consent
Fee Simple SUBDIVISION - Historical Reference RMA2861
Status: Processing complete
Applied 21/11/1997
- RMA/2014/76 - Land Use Consent
2 Mallard Place Woolston
Construction of a new dwelling with an attached garage - Historical Reference RMA92024673
Status: Processing complete
Applied 16/01/2014
Granted 23/01/2014
Decision issued 23/01/2014
- RMA/2014/1479 - Within scope amendment
2 Mallard Place Woolston
WITHIN SCOPE AMENDMENT TO RMA92024673 - Historical Reference RMA92026135
Status: Processing complete
Applied 19/06/2014
Granted 20/06/2014
Decision issued 20/06/2014

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9. Other land and building classifications

Section 44A(2)(g) LGOIMA. This is information notified to the Council by any statutory organisation having the power to classify land or buildings for any purpose.

 For land and building enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

Please refer to Section 1 for details

10. Network utility information

Section 44A(2)(h) LGOIMA. This is information notified to the Council by any network utility operator pursuant to the Building Act 1991 or the Building Act 2004.

 For network enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

- **None recorded for this property**

11. Other information

Section 44A(3) LGOIMA. This is information concerning the land that the Council has the discretion to include if it considers it to be relevant.

☎ For any enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

(a) Kerbside waste collection

- Your organics are collected Weekly on Monday. Please leave your organics at the Kerbside by 6:00 a.m.
- Your recycling is collected Fortnightly on the Week 1 collection cycle on a Monday. Please leave your recycling at the Kerbside by 6:00 a.m. Your nearest recycling depot is the Metro Place EcoDrop.
- Your refuse is collected Fortnightly on the Week 1 collection cycle on a Monday. Please leave your rubbish at the Kerbside by 6:00 a.m. Your nearest rubbish depot is the Metro Place EcoDrop.

(b) Other

• Floor Levels Information

Council holds a variety of information on requirements for building or property development. This includes:

- required minimum finished floor levels, which need to be set to meet the surface water requirements in clause E1.3.2 of the Building Code (where this applies); and
- the requirements of the Christchurch District Plan (where a property is in the Flood Management Area).

Where this information has been processed for your property, you can view it online at <https://ccc.govt.nz/flooding-and-floor-levels>.

Otherwise, if you are building or developing on this land, you can request a calculation on required finished floor levels for your proposed building by emailing us at floorlevels@ccc.govt.nz.

• Guest Accommodation

Guest accommodation (including whole unit listings on Airbnb; BookaBach; etc.) generally requires a resource consent in this zone when the owner is not residing on the site. For more information, please refer to: <https://ccc.govt.nz/providing-guest-accommodation/>.

• Community Board

Property located in Spreydon-Cashmere-Heathcote Community Board.

• Tsunami Evacuation Zone

This property is in the orange tsunami evacuation zone, and should be evacuated immediately after a long or strong earthquake, or when told to by an official civil defence warning. Residents should make a plan for where they would go in a tsunami evacuation and stay out of this zone until told it is safe to go back. More information can be found at <https://ccc.govt.nz/services/civil-defence/hazards/tsunami-evacuation-zones-and-routes/>

• Electoral Ward

Property located in Heathcote Electoral Ward

• Listed Land Use Register

Hazardous activities and industries involve the use, storage or disposal of hazardous substances. These substances can sometimes contaminate the soil. Environment Canterbury identifies land that is used or has been used for hazardous activities and industries. This information is held on a publically available database called the Listed Land Use Register (LLUR). The Christchurch City Council may not hold information that is held on the LLUR. Therefore, it is recommended that you check Environment Canterbury's online database at www.llur.ecan.govt.nz

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- **Spatial Query Report**

A copy of the spatial query report is attached at the end of this LIM. The spatial query report lists land use resource consents that have been granted within 100 metres of this property.

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Southern Response
C/- Arrow International (NZ) Ltd

7 May 2013

**RE: Shallow Bearing Capacity Memorandum – 2b Mallard Place, Woolston, Christchurch
(D3442561)**

Introduction and Background

Geoscience Consulting (NZ) Ltd (Geoscience) was requested by Arrow International (NZ) Ltd to complete shallow soil testing at the subject property (herein referred to as 'the site'). We understand that Golder Associates (NZ) Ltd completed a geotechnical investigation at the site and that you require shallow soil testing to determine shallow bearing capacities for foundation design.

Our scope of works specifically excluded assessment of the liquefaction potential at the site.

Hand Auger Borehole and Scala Penetrometer Testing

Geoscience completed two hand auger boreholes, one hydraulic auger borehole and four Scala Penetrometer (Scala) tests to a maximum depth of 3.0 m before meeting target depth. Groundwater was not encountered in the hand auger boreholes but was encountered at 2.9 m depth in the hydraulic auger borehole.

Summary of Subsurface Conditions

Subsurface conditions encountered in the shallow soil testing are summarised in Table 1 below:

Table 1: Summary of Subsurface Conditions Encountered in Ground Investigations

Depth (m)	Material Type	Density/Consistency
0.0 up to 1.0	TOPSOIL/FILL	N/A
1.0 up to 3.0	ALLUVIUM	Soft to Hard

The Scala tests were undertaken to assess the subsurface strength profile to enable us to provide shallow bearing capacities for the proposed foundation type.

Shallow Bearing Capacity

Table 2 details the static geotechnical Ultimate Bearing Capacities we have calculated for the proposed footing/pile width. These capacities are applicable below any topsoil and fill.

Table 2: Subsurface Strength Profile

Foundation Type	Embedment Depth	Footing Width/Pile Diameter	Soil Type	Calculated Geotechnical Ultimate Bearing Capacity
Type 1 Surface Structure	On FILL (above 1.5 m)	0.4 m	Cohesive	200 kPa*
Type 1 Surface Structure	Below TOPSOIL/FILL (below 1.5 m)	0.4 m	Cohesive	300 kPa

* If founding on there is potential for some on-going settlement to occur. This option should only be considered under the guidance of Golder.

The site location plan, raw Scala Penetrometer data, hydraulic auger borehole log and hand auger borehole logs are presented as attachments to this memorandum. The logs are written in accordance with the New Zealand Geotechnical Society field classification guidelines (NZGS, 2005).

The shallow bearing capacity calculations can be provided upon request.

References

Ministry of Business, Innovation and Employment (MBIE), December 2012: Repairing and Rebuilding Houses affected by the Canterbury Earthquakes (<http://www.dbh.govt.nz/guidance-on-repairs-after-earthquake>).

New Zealand Geotechnical Society, 2005: Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes.

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, Arrow International (NZ) Ltd, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. The recommendations in this report are based on the ground conditions indicated from published sources, site inspections and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the Client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it must 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 IPENZ/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.

For and on behalf of Geoscience Consulting (NZ) Ltd,



Carolina Winter

Environmental Geologist



Greg Martin

Associate Engineering Geologist

Director

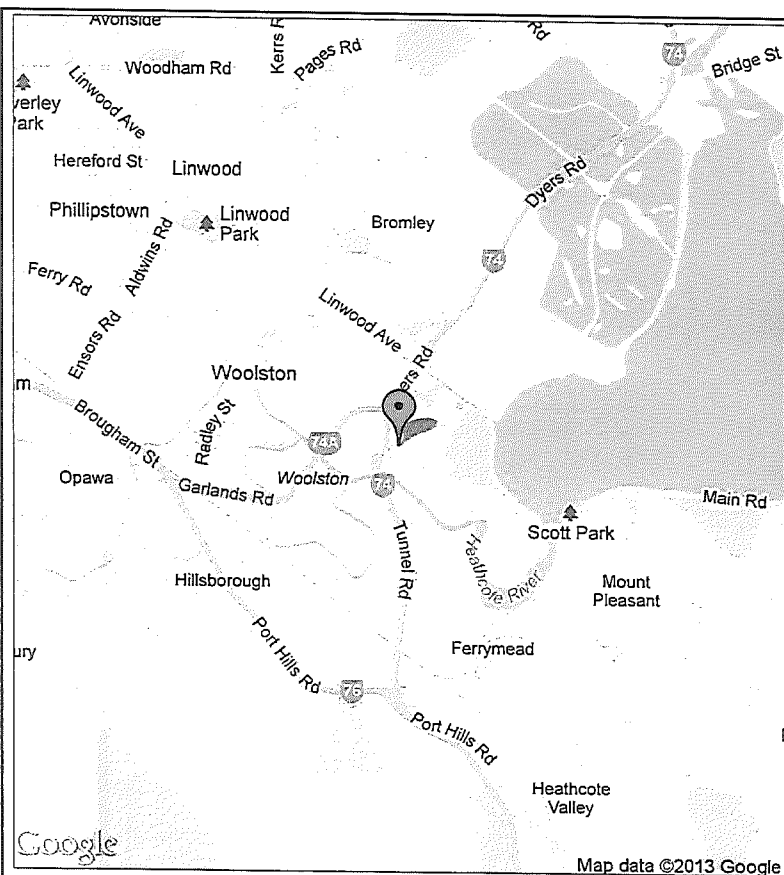


Don Bruggers, CPEng, IntPE (NZ); PE, GE (USA)

Principal Engineer

Attachments:

- Site Location Plan
- Hand Auger Borehole and Scala Penetrometer Logs
- Hydraulic Auger Borehole and Scala Penetrometer Log
- Raw Scala Penetrometer Data



= Test Location

Note: All images sourced from Google Maps



Date	May-13	Client	Arrow International		
Drawn by	CW	Project	Southern Response		
Approved by	RC	Description	Site Location Plan		
Scale	NTS	Geoscience Ref.	9653.000.660	Client Ref.	D3442561

HAND AUGER BOREHOLE - HA01

(Page 1 of 2)

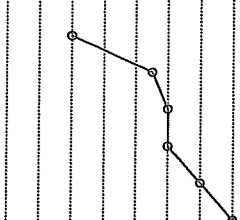
2b Mallard Place

Woolston

D3442561

Client : Arrow International
Project : Southern Response
Geoscience Ref. : 9653.000.660
Drilling Method : Hand auger
Hole Diameter : 50 mm

Date : 12/03/13
Hole Depth : 0.6 m
Shear Vane No. : N/A
Logged By : DG/RB
Reviewed By : CW

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Log	Water Level	Moisture Condition	Shear Vane (kPa) Peak/Remolded	Consistency / Density Index	Scala Penetrometer Blows per 100 mm
0.0	TOPSOIL	ML	SILT with trace gravel and rootlets; light brown [TOPSOIL].			D		N/A	
0.5			EOH: 0.4 m						
1.0									
1.5									
2.0									
2.5									
3.0									

Termination: Practical Refusal
Hand auger met practical refusal on inferred fill at 0.4 m depth.
Scala Penetrometer met practical refusal at 0.6 m depth.
Groundwater not encountered.

HAND AUGER BOREHOLE - HA02

(Page 2 of 2)

2b Mallard Place

Woolston

D3442561

Client : Arrow International
Project : Southern Response
Geoscience Ref. : 9653.000.660
Drilling Method : Hand auger
Hole Diameter : 50 mm

Date : 12/03/13
Hole Depth : 3.0 m
Shear Vane No. : N/A
Logged By : DG/RB
Reviewed By : CW

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Log	Water Level	Moisture Condition	Shear Vane (kPa) Peak/Remolded	Consistency / Density Index	Scala Penetrometer Blows per 100 mm
0.0	TS	ML	SILT with trace gravel, brick and rootlets; dark brown [TOPSOIL].			D			
0.5	FILL	ML	SILT with trace gravel, brick and charcoal; brown [FILL]. Becomes wet at 0.7 m depth.			M		N/A	
1.0			SILT; bluish grey with orange mottles. Becomes light grey with orange mottles from 1.3 m depth.						
1.5									
2.0	ALLUVIUM	ML				W		S-H	
2.5									
3.0									

Termination: Target Depth
Hand auger and Scala Penetrometer met target depth at 3.0 m depth.
Groundwater not encountered.
TS = TOPSOIL

HYDRAULIC AUGER BOREHOLE

(Page 1 of 1)

2b Mallard Place
Woolston
D3442561

Client : Arrow International
Project : Southern Response
Geoscience Ref. : 9653.000.660
Drilling Method : Hand auger
Hole Diameter : 50 mm

Date : 19/04/13
Hole Depth : 3.0 m
Shear Vane No. : N/A
Logged By : DG/AN
Reviewed By : CW

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Log	Water Level	Moisture Condition	Shear Vane (kPa) Peak/Remolded	Consistency / Density Index	Scala Penetrometer Blows per 100 mm
0.0	FILL	ML	SILT with trace cobbles, gravel, brick and rootlets; brown [FILL].					N/A	
0.5									
1.0	ESTUARINE DEPOSITS	ML						S-Vst	
1.5			SILT; brownish grey with orange mottles. Becomes wet at 1.7 m depth.						
2.0			Becomes grey at 2.2 m depth. Trace organics encountered.						
2.5									
3.0			Becomes saturated at 2.9 m depth.				S		

Termination: Target Depth
Hand auger and Scala Penetrometer met target depth at 3.0 m depth.
Groundwater encountered at 2.9 m depth.
No Scala penetrometer data recorded from 0.0 m to 1.5 m depth.

Client: Arrow International Ltd

Geoscience ref: 9653.000.660

Project: Southern Response

Client ref: D3442561

Site address: 2b Mallard Place

Date: 12/03/2013

Location: Refer to Site Location Plan

By: CW

Test No.	HA01	Test No.	HA02	Test No.	SP03	Test No.	SP04
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	4	100	2	100	3	100	2
200	9	200	3	200	7	200	3
300	10	300	1	300	7	300	8
400	10	400	3	400	9	400	15
500	12	500	2	500	9	500	
600	15	600	4	600	15	600	
700		700	3	700		700	
800		800	5	800		800	
900		900	4	900		900	
1000		1000	3	1000		1000	
1100		1100	2	1100		1100	
1200		1200	2	1200		1200	
1300		1300	5	1300		1300	
1400		1400	5	1400		1400	
1500		1500	7	1500		1500	
1600		1600	3	1600		1600	
1700		1700	4	1700		1700	
1800		1800	4	1800		1800	
1900		1900	4	1900		1900	
2000		2000	2	2000		2000	
2100		2100	3	2100		2100	
2200		2200	4	2200		2200	
2300		2300	5	2300		2300	
2400		2400	5	2400		2400	
2500		2500	4	2500		2500	
2600		2600	6	2600		2600	
2700		2700	4	2700		2700	
2800		2800	8	2800		2800	
2900		2900	7	2900		2900	
3000		3000	7	3000		3000	
3100		3100		3100		3100	
3200		3200		3200		3200	
3300		3300		3300		3300	
3400		3400		3400		3400	
3500		3500		3500		3500	
3600		3600		3600		3600	
3700		3700		3700		3700	
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3900		3900		3900		3900	
4000		4000		4000		4000	

February 2012

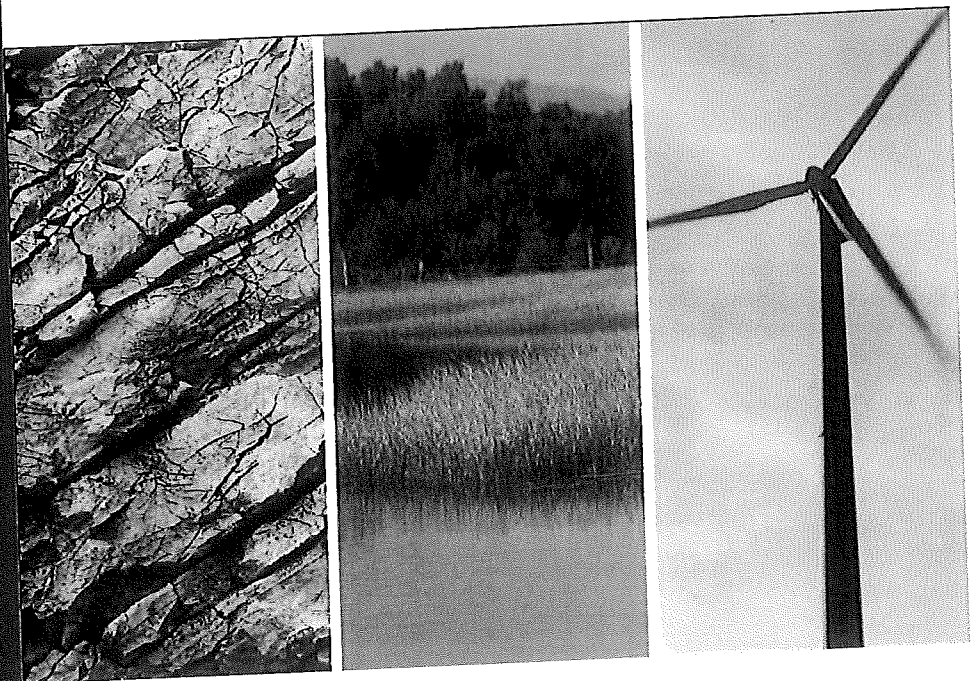
GEOTECHNICAL ASSESSMENT REPORT

2b Mallard Place, Woolston

Submitted to:
Arrow International Ltd

Reference - D3442561

REPORT



Report Number. 1078102_455 / Task 320

Distribution:

Wayne Ballard - Arrow International Ltd
Louise Sturgess - Arrow International Ltd
Alex Baldwin - Golder Associates (NZ) Ltd
Mel Horswell - Golder Associates (NZ) Ltd



GEOTECHNICAL ASSESSMENT REPORT - 2B MALLARD PLACE, WOOLSTON

SUMMARY

Arrow International Limited has engaged Golder Associates (NZ) Limited (Golder) to undertake geotechnical investigations as part of the geotechnical assessment of the site at 2b Mallard Road, Woolston, Christchurch.

The purpose of this report is:

- To present the findings of two Cone Penetration Tests (CPTs) conducted at the site on the 31 January 2012, to assess the liquefaction susceptibility of the materials beneath the site
- To assess potential foundation remediation solutions for the construction of a new house on the property

The ground conditions comprise an initial nominal thickness of sand and silty sand, underlain by clay and silty clay to a depth of approximately 1.8 m, this is underlain by sand and silty sand with trace sandy silt beds to the full depth of the investigation at 20.4 m.

The results of the analyses of the CPT data indicate the presence of two layers of potentially liquefiable soils throughout the soil profile at depths of approximately 1.5 – 3.5 m bgl and 7 – 20 m bgl.

- Under the SLS earthquake scenarios considered, liquefaction induced settlement is estimated to be in the range of 45 – 110 mm
- Under the ULS event, liquefaction induced settlement is estimated to be approximately 290 mm

It is recommended that ground improvement measures be conducted to densify the in situ soils in the soil column. Based on the available geotechnical information, there are two primary options for soil treatment at this site:

- Ground compaction of the first 3.5 m of the soil column would reduce the risk of settlement in a SLS (0.15 g & 0.20 g) event to 25 – 80 mm and 220 – 250 mm in an ULS event
- Deep ground improvement to approximately 10 m would be the more costly alternative and would reduce the risk of settlement in a SLS event to 10 – 60 mm and approximately 180 mm in an ULS event

Following confirmation that the ground improvement has achieved the required level of densification, a specifically designed shallow tied raft foundation (such as Options 2 – 4 listed in the DBH guide), making sure to give particular consideration to the ability to re-level it following any future liquefaction settlement. Consequently, the predicted settlement should be accommodated by using lightweight construction (lightweight cladding and roof) and giving specific consideration to repairability (Table 8.1, DBH Guide, 2011) and ability to re-level the structure.

The combination of a gravel raft to 1 m, ground treatment, an enhanced foundation, and a lightweight structure is expected to limit any future liquefaction settlement damage and enable the building to be easily re-levelled if necessary.

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**GEOTECHNICAL ASSESSMENT REPORT - 2B MALLARD
PLACE, WOOLSTON**

APPENDICES

APPENDIX A

Report Limitations

APPENDIX B

Site Plan

APPENDIX C

EQC CPT Logs

APPENDIX D

Golder Visual Inspection Report

APPENDIX E

Site Photographs

APPENDIX F

CPT Profile

APPENDIX G

Liquefaction Assessment Plots

GEOTECHNICAL ASSESSMENT REPORT - 2B MALLARD PLACE, WOOLSTON

1.0 INTRODUCTION

Arrow International Limited (Arrow) has engaged Golder Associates (NZ) Limited, (Golder) to undertake a geotechnical investigation as part of the assessment of 2b Mallard Place, Woolston, Christchurch (the site). The existing house on the site was affected by the 2010-2011 Canterbury earthquake series of events and, as such is the subject of insurance claim number D3442561 lodged with Arrow.

Golder previously carried out an initial visual assessment of the property in July 2011. Subsequently, Golder was provided with a "Request for Geotechnical Investigation Report" (ref: email dated 8 December 2011) which identified the house as requiring demolition and rebuilding. As such, a geotechnical investigation and assessment was requested in order to identify geotechnical considerations for rebuilding options. The scope of work for the geotechnical investigation was defined as follows:

- Review existing geotechnical data for, and in the vicinity of, the site
- Review existing topographical and geological data
- Conduct a site investigation comprising two Cone Penetration Tests (CPTs)
- Assess the geotechnical issues at the site
- Provide comments on foundation options for the rebuilding

This report presents the findings of the geotechnical investigation and assessment.

The geotechnical investigation and assessment for the Site has been carried out in accordance with the Department of Building and Housing (DBH) "Revised Guidance on Repairing and Rebuilding Houses affected by the Canterbury Earthquake Sequence" published in November 2011 (hereafter referenced as DBH 2011). The guideline was prepared after widespread and varied levels of damage to infrastructure occurred throughout the region as a result of the 4 September 2010 and 22 February 2011 earthquake events and subsequent aftershocks that caused liquefaction and associated differential and total vertical settlement and lateral spreading.

Our scope of work for this assignment is a geotechnical engineering assessment of the proposed rebuilding, including identification of the subsurface conditions and assessment of the potential liquefaction and feasibility-level geotechnical development considerations/foundation options. The scope of work does not include any detailed design, geo-environmental investigation or assessment of the potential for, nor implications of, soil and/or groundwater contamination at the property.

At the time of preparation of this report and the geotechnical assessment and recommendations presented above, no specific information was available to Golder on the proposed building layout and loadings, or on the presence and depths existing buried utilities. It is recommended that Golder review and provide additional geotechnical input and recommendations as part of detailed design. Further, it is recommended that, should new or additional revisions of the aforementioned DBH guidelines be released, that Golder review the recommendations contained herein.

This report does not address the reinstatement of land levels. In some areas, land levels within Christchurch have dropped due to a combination of liquefaction related settlement and tectonic settlement. It is understood that some sites will require the land level to be returned back to approximately pre-earthquake levels. The data indicating whether land levels should be raised and to what level, is not currently available to us. It is noted that the site is within a flood management area, and the Christchurch City Council will have to be consulted to acquire the proper building requirements regarding flood management for this site.

Our work on this assignment is carried out for the exclusive use of Arrow. This report should be read in conjunction with the "Report Limitations" set out in Appendix A. The reader's attention is specifically drawn to this information as it is essential for the proper use and interpretation of this report.

2.0 SITE DESCRIPTION

2.1 Site Location and Description

The site is located at 2b Mallard Place, Woolston, approximately 5.25 km south east of the Christchurch Central Business District (CBD). The property is a residential lot with approximate dimensions of 30 m by 20 m (600 m²). The property is accessed from Mallard Place to the north. The site is flat lying. A site plan is included in Appendix B.

The site is located within an area classified by DBH 2011 as Technical Category 3, "an area which is likely to suffer moderate to significant land damage from liquefaction during future earthquakes". The area was mapped by Tonkin & Taylor on behalf of the Earthquake Commission (EQC) as having undergone liquefaction as a result of the 22 February 2011 and 13 June 2011 earthquakes.

2.2 Existing Residence

The site is occupied by a single story dwelling with a timber-frame and a combination of brick and concrete masonry exterior cladding on a concrete slab-on-grade foundation. The construction is classified as a C2 type in accordance with DBH 2011. The foundation details are not specifically known; however, it has been reported in DBH 2011 that typical construction practice has comprised shallow perimeter strip footings with unreinforced slab-on-grade floor.

A survey of the floor levels within the dwelling undertaken by Arrow post-major earthquake events (exact date unknown) indicates a maximum differential settlement of approximately 50 mm. Arrow has designated the residence as requiring demolition and rebuilding.

3.0 GEOLOGICAL SETTING

3.1 Geological Deposits

Christchurch is known to be underlain by a series of inter-bedded terrestrial gravels and fine grained marine and estuarine sediments. The gravels are aggradational deposits derived from the Waimakariri River and the finer sediments were deposited in estuaries and shallow transgressing seas. The gravels are high yielding aquifers within the finer beds; although essentially heterogeneous in composition. The finer beds are of low permeability, acting as a confining layer to water held in the underlying gravels at high pressure.

The Geological Survey Map of the area (Forsyth et al 2008) indicates that the Halswell area is underlain by river alluvium beneath plains of low level terraces. These alluvial deposits are part of the Springston Formation, mainly comprising post-glacial age gravels, silts and sands which underlie most of the western Christchurch urban area.

3.2 Faults

A number of seismically active faults within the Canterbury region affect the earthquake hazard in Christchurch. These include the Greendale Fault (responsible for the 4 September 2010 earthquake), Christchurch Fault (responsible for the Boxing Day 2010 aftershock) and the Port Hills Fault (responsible for the 22 February 2011 and 13 June 2011 earthquakes and aftershocks).

Also of interest is the Alpine Fault transecting the South Island from north east to south west which is located some 100 km from Christchurch. It is considered that this fault has the potential to produce earthquakes of the greatest magnitude and duration likely to affect the Christchurch area.

3.3 Design Seismic Hazard

The seismic hazard in New Zealand has been described based on a probabilistic seismic hazard model developed by GNS Science. The output of this model is the basis for the current structural seismic design code (NZS1170.5:2004). The probabilistic model describes the seismic hazard in terms of various ground shaking parameters over a range of annual exceedance probabilities.

GEOTECHNICAL ASSESSMENT REPORT - 2B MALLARD PLACE, WOOLSTON

The damaging earthquakes that affected Christchurch during 2010 and 2011 lead to re-evaluation of the seismic hazard in Christchurch and revised earthquake loadings have been issued by the DBH. At a recent DBH meeting, revised horizontal peak ground acceleration (PGA) values for liquefaction assessment in Canterbury were announced as follows:

- Serviceability limit state (SLS): 0.15 g
- Ultimate limit state (ULS): 0.49 g

In addition, Golder has also undertaken a "conservative" SLS evaluation using a PGA of 0.2 g.

The design magnitude earthquake is M7.5.

3.4 Peak Ground Acceleration Experienced During 2010-2011 Events

The nearest strong motion seismic recording station is located at Pages Road Pumping Station (PRPC) approximately 3.0 km to the north of the site. Review of records held on Geonet indicates this strong motion recorder has experienced peak ground accelerations of:

- 0.309 g during the 4 September 2010 M7.1 earthquake
- 1.629 g during the 22 February 2011 M6.3 earthquake
- 0.695 g during the 13 June 2011 M6.3 earthquake

4.0 GEOTECHNICAL INVESTIGATION WORK

4.1 Review of Available Information

A review of publically available EQC information has identified one Cone Penetration Test (CPT) approximately 40 m from the site. A summary of this CPT is presented in Table 1 and the complete log is included in Appendix C.

Table 1: EQC CPT summary.

CPT	Ground Surface RL	Depth to Groundwater (bgl) ¹	Final Probe Depth (bgl)	Min. q_c ² (MPa)	Max. q_c (MPa)	q_c at Final Probe Depth (MPa)
CPT-WSW-48	1.99 m	1.5 m	10.8 m	< 0.5	16	11.5

Notes:

¹ Unknown if depth to groundwater is measured or assumed.

² q_c – cone penetration resistance.

4.2 Visual Inspection

A site visit was undertaken by Golder on 20 July 2011:

The purpose of the visit was to review the land surrounding the house on the Site and did not include inspection within the house itself. Generally, the site inspection indicated land damage as follows:

- Cracking to the driveway, perimeter patio slab and patio
- Evidence of cleaned-up liquefaction ejecta

The site visit report is included in Appendix D and site photographs taken at the time of inspection are included in Appendix E.

GEOTECHNICAL ASSESSMENT REPORT - 2B MALLARD PLACE, WOOLSTON

4.3 Cone Penetration Testing (CPT)

A geotechnical investigation was carried out at the site in accordance with the minimum requirements for geotechnical assessment for land development in the Canterbury region as established and published by the DBH 2011. The DBH 2011 requires characterisation of sub-surface conditions to at least 15 m below ground surface unless the ground is known to acceptable quality from lesser depths and established Cone Penetrometer Testing (CPT) as an appropriate tool for such characterisation.

The geotechnical investigation was undertaken on 31 January 2012. The site investigation comprised two CPTs at the locations shown in Appendix B. The CPT's were carried to depths of 20.4 m below ground level (m bgl) and were terminated as their target depths had been achieved. A summary of the CPT profile is presented in Table 2 with the complete CPT profile attached in Appendix F.

Table 2: Summary of CPTs.

CPT	Depth to Groundwater (m bgl) ¹	Final Probe Depth (m bgl)	Min. q_c ² (MPa)	Max. q_c (MPa)	q_c at Final Probe Depth (MPa)
CPT-01	2.0	20.36	<0.5	25.6	20.7
CPT-02	1.8	20.4	0.25	23.5	20.9

5.0 SUBSURFACE CONDITIONS

5.1 Soil Stratigraphy

The raw data from the CPT profile has been analysed using the commercially available software package CPET-IT (Geologismiki, 2006). The soil type and relative density has been inferred using empirical correlations between tip resistance, sleeve friction and pore pressure measurement.

Generally, the interpretation of the CPT data indicates the subsurface soils comprises an initial nominal thickness of sand and silty sand, underlain by clay and silty clay to a depth of approximately 1.8 m, underlain by sand and silty sand with trace sandy silt beds to the full depth of the investigation at 20.4 m. A summary of the results is presented in Table 3 with the complete CPT profile attached in Appendix F.

Table 3: Summary of CPT profile.

Depth (m bgl)	Measured Parameter		Inferred Parameter based on Empirical Correlations		
	Cone Resistance (MPa)	Friction Ratio (%)	Soil Behaviour Type (SBT)	SPT N60	Relative Density/Consistency
0 – 0.5 m	5 – 17	0 – 4	SAND & silty SAND	12 – 30	Medium dense to dense
0.5 – 1.8 m	0 – 5	3 – 7	CLAY & silty CLAY	7 – 10	Firm
1.8 – 20.4 m	5 – 27	< 2	SAND & silty SAND with trace sandy silt	15 – 48	Medium dense to very dense

5.2 Groundwater

The depth to groundwater has been recorded at 1.8 m bgl and 2.0 m bgl on the two CPT profiles provided by ProDrill. As testing has been undertaken in summer, and based on known groundwater levels in this area, a conservative groundwater level of 1.5 m bgl has been assumed for the assessment reported herein.

6.0 GEOTECHNICAL ASSESSMENT

6.1 Liquefaction Potential

The potential for liquefaction and/or cyclic softening of soils in response to the design SLS and ULS ground motions was assessed using the procedures set forth in *"Geotechnical Earthquake Engineering Practice"* (NZGS July 2010) and *"Soil Liquefaction during Earthquakes"* (Idriss and Boulanger 2008) as required by the DBH 2011. These procedures generally use empirical correlations to assess the factor of safety against liquefaction (in granular soils) or cyclic softening (in fine-grained soils) by comparing the cyclic shear stress ratio (CSR) to trigger liquefaction with the cyclic resistance ratio (CRR) of the native soils. Liquefaction is predicted to occur in granular soils below the water table when the CRR is less than the CSR. The assessment has been undertaken using proprietary software CLiq (GeoLogismiki, 2006). The CLiq liquefaction assessment plots are presented in Appendix G.

The results indicate that the sand and silty sand deposits below the water table and within the upper 20 m of the soil column are potentially liquefiable under both the SLS and ULS design events in two zones as follows:

- 1.5 m to 3.5 m
- 7 m to 20 m

It is unknown as to whether soils below depths of 20 m are susceptible to liquefaction as the testing data beyond 20 m has not been established.

Liquefaction will not occur in non-saturated soils above the water table. Should the groundwater level rise above that indicated in Section 5.2, there is a potential for additional thickness of potentially liquefiable soil.

6.2 Post-Liquefaction Settlement

The post-liquefaction induced settlement in the upper 20 m of the soil column is estimated to be in the order-of-magnitude of:

- 50 mm for the SLS
- 250 mm for the ULS

Additional post-liquefaction settlement could occur in the soil column below depths of 20 m if these deposits are liquefiable.

The estimated settlement within the sand unit is anticipated to occur either during or rapidly following cessation of the seismic shaking earthquake motions.

The site soil deposits are variable and consequently, significant differential settlements can occur as the extent of soil liquefaction will likely not be uniform across the site during and following the earthquake. The magnitude of post-liquefaction differential settlement is difficult to estimate as it is a function of the variability of soil conditions, the timing of the onset of liquefaction and the rate of dissipation of porewater pressures across the site. These variables cannot be assessed without rigorous geotechnical investigation and numerical modelling. In the absence of such assessment, it is recommended that the development of the site considers the potential for differential settlements that approach the magnitude of the estimated total settlements.

6.3 Liquefaction-Induced Lateral Spread

The deposits of silty sand are susceptible to liquefaction and therefore there may be a potential for liquefaction-induced lateral spread to occur. Generally, the liquefaction-induced lateral spread would occur as movement toward a free face, such as the water course 200 m to the south of the site, or the channel 100 m west of the site. Such movement may occur if the liquefiable deposits daylight at the

channel, and if this is the case, would be expected to occur at the channel and could be expected to extend considerable distance into the site.

7.0 GEOTECHNICAL DEVELOPMENT CONSIDERATIONS

In our opinion, the property is generally suitable for rebuilding conditional on implementation of a design that considers the presence of sandy soils that are vulnerable to liquefaction and associated settlement and/or lateral spread displacement and loss of bearing strength during strong seismic shaking. It is considered likely that such design will require pre-rebuilding site treatment such as ground improvement coupled with rigid foundation solutions and/or pile-supported foundations to accommodate the seismic site response. The approaches to site redevelopment considered herein include:

- Option 1: Carry out shallow ground improvement site preparation works coupled with relatively rigid structural design of the foundation system with the expectation of the need for re-levelling and maintenance to mitigate potential future seismically-induced ground deformations.
- Option 2: Carry out deep ground improvement site preparation works coupled with relatively rigid structural design of the foundation system to reduce the requirements for re-levelling and maintenance (relative to Option 1) resulting from potential future seismically-induced ground deformations.
- Option 3: Support the structures and settlement sensitive infrastructure on piled foundations designed to accommodate seismically induced loadings, loss of shaft support under liquefied ground conditions, and lateral spreading deformation.

7.1 Shallow Ground Improvement coupled with Rigid Slab-on-Grade

Consideration could be given to carrying out ground improvement of the upper liquefiable deposits to create a "bridging layer" in the order of 3 to 5 m thickness coupled with a relatively rigid foundation system (such as a suitably reinforced stiffened raft) capable of tolerating the anticipated residual post-liquefaction settlement/displacement of the site in its post-ground improved condition. Such a foundation could then be re-levelled by jacking and grouting should future seismically-induced ground deformation occur.

The selection of a suitable method of shallow ground improvement would need to consider site constraints such as: the presence of the upper capping layer of clay and silt, which can limit the effectiveness of some methods of ground improvement relying on impact for densification (such as rapid impact compaction or impact rollers); the presence of a relatively shallow groundwater table, which can cause difficulties with ground improvement methods requiring open-cut excavations (such as remove and replace) particularly given potential restrictions on discharge of groundwater and potential impact on adjacent infrastructure resulting from drawing down the groundwater table. Given the above constraints, consideration may be given to ground improvement using an in-situ cement-soil-mixed improvement zone and/or a bridging layer constructed using shallow remove and replace with or without cement stabilisation.

Another option may also consider complementing the bridging layer with short driven compaction piles (such as timber piles driven to shallow depths at close centre-to-centre spacing). Such compaction piles would further reduce the requirements for on-going maintenance, although some re-levelling would still be anticipated.

The advantage of this approach is the cost-effectiveness of the initial capital cost compared to other alternatives. However, a disadvantage is the anticipated additional cost of maintenance in the event of future seismic events.

7.2 Deep Ground Improvement coupled with Rigid Slab-on-Grade

Consideration could be given to carrying out ground improvement at the building area to depths in the order of 20 m (or possibly greater). As with Option 1, this method would be coupled with a relatively rigid foundation system although, due to the further reduction in anticipated residual post-liquefaction



GEOTECHNICAL ASSESSMENT REPORT - 2B MALLARD PLACE, WOOLSTON

settlement/displacement of the site in its post-ground improved condition, the raft may have opportunity to be less stiff and/or there may be a lesser requirement for maintenance following future seismic events.

Options may include deep driven compaction piles (such as timber piles driven to deep depths at close centre-to-centre spacing) or stone columns.

The advantage of this approach, in comparison to the option outlined above, is that after deep ground improvement has been completed, less on-going maintenance associated with potential future earthquake events would be required. A disadvantage is the time and cost required for site preparation and increased initial capital costs.

7.3 End-Bearing Pile Supported Foundation

Consideration could be given to use of an end-bearing pile-supported foundation and floor slab. The pile-supports would need to be designed to carry the building loads below the zones of liquefiable soils and would need to sufficiently penetrate into a sound bearing stratum. The depth to such a suitable founding stratum has not been established in the current investigation; however, based on the available CPT results, it is anticipated to be at depths greater than 20 m bgl.

The pile design would need to consider: loss of support to the pile shaft while soils are in a liquefied state; horizontal and axial design loads under earthquake shaking; and (potentially) lateral soil pressures resulting from lateral-spread. It is envisaged that such design would require piles with substantial bending moment and shear capacity such as medium to large diameter concrete-filled steel pipe piles, or suitably reinforced concrete piles.

Construction considerations for the installation of piles would include: the shallow groundwater table and associated difficulties with the installation of unlined bored piles; the potential for large obstructions within the subsurface conditions (such as cobbles and/or boulders) and associated difficulties with pile installations/potential requirements for driving shoes, etc; and vibrations resulting from driven pile installations and the associated effects on adjacent infrastructure or residents.

This option may reduce site preparation and on-going maintenance associated with potential future earthquake events. However, this approach would likely require a higher initial capital cost and may lead to problematic differential settlement effects between pile-supported and grade-supported components.

8.0 CLOSURE

We trust that this report meets your current requirements. Should you have any queries, or require further clarification, please feel free to contact us.



APPENDIX A

Report Limitations

GEOTECHNICAL ASSESSMENT REPORT - 2B MALLARD PLACE, WOOLSTON

REPORT LIMITATIONS

This Document has been provided by Golder Associates (NZ) Ltd ("Golder") subject to the following limitations:

- (i). This Document has been prepared for the particular purpose outlined in Golder's proposal and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.
- (ii). The scope and the period of Golder's Services are as described in Golder's proposal, and are subject to restrictions and limitations. Golder did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Golder in regards to it.
- (iii). Conditions may exist which were undetectable given the limited nature of the enquiry Golder was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.
- (iv). In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Golder's opinions are based upon information that existed at the time of the production of the Document. It is understood that the Services provided allowed Golder to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.
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APPENDIX B

Site Plan



Legend

-  CPT location
-  EQC CPT location

Aerial: <http://coordinates.com/laver/3185-christchurch-post-earthquake-aerial-photos-24-feb-2011/?embed=1>, Flown 24 Feb 2011.
 Map image: Land Information New Zealand NZMS Series, Copyright Reserved.
 Schematic only, not to be interpreted as an engineering design or construction drawing
 Figure Not to Scale (NTS)



TITLE

Exploratory Hole Location Plan
 2b Mallard Road, Woolston, CHCH

February 2012

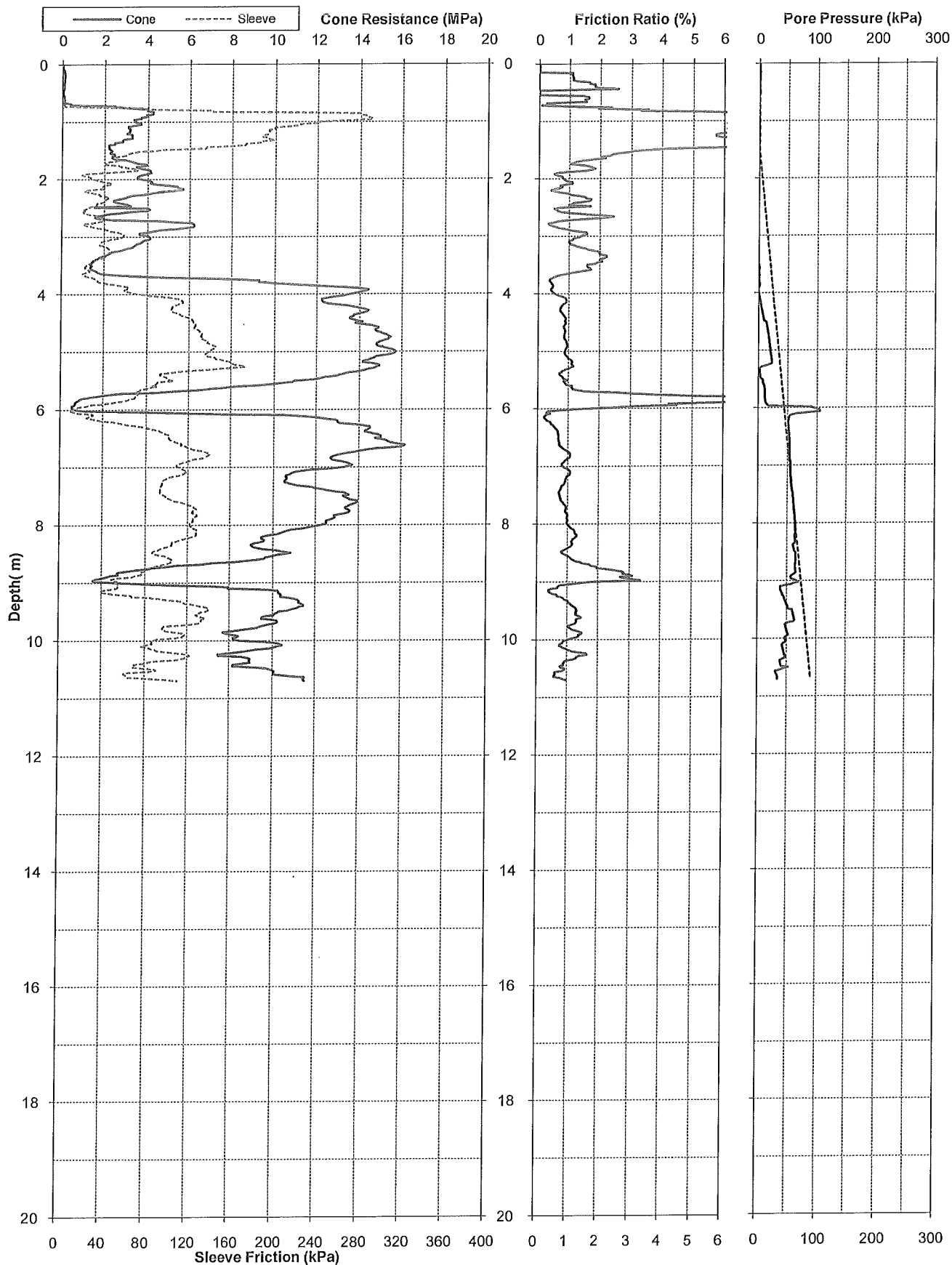
PROJECT 1078102455

1

APPENDIX C

EQC CPT Logs

Project: Christchurch 2011 Earthquake - EQC Ground Investigations				Page: 1 of 1	CPT-WSW-48	
Test Date:	13-Jun-2011	Location:	Woolston	Operator:	Geotech	 
Pre-Drill:	1.2m	Assumed GWL:	1.5mBGL	Located By:	Survey GPS	
Position:	2485207.8mE	5739391.3mN	1.99mRL	Coord. System:	NZMG & MSL	
Other Tests:				Comments:		





APPENDIX D

Golder Visual Inspection Report

GEOTECHNICAL INSPECTION FOR ARROW INTERNATIONAL



VISUAL INSPECTION REPORT

Street Address	2b Mallard Place			Date of Inspection	20/07/2011		
Suburb	Woolston			Engineers' Names	Justin Legg		
Town/City	Christchurch				Marie-Claude Hébert		
AMI Claim No./PM	D3442561	Wayne Ballard		Job No/Task No	1078102455	320	
Scope	This geotechnical visual inspection was undertaken following the 4 September 2010 earthquake and 22 February 2011 and 13 June 2011 aftershocks including any associated aftershocks up to the date of this inspection. This report has been prepared in accordance with Golder Associates (NZ) Limited Standard Terms & Conditions which are presented on the back of this sheet.						
House Type	C2			Based on Table 5.1 DBH 2010			
Land Damage Category	Moderate			Based on Table 3.1 DBH 2010			
Landowner / occupant discussion	There is a crack in the concrete slab. The house has experienced approximately 80 mm of settlement. The lounge, in the southern portion of the house, seems to have sunk more than the rest of the house.						
Topographic setting	The section is flat.						
Property Damage Comments	This is a single level house with minor shaking damage. There are cracks in the patio and driveway. The path in the backyard tilts towards the house. Settlement appears to have occurred. The backyard appears hummocky.						
Liquefaction Ejecta	Liquefaction Ejecta Present on Ground Surface	Yes	Areal Extent of Liquefaction Ejecta on Ground Surface				
			Distributed over entire site?	Yes	approx 30 % of site		
Liquefaction Ejecta Comments	Liquefaction ejecta was found in both the front and backyards but the largest amount was found along the boundary fences in the backyard (southern side). The 24 February 2011 aerial photograph shows significant amounts of liquefaction ejecta in the street and all neighbouring properties.						
Ground Cracking	No. of Ground Cracks Observed	Approximately 7		Type of cracking	Settlement related		
	Cumulative Horizontal Displacement (mm)	0 - 50		Typical vertical displacement (mm)	10 - 50		
Comments	The fine cracks found between the patio and the house are potential evidence of settlement as they have vertical displacement. The cracks observed in the patio and driveway are likely to be due to oscillation damage.						
Discussion	Liquefaction ejecta, cracking between the house and surrounding patio and the owner's statements show potential evidence for settlement. Based on the liquefaction ejecta observed on this property we recommend a deep foundation investigation. In addition we recommend that a structural engineer / building surveyor damage assessment report is prepared, including levels inside the dwelling and of the ground surrounding the property.						
Recommendations	Repair	Repair options:	The concrete slab on grade foundations could be re-levelled by screw piling or compaction grouting / resin injection beneath the slab depending on the amount of re-levelling required. If screw piles are required they are to be founded in competent stratum below the base of the liquefiable layer, and consequently will provide additional settlement resistance. For screw piles a deep foundation investigation is recommended. However if compaction grouting / resin injection is used, a shallow investigation would be sufficient.				
		Future Investigations	Deep Foundation Investigation; Type CPTLA				
		Golder Costs (\$ excl GST)	3250	Contractor Costs Estimate excl GST (\$)	1200 - 1700	Total estimate excl GST (\$)	4450 - 4950
	Rebuild	Rebuild options:	If rebuild is necessary then a deep foundation investigation consisting of CPTs is recommended following demolition of the dwelling. Data from the CPTs will assist in the selection of the most appropriate foundation option. For the majority of situations it is envisaged that driven / screw piles installed to a competent bearing stratum below the liquefiable layer will be the most appropriate foundation solution. Where ground conditions permit, the use of an engineered granular fill raft and / or waffle slab would merit consideration.				
		Future Investigations	Deep Foundation Investigation; Type CPTLA				
		Golder Costs (\$ excl GST)	3250	Contractor Costs Estimate excl GST (\$)	1200 - 1700	Total estimate excl GST (\$)	4450 - 4950
Comments	There is CPT rig access to the front yard only. If there are other houses insured by AMI in the immediate vicinity that require investigation, CPT and analysis costs could be reduced by combining the investigations. The Tonkin & Taylor database should be checked for borehole or CPT data within 50 m of the property boundary. Relevant borehole or CPT should be reviewed as part of the assessment of foundation options.						

References: Department of Building and Housing *Te Tari Kaupapa Whaire*. 20 December 2010. Guidance on house repairs and reconstruction following the Canterbury earthquake.

Notes: The Department of Building and Housing update to the Building Code Issued on 19 May 2011 makes the following change inside the Canterbury Earthquake Region "A new definition of 'good ground' excludes ground where liquefaction and/or lateral spread could occur." Under these circumstances, site specific foundation design is required.

REPORT LIMITATIONS

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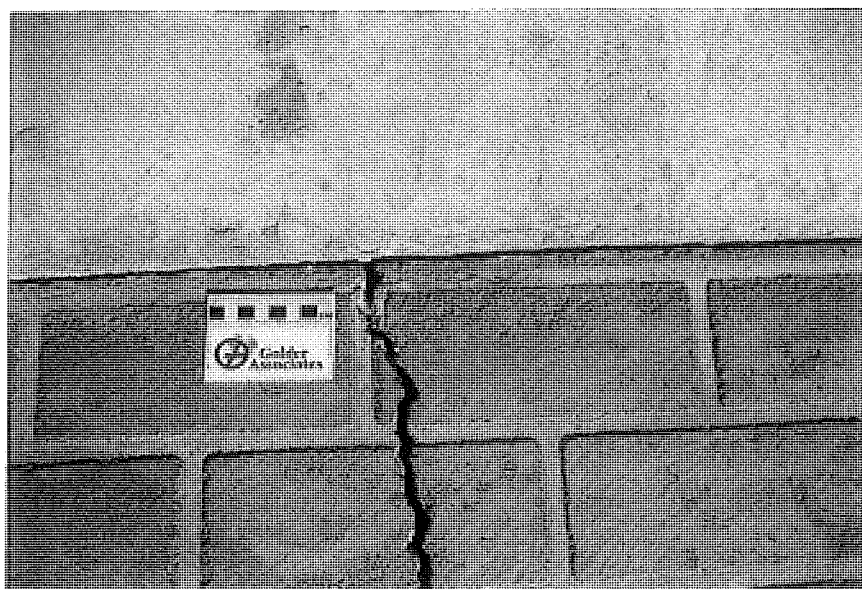


APPENDIX E

Site Photographs

Claim Number	D3442561
Street Address	2b Mallard Place
Suburb	Woolston

Date of Inspection	20/07/2011	
Engineers' Names	Justin Legg	
	Marie-Claude Hébert	
Job No/Task No	1078102455	320



Photograph 1

Evidence of ground cracking in front brick driveway.

Claim Number	D3442561
Street Address	2b Mallard Place
Suburb	Woolston

Date of Inspection	20/07/2011	
Engineers Names	Justin Legg	
	Marie-Claude Hébert	
Job No / Task No	1078102455	320



Photograph 2
Evidence of liquefaction ejecta in back garden.

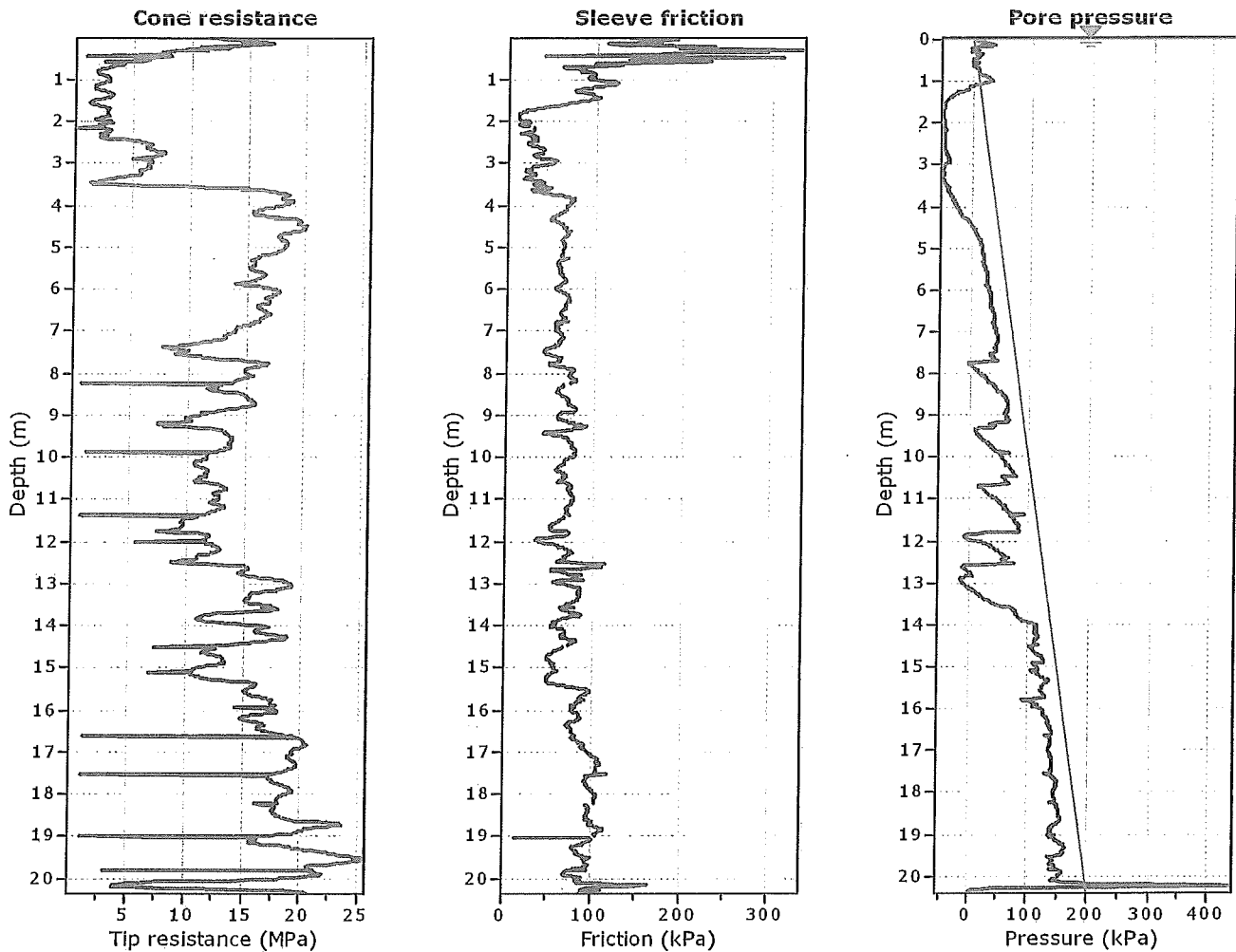


APPENDIX F

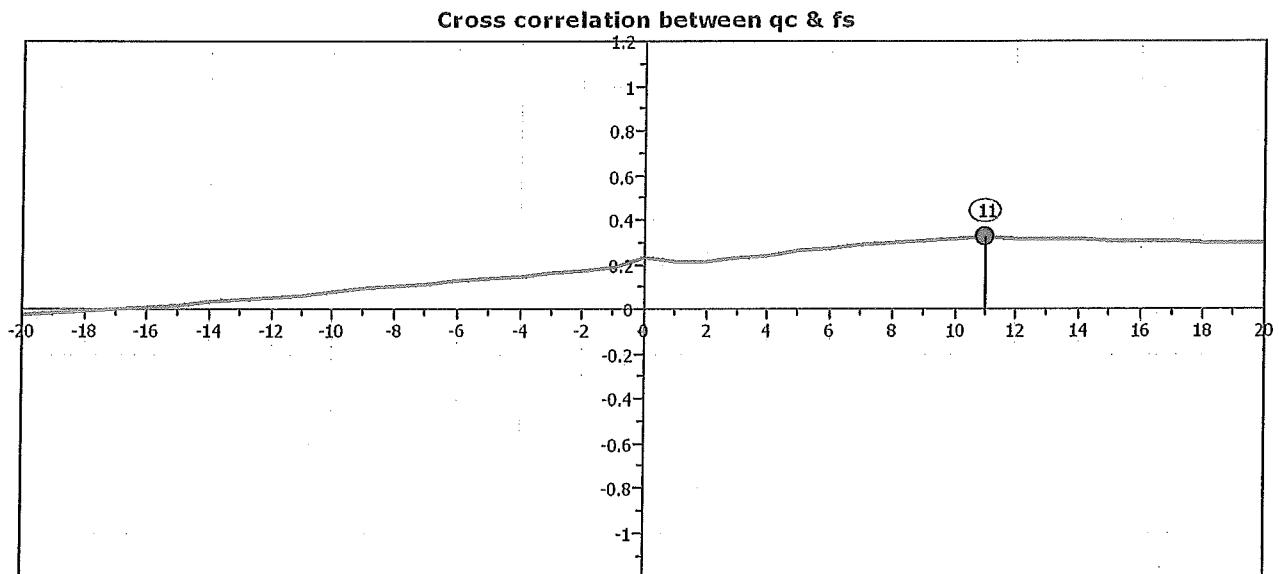
CPT Profile

Project:

CPT: CPT-01 - Total depth: 20.36 (m)

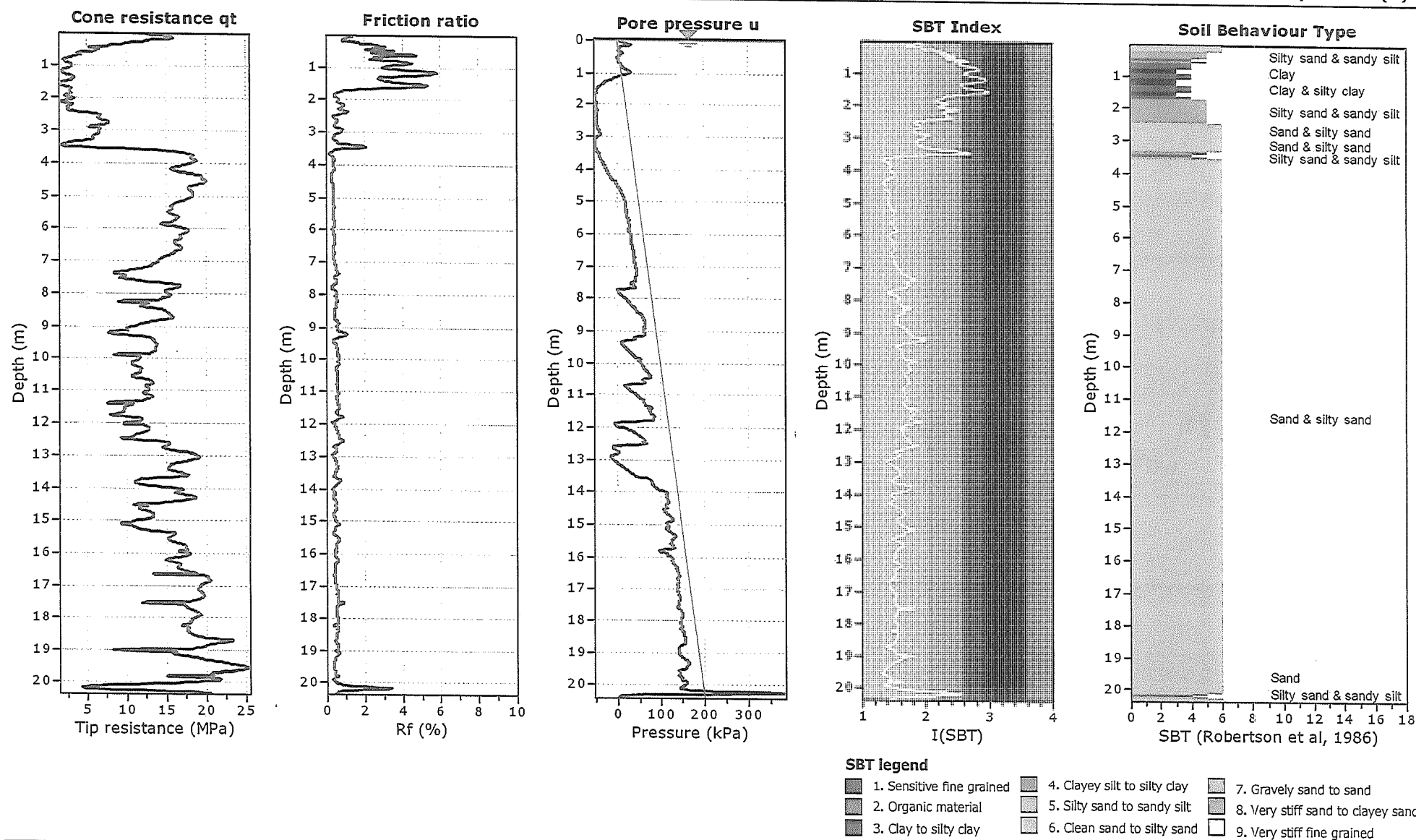


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).



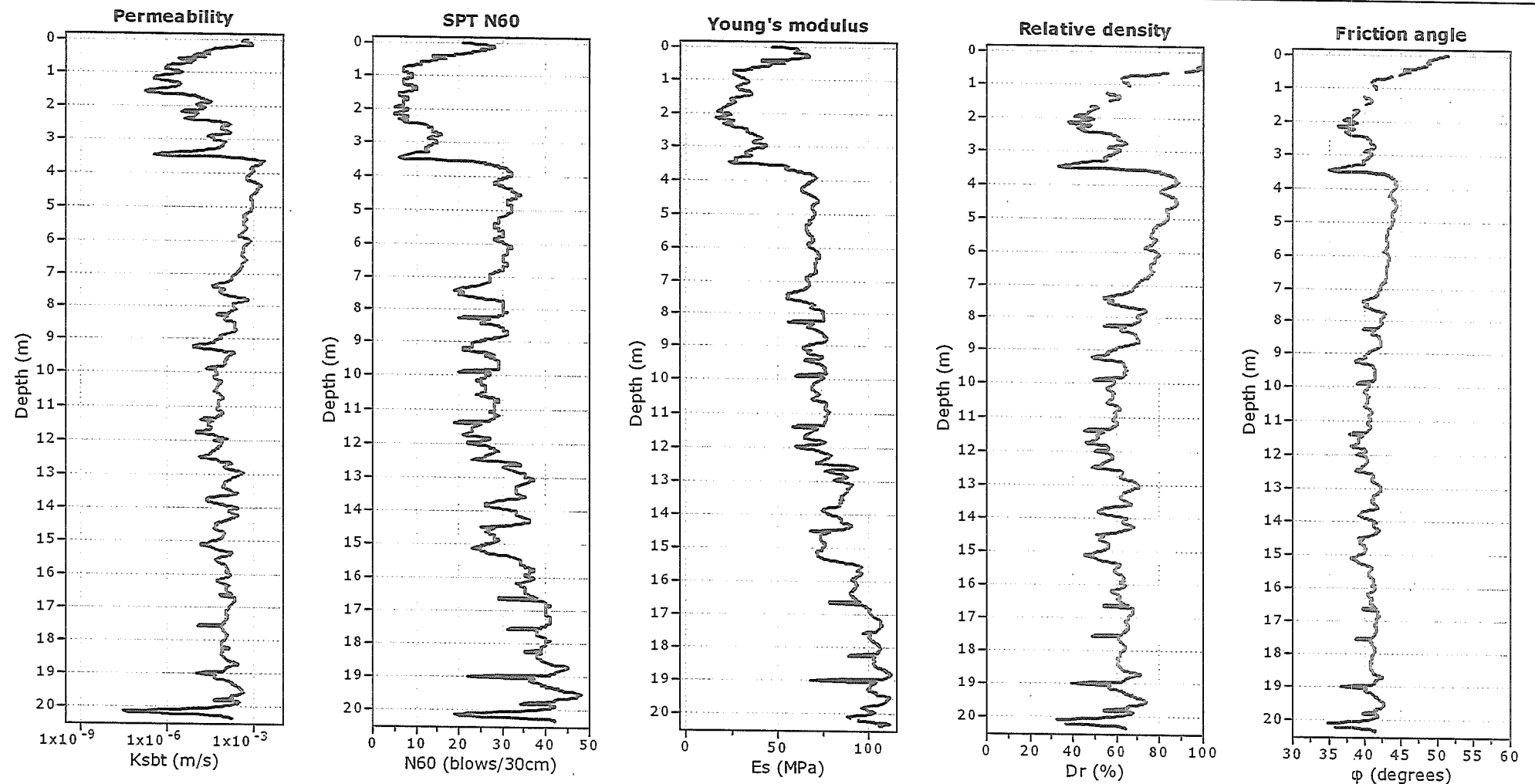
Project:

CPT: CPT-01 - Total depth: 20.36 (m)



CPeT-IT v.1.7.2.59 - CPTU data presentation & interpretation software - Report created on: 2/02/2012, 11:09:59 a.m.

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Calculation parameters

Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_c

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr} : 350.0

Phi: Based on Kulhawy & Mayne (1990)

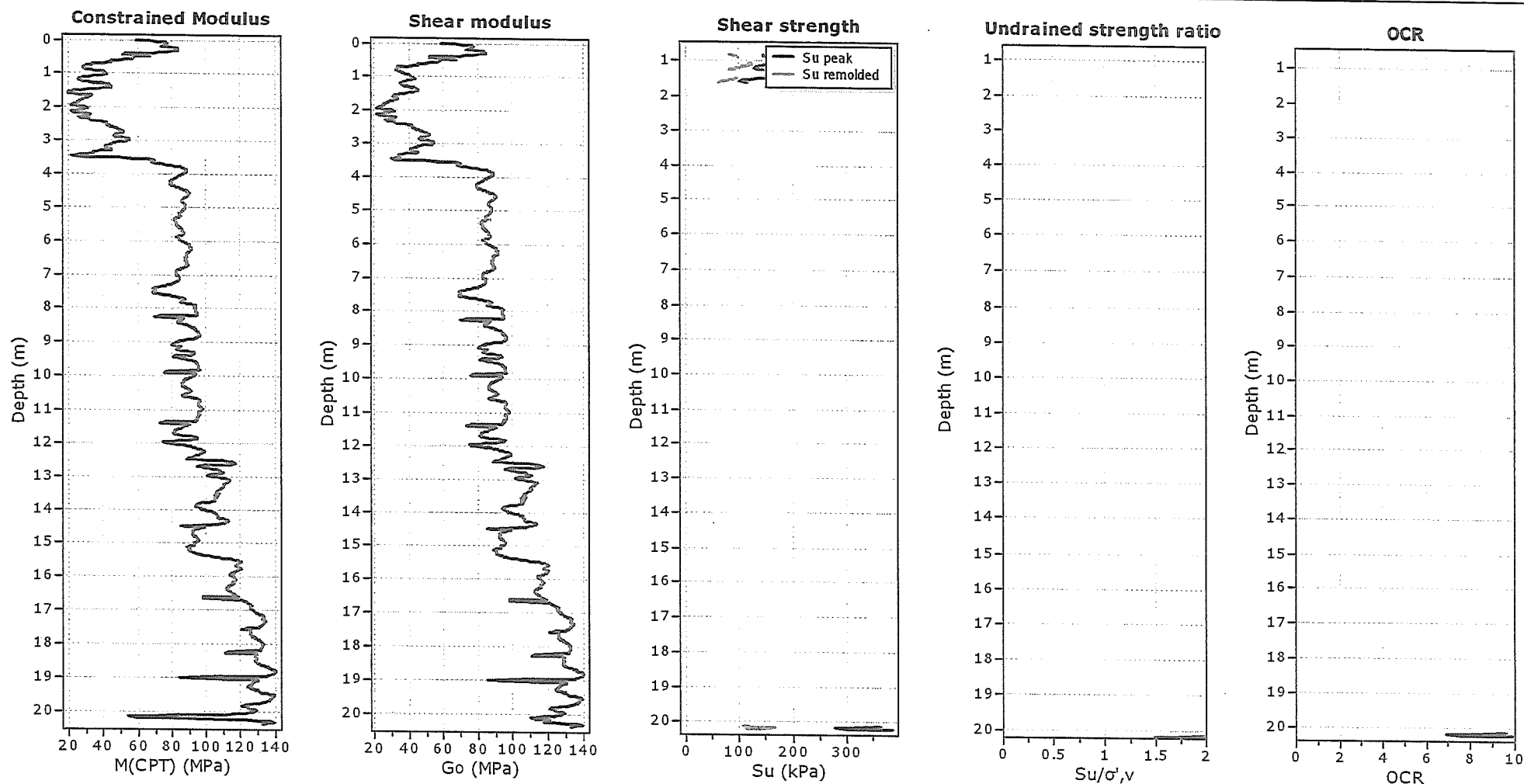
—●— User defined estimation data

CPeT-IT v.1.7.2.59 - CPTU data presentation & interpretation software - Report created on: 2/02/2012, 11:09:59 a.m.

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Project:

CPT: CPT-01 - Total depth: 20.36 (m)



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_m (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : 0.33

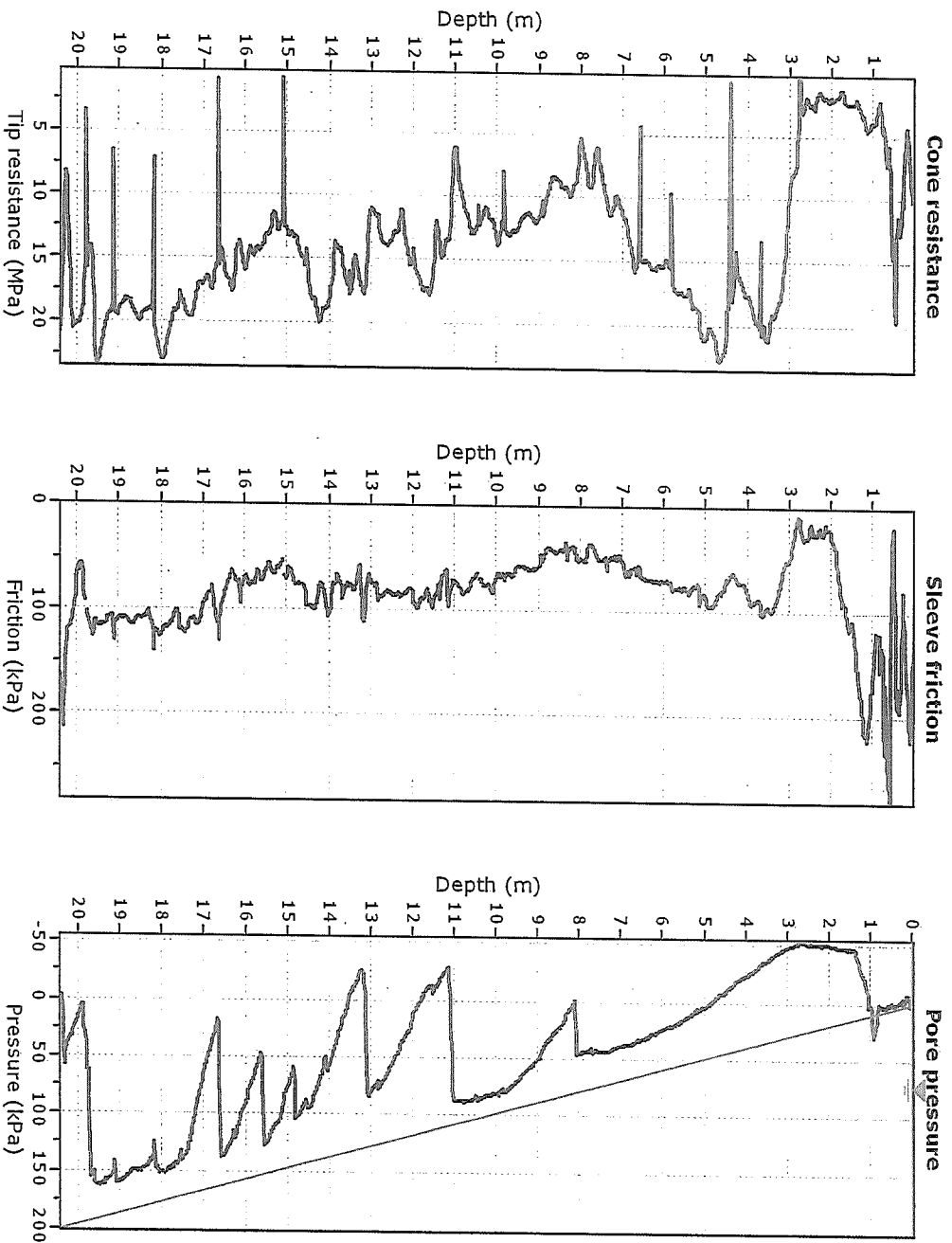
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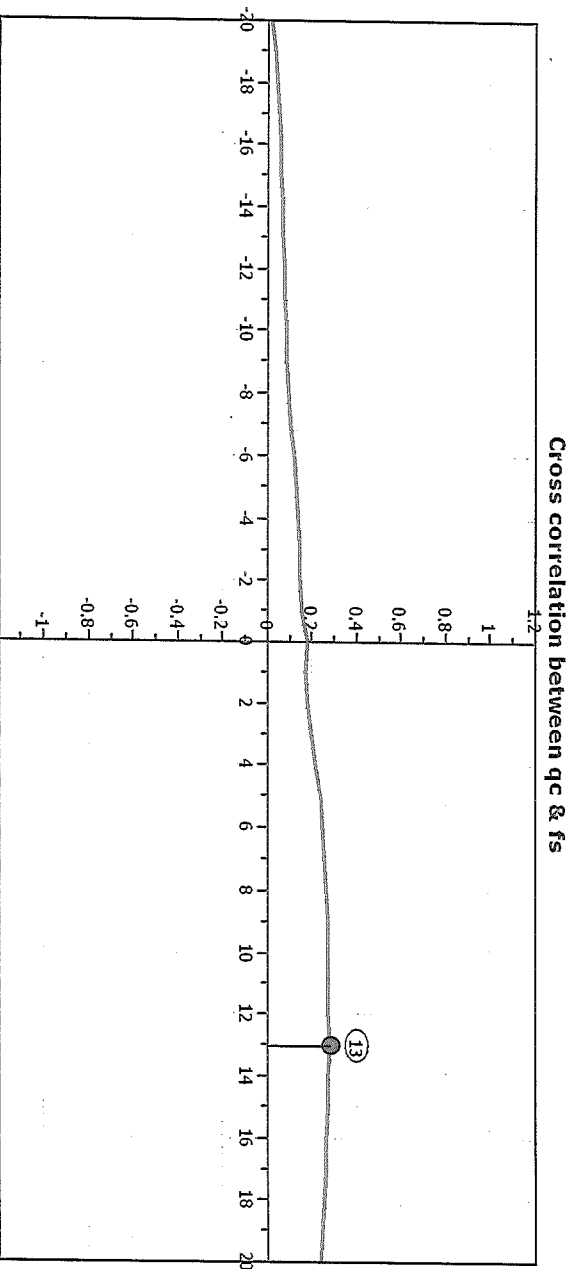
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Project:

CPT: CPT-02 - Total depth: 20.40 (m)

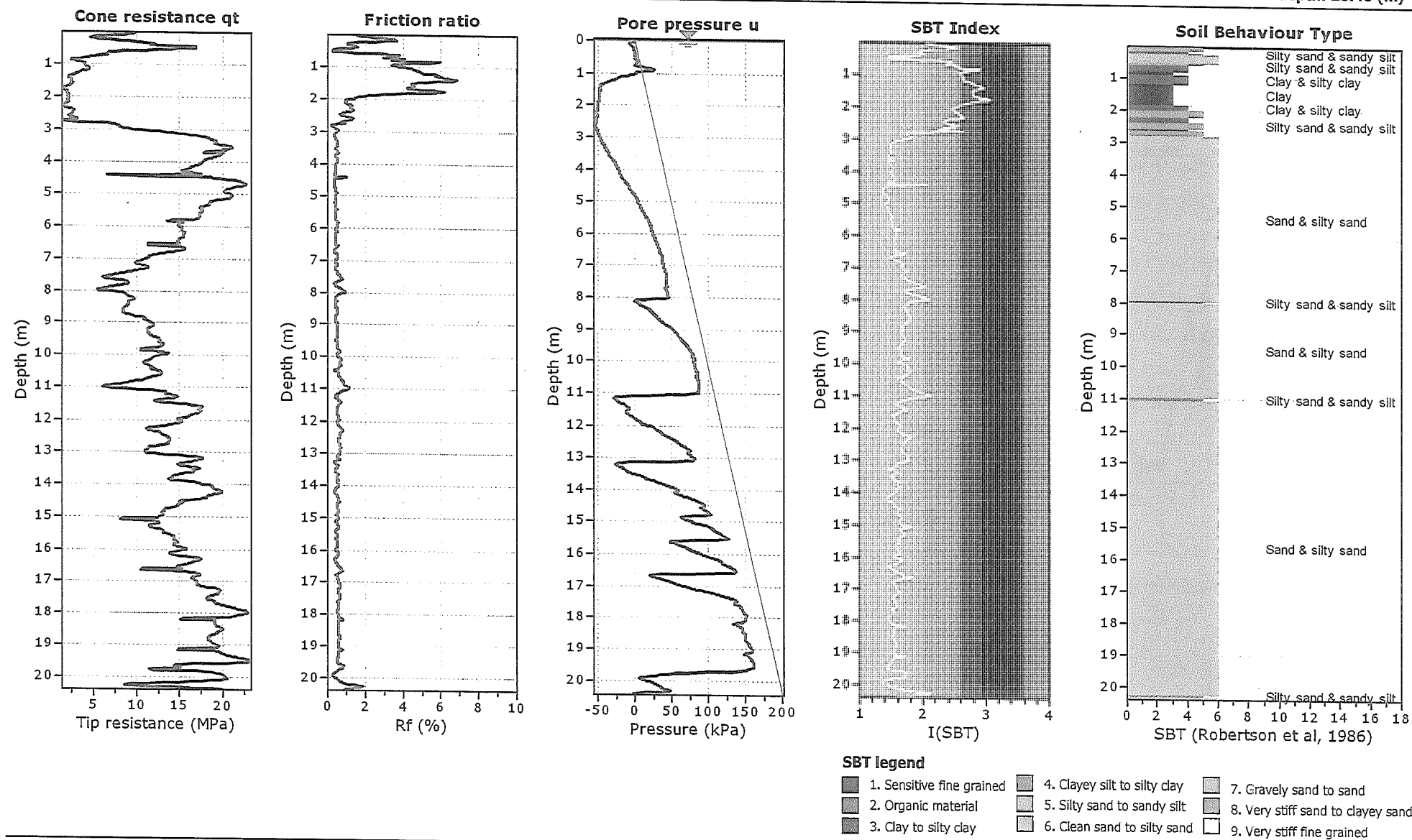


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).



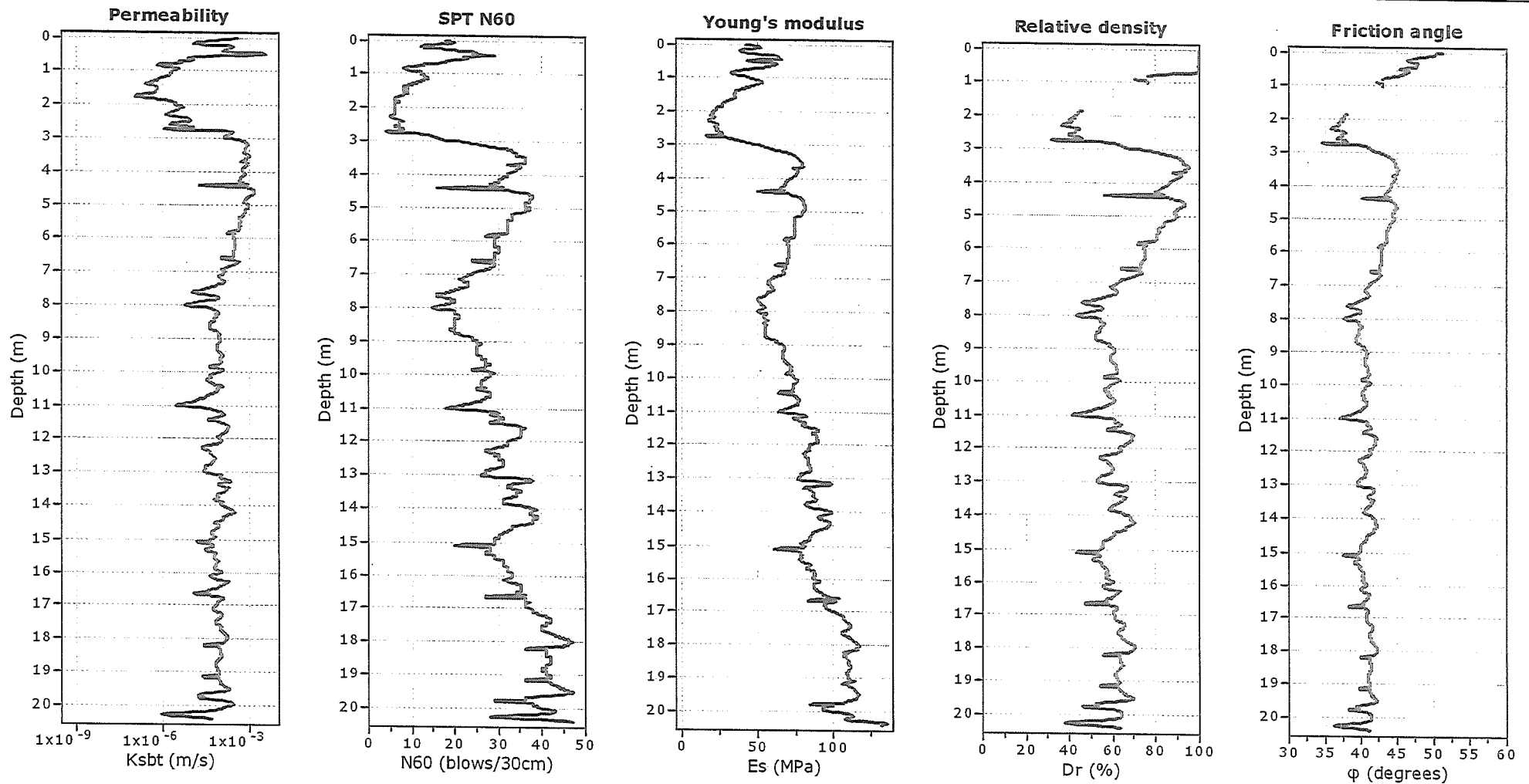
Project:

CPT: CPT-02 - Total depth: 20.40 (m)



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Calculation parameters

Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_t

Young's modulus: Based on variable α using I_c (Robertson, 2009)

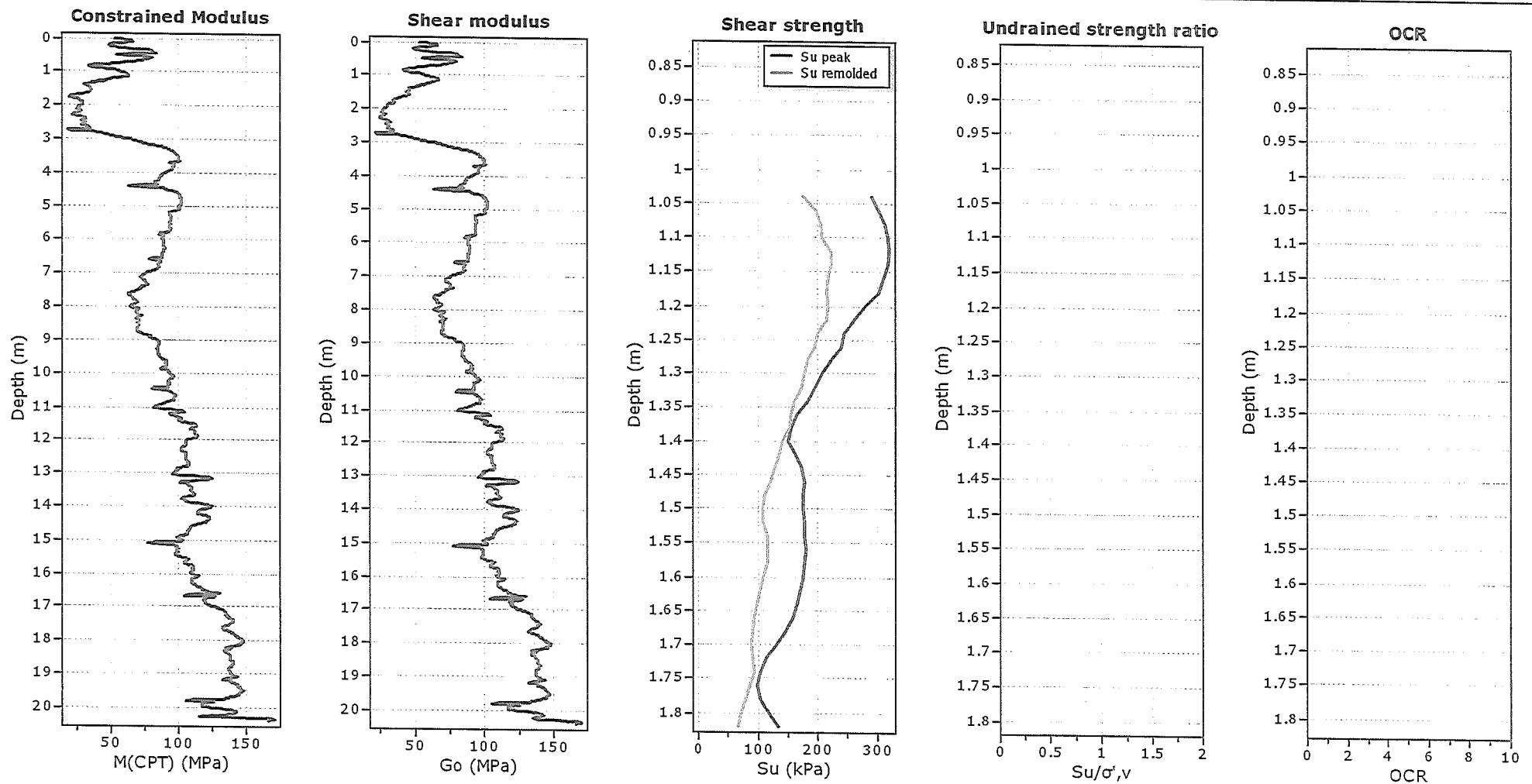
Relative density constant, C_{Dr} : 350.0

Phi: Based on Kulhawy & Mayne (1990)

● User defined estimation data

Project:

CPT: CPT-02 - Total depth: 20.40 (m)



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_m (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : 0.33

● User defined estimation data

CPeT-IT v.1.7.2.59 - CPTU data presentation & interpretation software - Report created on: 2/02/2012, 11:10:00 a.m.

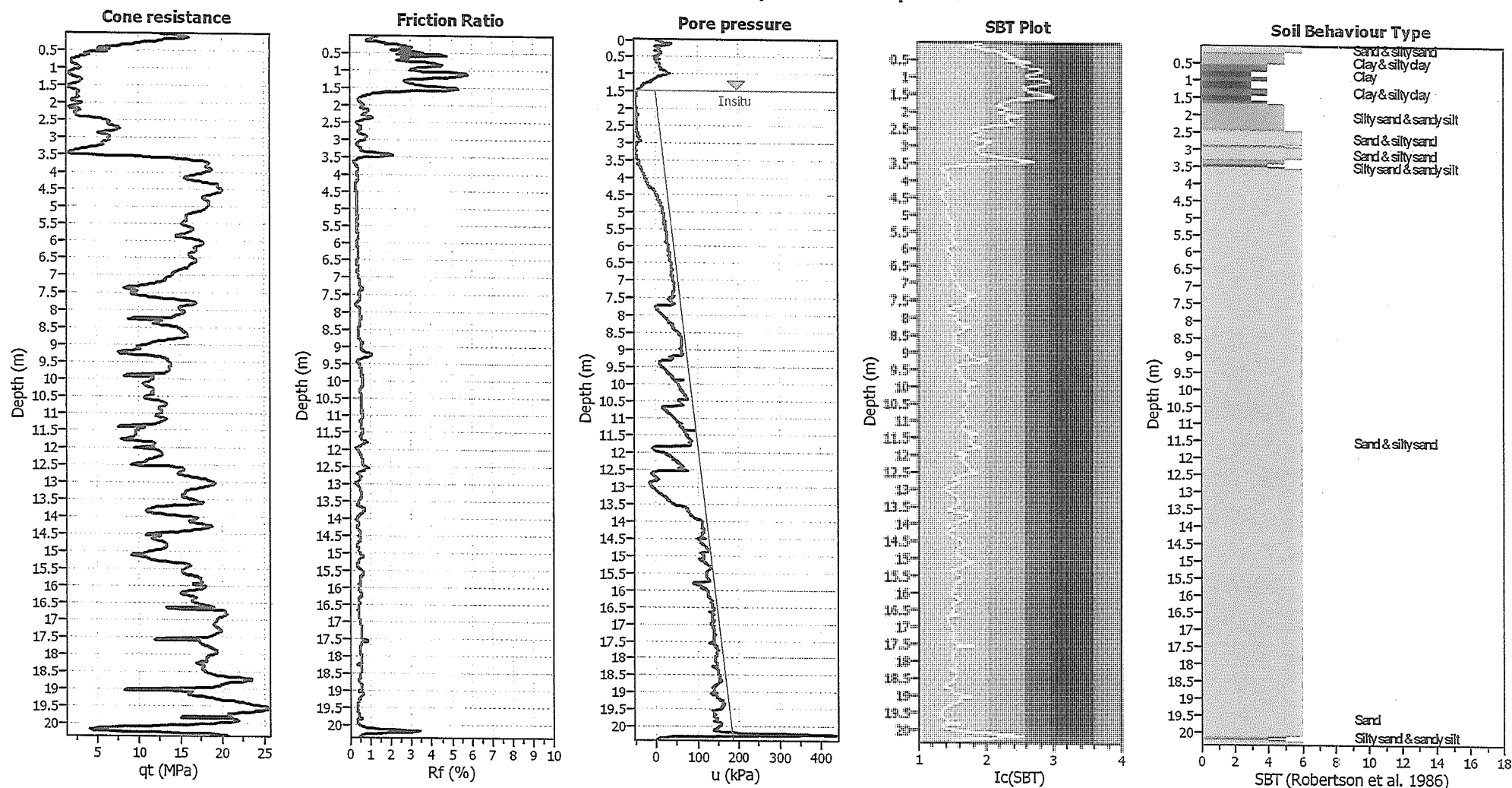
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APPENDIX G

Liquefaction Assessment Plots

CPT basic interpretation plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_0 applied:	Yes
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay-like behavior applied:	Sands only
Peak ground acceleration:	0.15	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	N/A

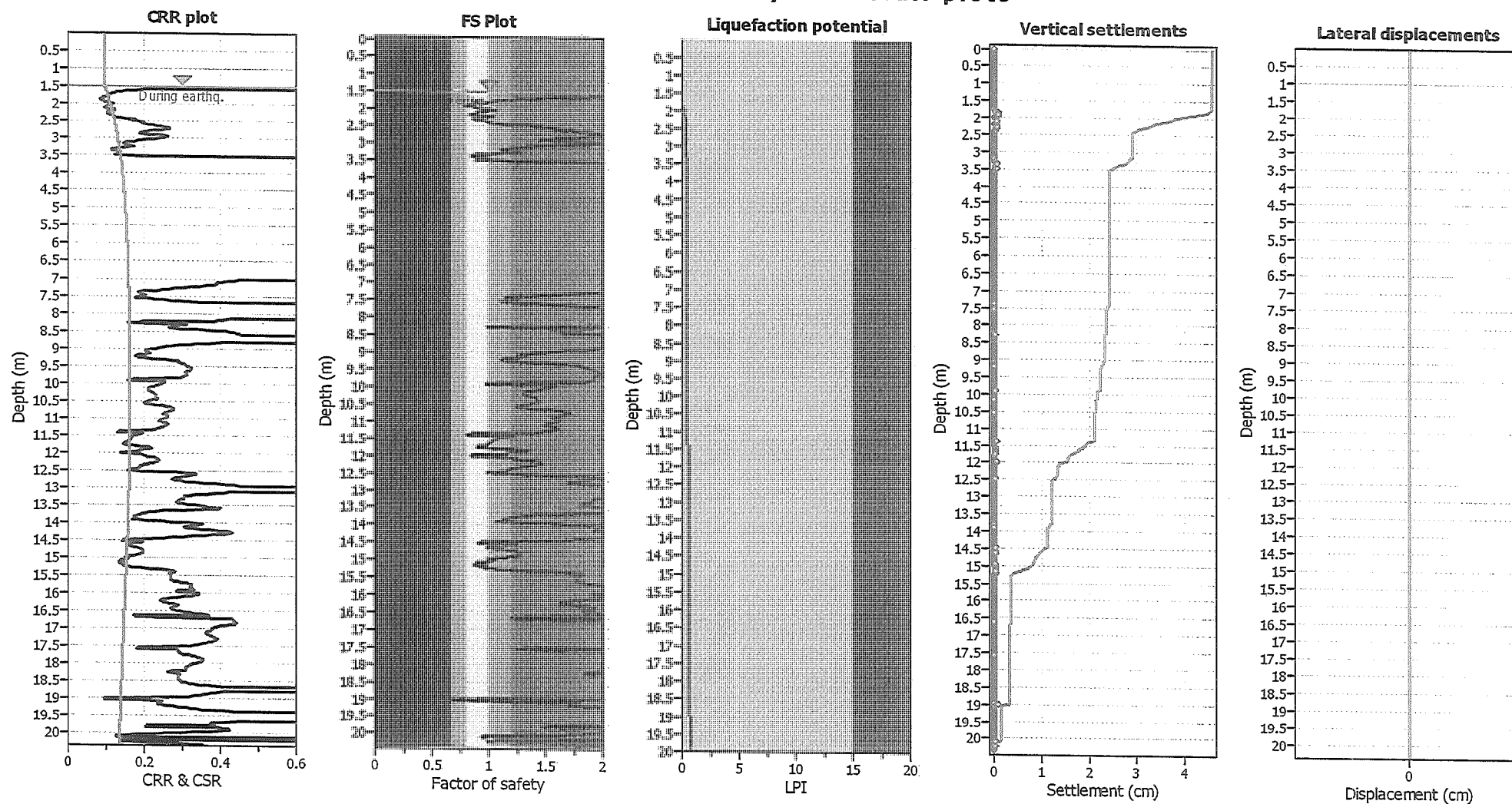
SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CLiq v.1.5.1.16 - CPT Liquefaction Assessment Software - Report created on: 1/02/2012, 4:09:04 p.m.

Project file: I:\Projects-Numbered\10781x\02xxx\1078102_455_ArrowIntLtd_AMISupport\Tasks\300 to 399\320_2b Mallard Place, Woolston\Data_Golder\0.20g.ciq

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (earthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.15	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

Very high risk	Almost certain it will liquefy
High risk	Very likely to liquefy
Low risk	Liquefaction and no liquefaction are equally likely
	Unlike to liquefy
	Almost certain it will not liquefy

LPI color scheme

Very high risk
High risk
Low risk

CLiq v.1.5.1.16 - CPT Liquefaction Assessment Software - Report created on: 1/02/2012, 4:09:04 p.m.

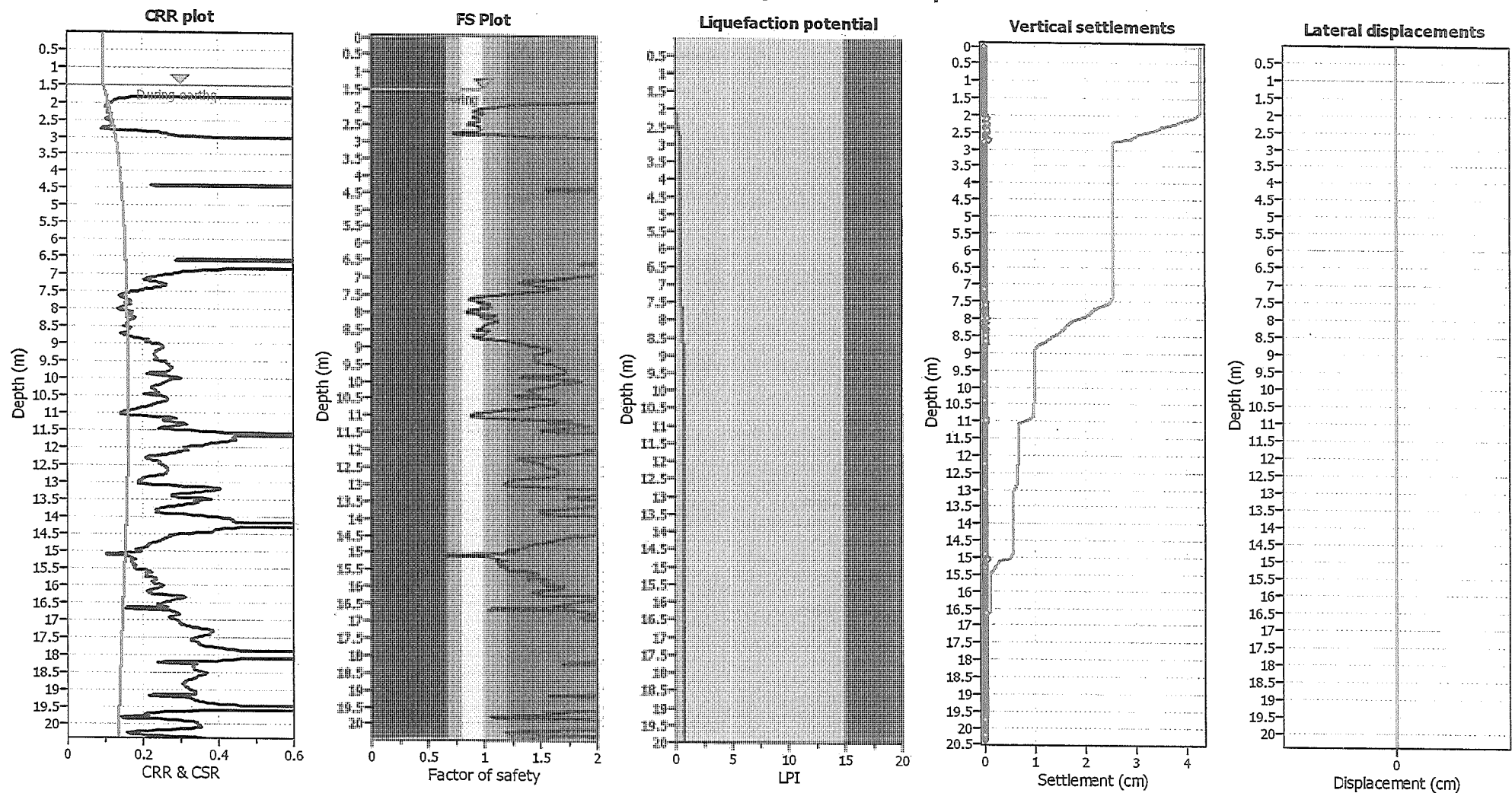
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Analysis method:	NCEER (1998)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.15	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	N/A

	1. Sensitive fine grained		4. Clayey silt to silty		7. Gravely sand to sand
	2. Organic material		5. Silty sand to sandy silt		8. Very stiff sand to
	3. Clay to silty clay		6. Clean sand to silty sand		9. Very stiff fine grained

Project file: I:\Projects-Numbered\10781x\02xxx\1078102_455_ArrowIntLtd_AMISupport\Tasks\300 to 399\320_2b Mallard Place, Woolston\Data_Golder\0.20g.clg

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{α} applied:	Yes
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.15	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

Very dark grey	Almost certain it will liquefy
Dark grey	Very likely to liquefy
Light grey	Liquefaction and no liquefaction are equally likely
White	Unlike to liquefy
Very light grey	Almost certain it will not liquefy

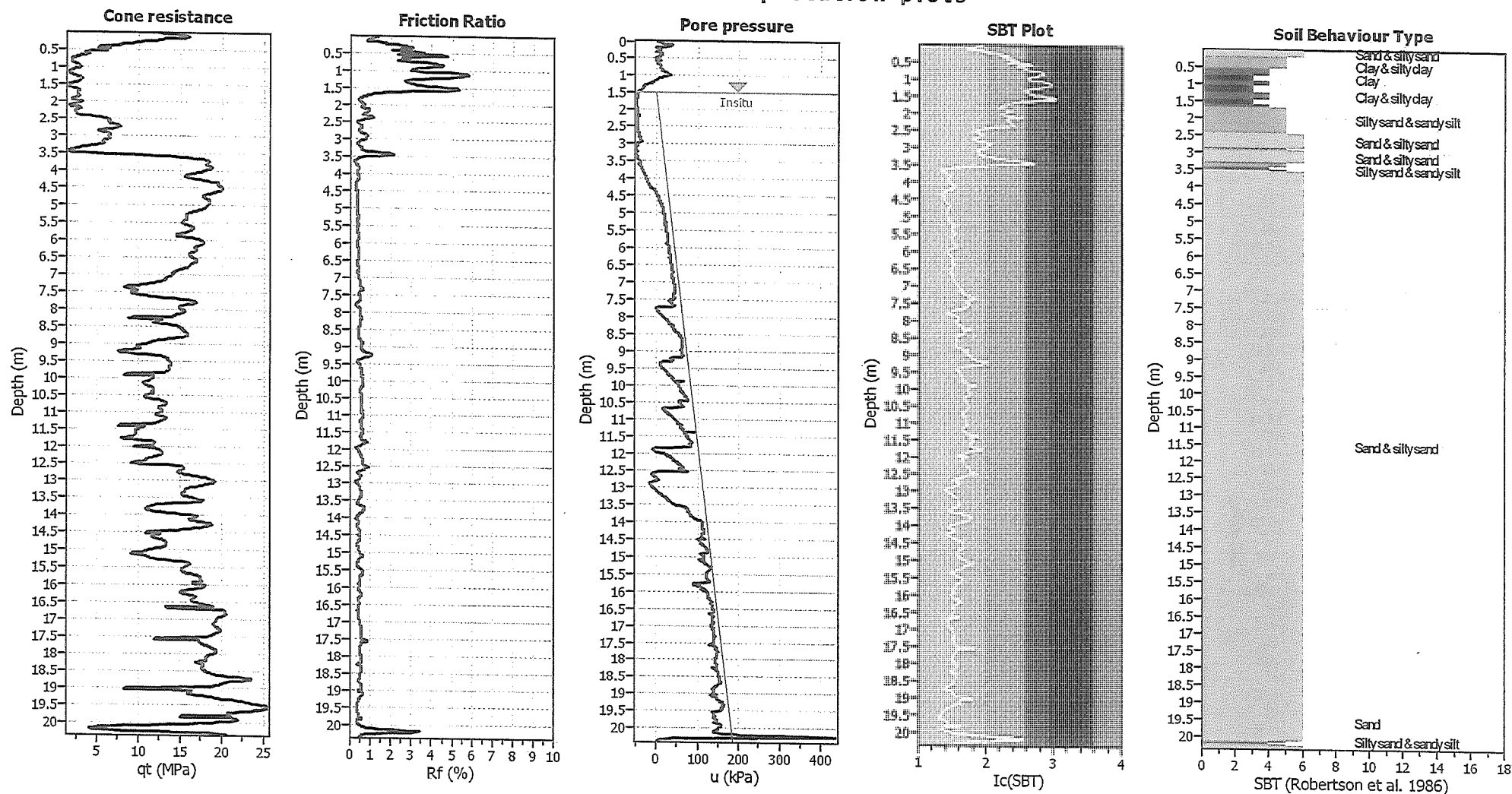
LPI color scheme

Dark grey	Very high risk
Light grey	High risk
White	Low risk

CLiQ v.1.5.1.16 - CPT Liquefaction Assessment Software - Report created on: 1/02/2012, 4:09:05 p.m.

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CPT basic interpretation plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_0 applied:	Yes
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.20	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	N/A

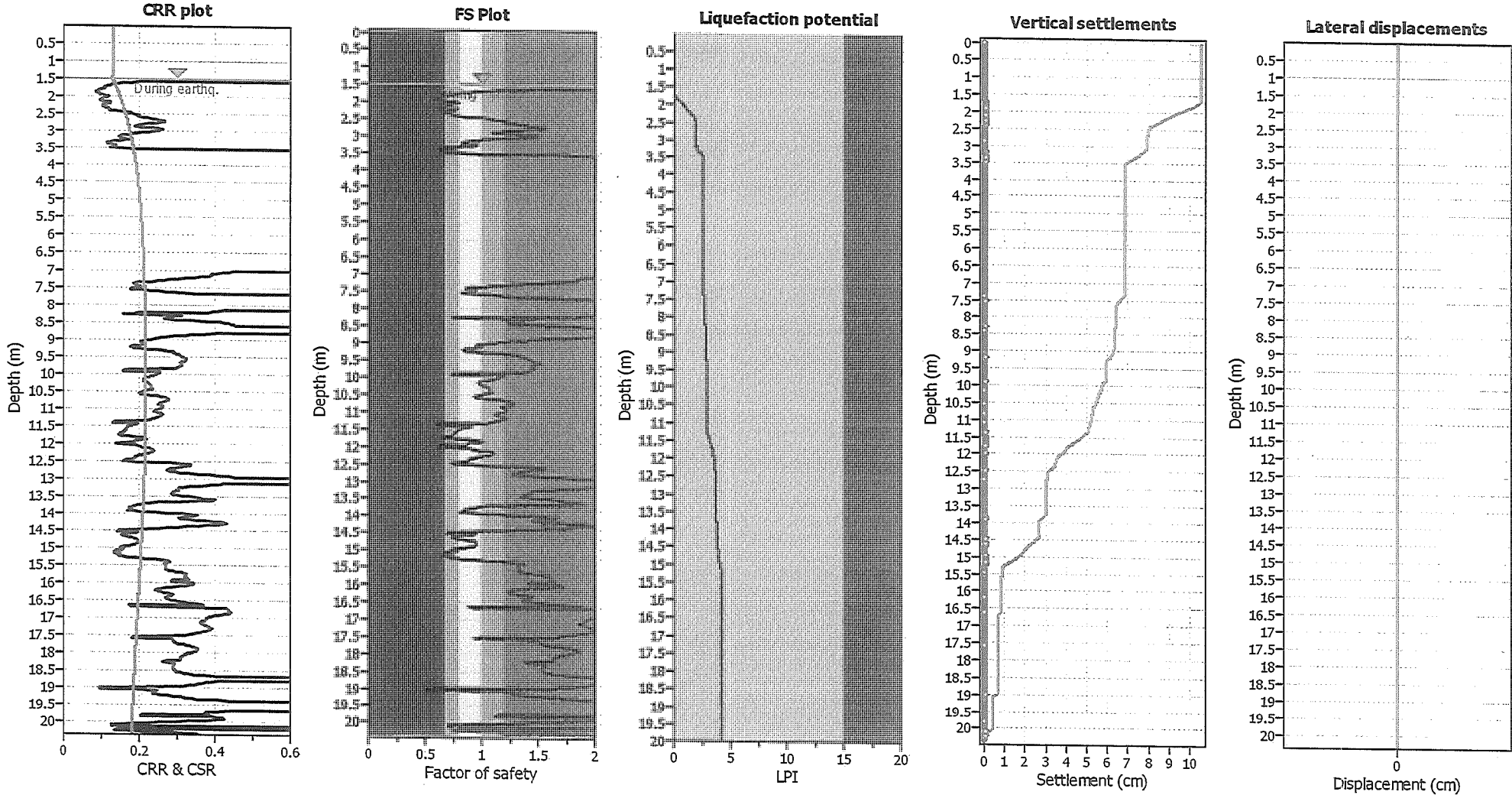
SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Cliq v.1.5.1.16 - CPT Liquefaction Assessment Software - Report created on: 1/02/2012, 4:08:24 p.m.

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Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	7.50	Unit weight calculation:	Based on SBT	Clay-like behavior applied:	Sands only
Peak ground acceleration:	0.20	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liquefaction are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

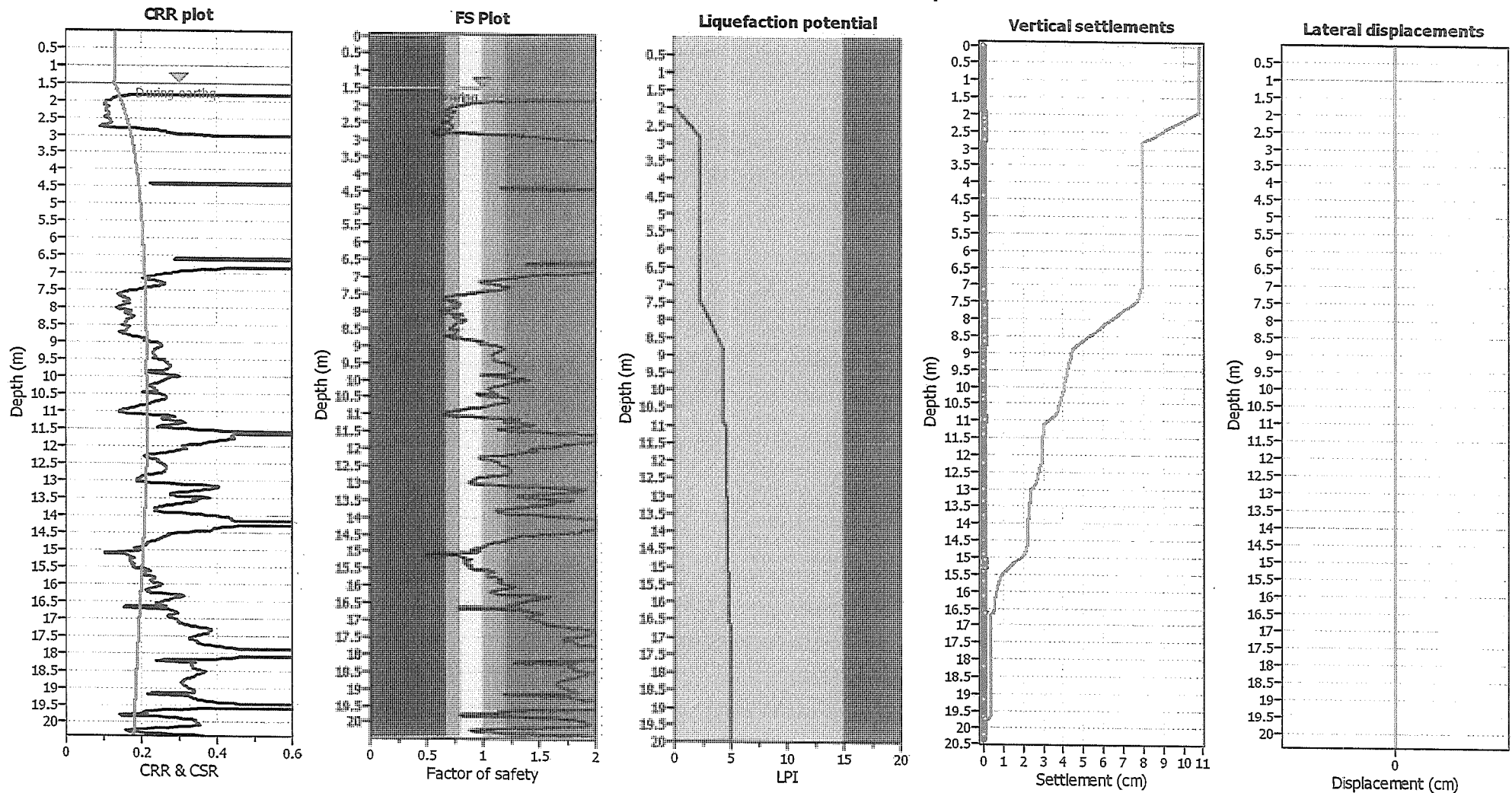
Clq v.1.5.1.16 - CPT Liquefaction Assessment Software - Report created on: 1/02/2012, 4:08:24 p.m.

Project file: I:\Projects-Numbered\10781x\02xxx\1078102_455_ArrowIntLtd_AMISupport\Tasks\300 to 399\320_2b Mallard Place, Woolston\Data_Golder\Mallard Place_Basic CPT Interp.clq

CPT name: CPT-02



Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.20	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

	Almost certain it will liquefy
	Very likely to liquefy
	Liquefaction and no liquefaction are equally likely
	Unlike to liquefy
	Almost certain it will not liquefy

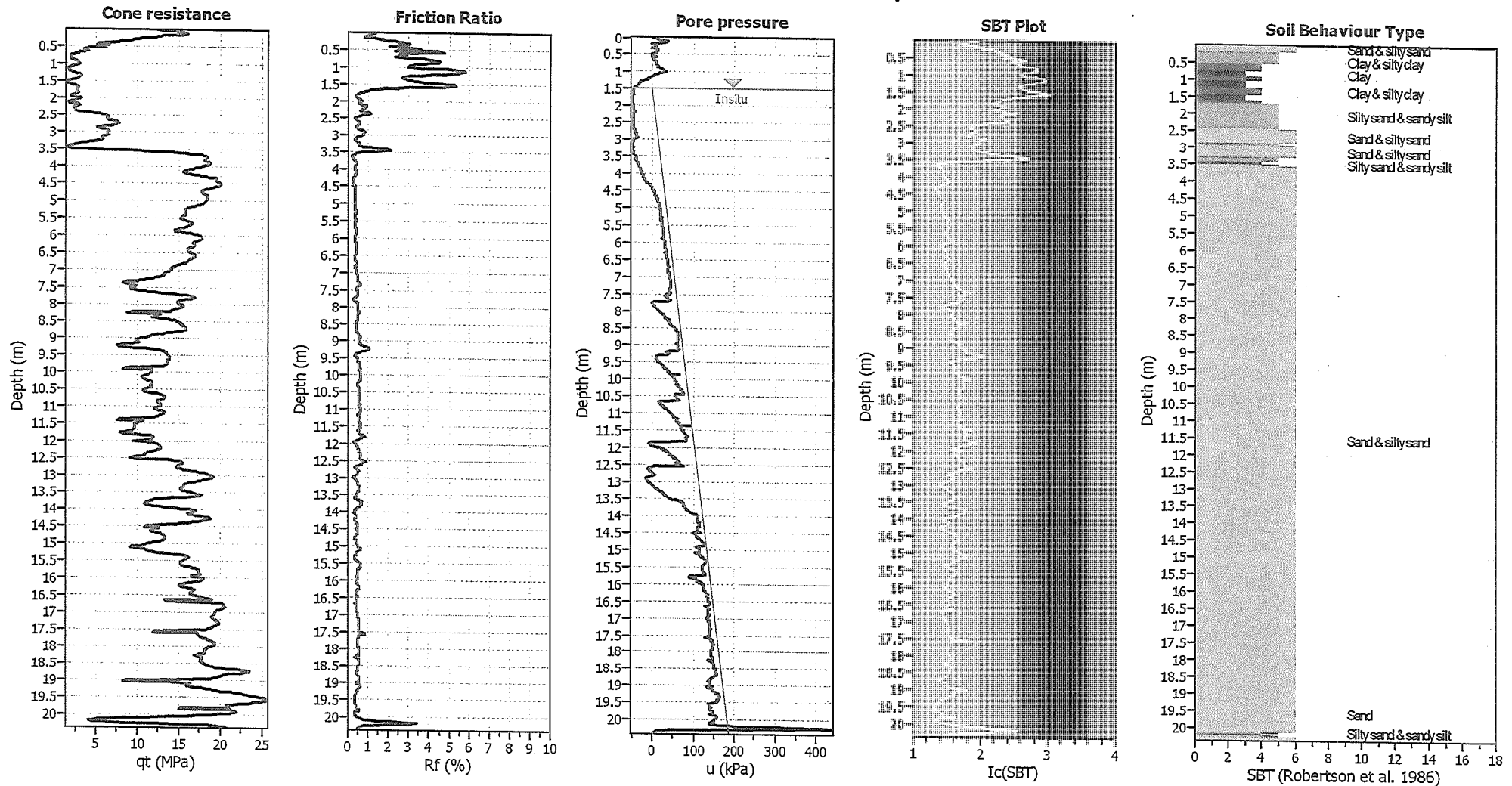
LPI color scheme

	Very high risk
	High risk
	Low risk

Clq v.1.5.1.16 - CPT Liquefaction Assessment Software - Report created on: 1/02/2012, 4:08:25 p.m.

Project file: I:\Projects-Numbered\10781x\02xxx\1078102_455_ArrowIntLtd_AMISupport\Tasks\300 to 399\320_2b Mallard Place, Woolston\Data_Golder\Mallard Place_Basic CPT Interp.clq

CPT basic interpretation plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _g applied:	Yes
Earthquake magnitude M _w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	N/A

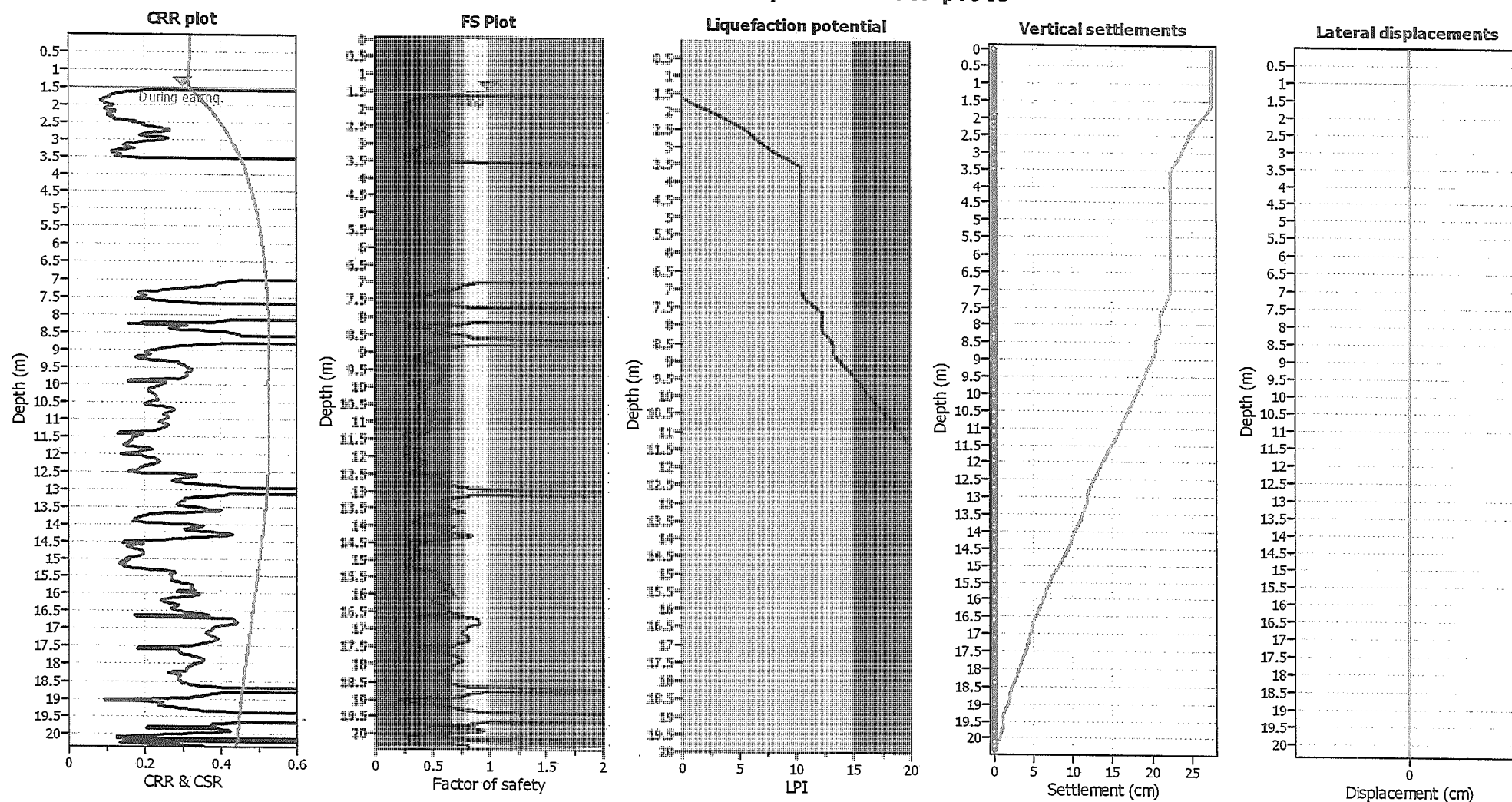
SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CLiQ v.1.5.1.16 - CPT Liquefaction Assessment Software - Report created on: 1/02/2012, 4:09:48 p.m.

Project file: I:\Projects-Numbered\10781x\02xxx\1078102_455_ArrowIntLtd_AMISupport\Tasks\300 to 399\320_2b Mallard Place, Woolston\Data_Golder\0.49g.clq

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

	Almost certain it will liquefy
	Very likely to liquefy
	Liquefaction and no liquefaction are equally likely
	Unlike to liquefy
	Almost certain it will not liquefy

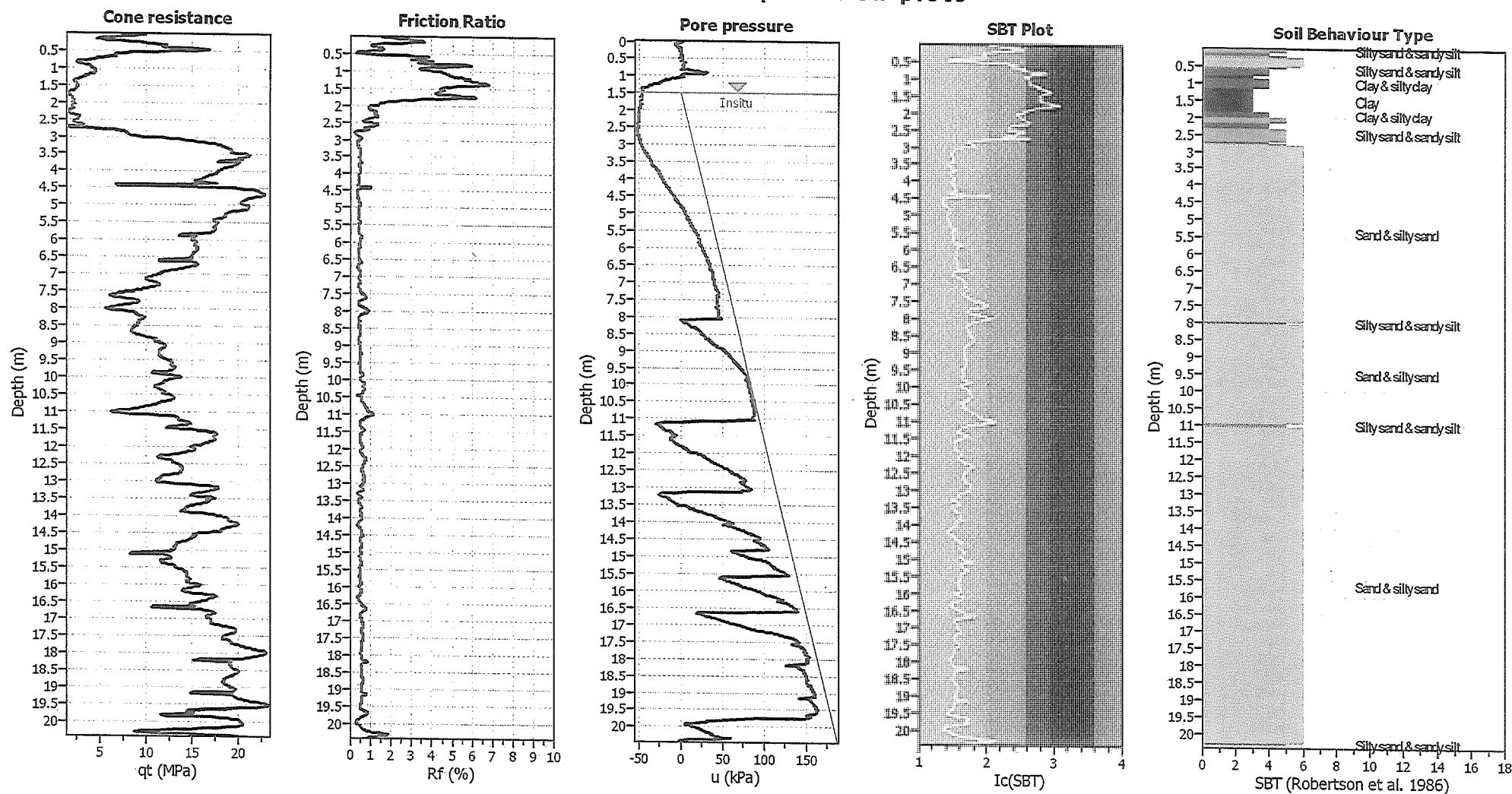
LPI color scheme

	Very high risk
	High risk
	Low risk

CLiq v.1.5.1.16 - CPT Liquefaction Assessment Software - Report created on: 1/02/2012, 4:09:48 p.m.

Project file: I:\Projects-Numbered\10781x\02xxx\1078102_455_ArrowIntLtd_AMISupport\Tasks\300 to 399\320_2b Mallard Place, Woolston\Data_Golder\0.49g.clg

CPT basic interpretation plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_p applied:	Yes
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	N/A

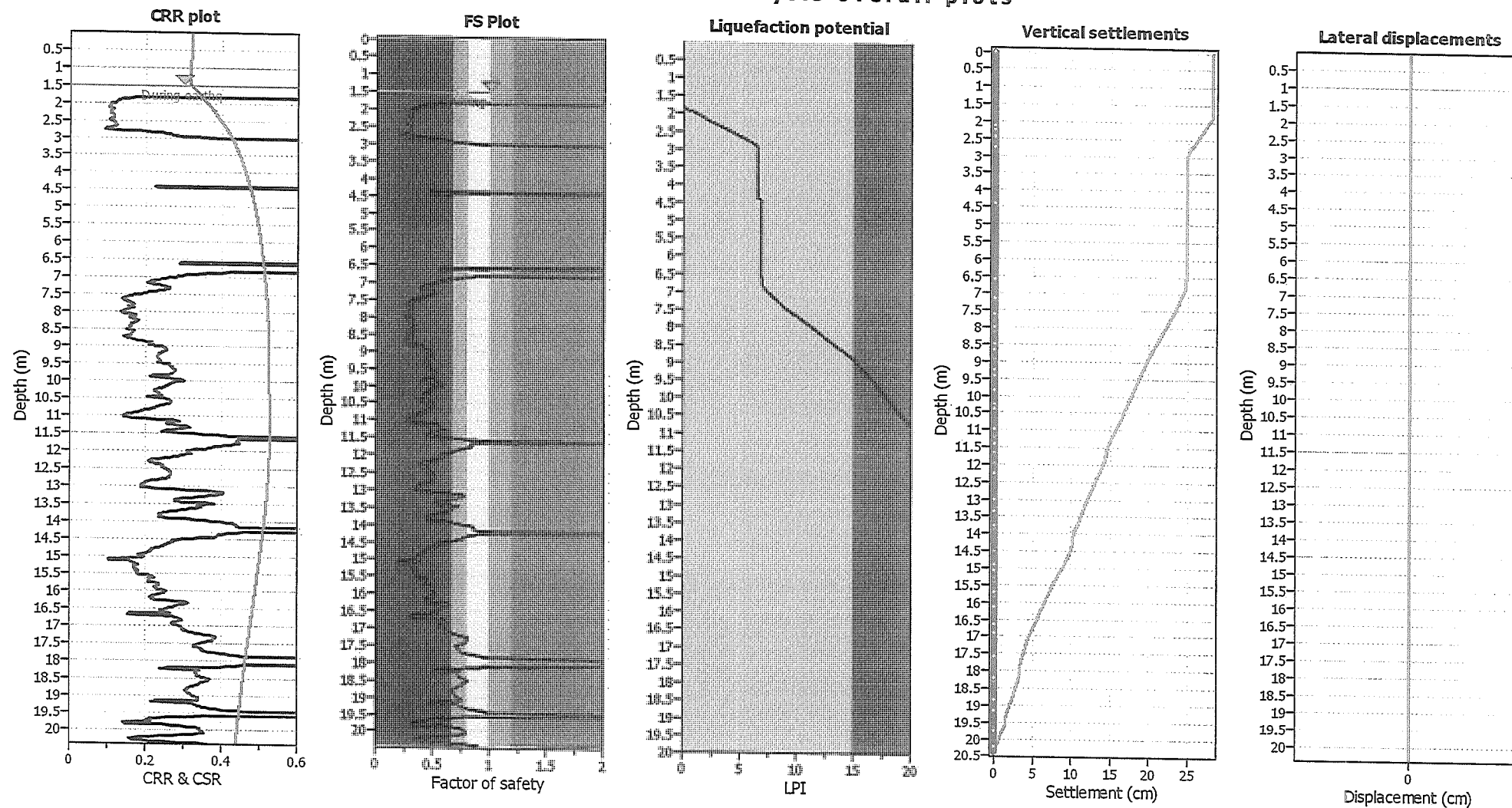
SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CLiq v.1.5.1.16 - CPT Liquefaction Assessment Software - Report created on: 1/02/2012, 4:09:49 p.m.

Project file: I:\Projects-Numbered\10781x\02xxx\1078102_455_ArrowIntLtd_AMISupport\Tasks\300 to 399\320_2b Mallard Place, Woolston\Data_Golder\0.49g.cliq

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_0 applied:	Yes
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.49	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

Very high risk	Almost certain it will liquefy
High risk	Very likely to liquefy
Low risk	Liquefaction and no liquefaction are equally likely
	Unlike to liquefy
	Almost certain it will not liquefy

LPI color scheme

Very high risk
High risk
Low risk

CLiq v.1.5.1.16 - CPT Liquefaction Assessment Software - Report created on: 1/02/2012, 4:09:49 p.m.

Project file: I:\Projects-Numbered\10781x\02xxx\1078102_455_ArrowInt\td_AMISupport\Tasks\300 to 399\320_2b Mallard Place, Woolston\Data_Golder\0.49g.clq

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 New Zealand +61 2 9221 0100
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 North America +1 800 275 3281
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 Nelson 7010

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 Nelson 7040

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Tel +64 3 377 5696
 Fax +64 3 377 9944

Level 1
 132 Tuam Street
 Christchurch 8011

PO Box 2281
 Christchurch 8140

DUNEDIN

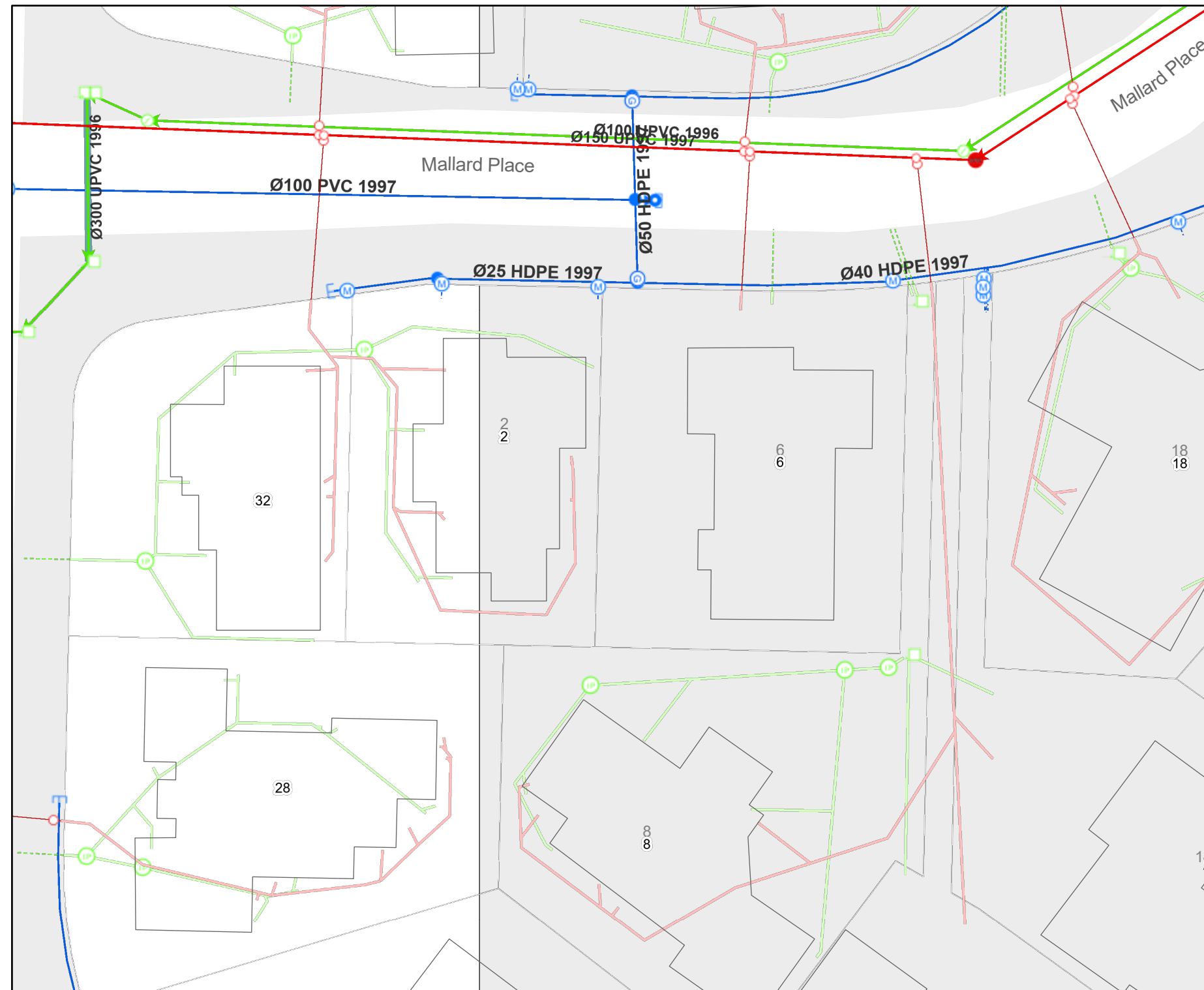
Tel +64 3 479 0390
 Fax +64 3 474 9642

Level 9A
 John Wickliffe House
 265 Princes Street
 Dunedin 9016

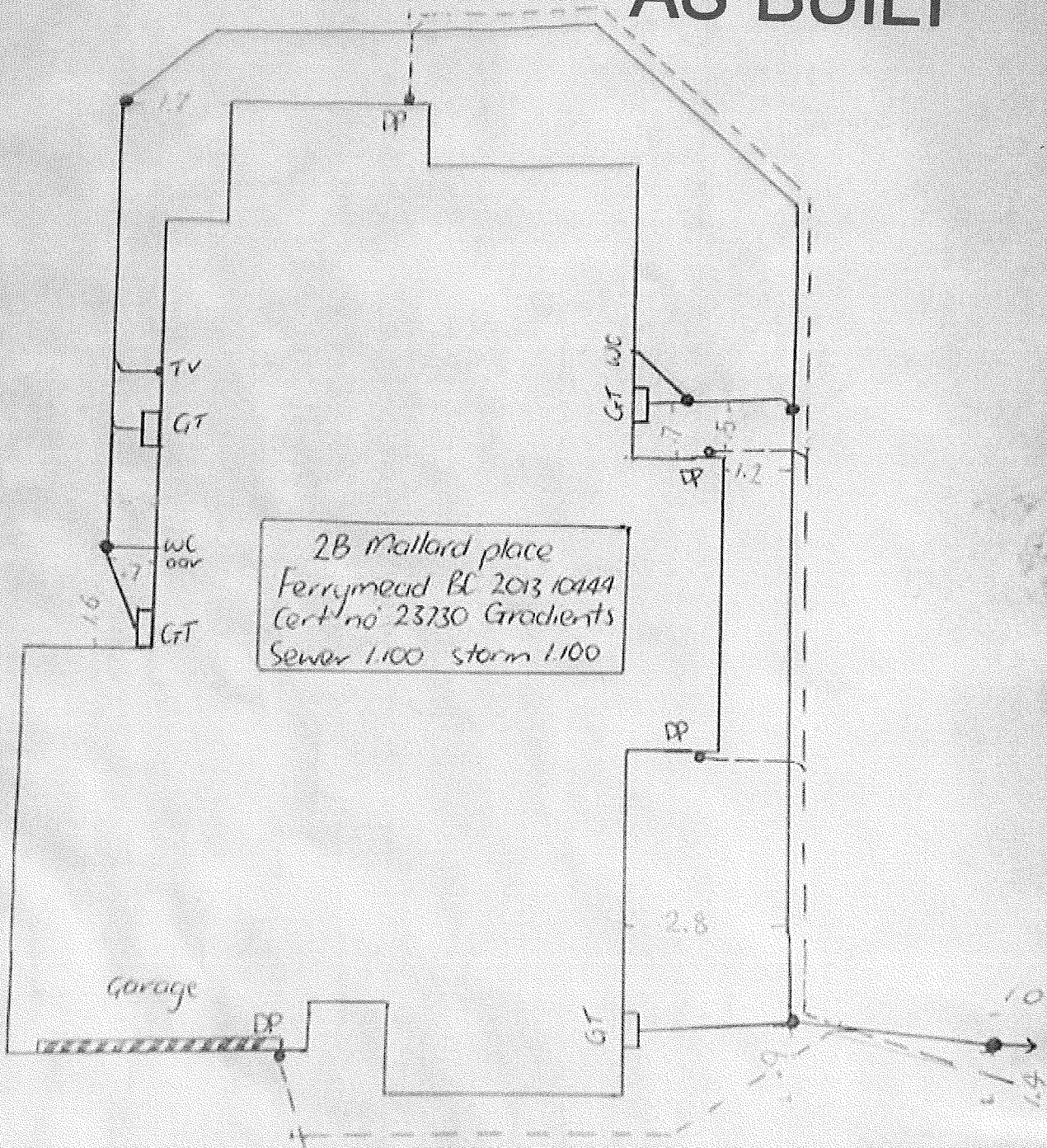
PO Box 1087
 Dunedin 9054



- Buildings
- StreetAddress
- WwAccess
- Vented Manhole
- WwEye
- Eye
- Eye
- WwLateralFitting
- Lateral Fitting
- WwPipeFlowDirection
- WwPipe
- NominalDiameter
- Diameter is 200mm or smaller
- WwLateral
- WwLateral (non CCC)
- In Service
- SwInlet
- Single Sump
- Double Sump
- SwFitting
- Bend
- SwPipeFlowDirection
- SwLateralFitting
- Single Sump
- Inspection Point
- SwPipe
- NominalDiameter
- Diameter is 450mm or smaller
- SwLateral
- SwPipeProtection
- SwPipe (non CCC)
- In Service
- SwLateral (non CCC)
- In Service
- WsValve
- Gate
- Sluice
- WsHydrant
- WsConnection
- Meter
- ▲ WsPipeRestraint
- WsFitting
- End Cap
- Connector
- Connector
- WsPipe
- NominalDiameter
- Diameter is 110mm or smaller
- WsLateral
- RatingUnit



AS BUILT





Christchurch City Council
Approved
Amendments Incorporated
20/06/2014

Christchurch City Council
AMENDMENT #1
BCN/2013/10444/A
Andrew Black
Page 1 of 3
20/06/2014

TODAY HOMES LTD
251 BLENHEIM ROAD
PO BOX 8043
CHRISTCHURCH
P (03) 341 6460
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www.todayhomes.co.nz

SITE PLAN & SERVICES LEGEND

DRAINAGE & SITE WORKS

- SEWER DRAINAGE
100mm DIA @ 1:80 GRADIENT
- STORMWATER DRAINAGE
100mm DIA @ 1:80 GRADIENT
- GULLY TRAP
- INSPECTION POINT
- SITE SPOT LEVELS ALL LEVELS TO BE CONFIRMED ON SITE PRIOR TO SETOUT
- COARSE GRAVEL- RUMBLE WASH DOWN AREA FOR VEHICLES

NOTE:
THERMAL MOVEMENT OF PIPES SHALL BE IN ACCORDANCE WITH G13/AS1 AND NZS 7643

SEDIMENT CONTROL

DOWNPIPES TO BE CONNECTED AS SOON AS ROOF IS FITTED AND DRAINS ARE LAYED. (TEMPORARY IF EXTERIOR CLADDING IS NOT FITTED)

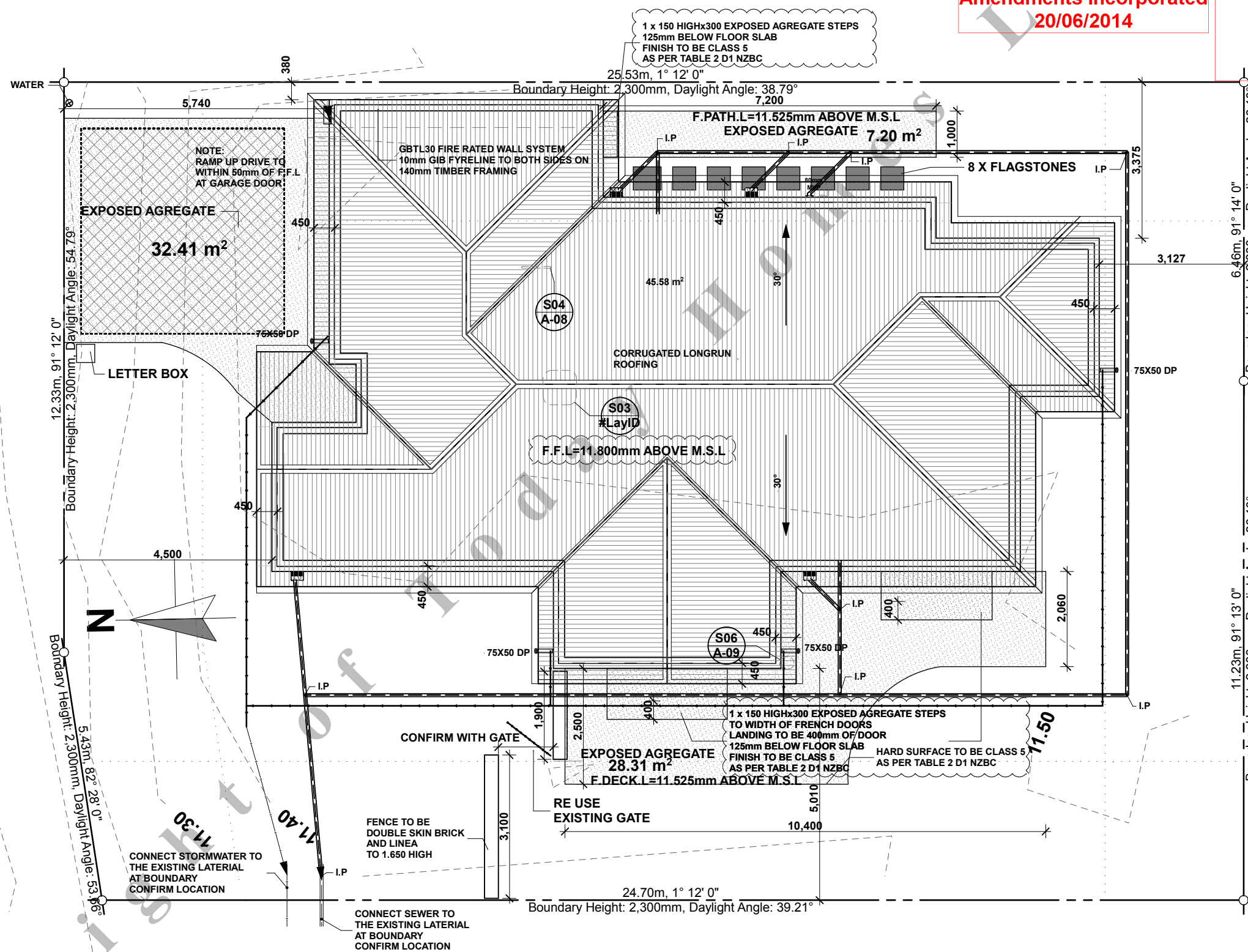
PROJECT MANAGER OR FOREMAN TO OVERSEE SEDIMENT CONTROL.

SPOUTING CATCHMENT AREA CALCULATION

RAINFALL INTENSITY APPENDIX A E1/AS1	= 85mm/hr
GUTTER CROSS SECTION	= 9000mm ² min
MAX. ROOF AREA FIGURE 15 E1/AS1	= 45m ²
MAX USED	= 45m ²
GUTTER TO BE COLORSTEEL FASCIA & GUTTER SYSTEM	
DOWNPIPE MIN. SIZE FOR ROOF AREA	
TABLE 5 E1/AS1 25-35°	= 75x50mm

LEGAL DESCRIPTION:

LOT No: 2
D.P No: 77858
SITE AREA: 450m²
BUILDING AREA: 151m²
SITE COVERAGE: 34%



Site/Drainage & Roof Plan

FLATLEY RESIDENCE

2B MALLARD PLACE FERRYMEAD,



10-06-14: BUILDING CONSENT AMENDMENT
F.F.L 11.800

This drawing is copyright. Under no circumstances may this drawing be reproduced in any form without the written permission of **TODAY HOMES**.

All plans are to be read in conjunction with the specification & Engineer's details. The Contractor shall verify all dimensions on site before commencing work. Written dimensions are to be taken priority over scaled dimensions.

SITE DRAINAGE & ROOF PLAN

JOB NO: #P1n
ORIGINAL SHEET SIZE A3
DRAWN: SHAUN HALPINE
PRINTED: Tuesday, 10 June 2014

A-01

REVISION
OF 15

Today Homes



Flatley



Compliance and Electrical Safety Certificate

This form has been issued by the Electrical Workers Registration Board

TP 11002



This form has been designed to be used by licensed electrical workers to certify low voltage installations or part installations that comply with Part 2 of AS/NZS 3000 and are safe to be connected to a 230/400 volt multiple earth neutral (MEN) system of electrical supply.

(1) Location of installation

Address: 26 Mallard Place, Ferrymead

(2) Customer Information

Name: Today Homes

Postal Address: PO Box 8043, Riccarton, Cdn 8440

Phone and Email: 341 6460

(3) Electrical Worker Information

Name: Charlie Gaze

Registration/Practising Licence Number: LM243035

Organisation: Telpower (1998) Ltd

Telephone Number: 339 4150

Email: operations@telpower.co.nz

Name of person(s) being supervised:

(4) Work Details

The work is (circle): additions | alterations | new work

The prescribed electrical work is: ☒ High Risk ☐ General ☐ Low Risk ☐ The homeowner has undertaken part of the electrical installation work.
(Please tick (✓) as appropriate)

Indicate the number of each item installed or altered:

Number of lighting outlets: 16mm 1 Ø NS mains
Number of socket outlets: cable and bare
Number of ranges: earth in open
Number of water heaters: trench

Other Work?

Tick (✓) if work includes:

- ☒ Mains
☐ MEN switchboard closest to point of supply
☒ Main Earthing System
☐ Electric Lines

(5) Certification of Work

I certify that the completed prescribed electrical work to which this certificate applies, has been done lawfully and safely and the information in the certificate is correct in that the installation, or part of the installation:

- ☐ has been installed in accordance with a certified design
☐ has an earthing system that is correctly rated
☐ contains fittings which are safe to connect to a power supply
☐ relies on supplier's Declaration of Conformity (attach or reference!)
☐ relies on manufacturer's instructions (attach or reference!)
☐ has been satisfactorily tested in accordance with Electricity (Safety) Regulations 2010
☐ is safe to connect

Electronic reference:

Electrical Worker's Signature:

Date: 18th July 2014

1. If it is impractical to attach a copy of a particular manufacturer's instructions, or of any certified design or supplier declarations of conformity, provide a reference to where the documents can be found, in a readily accessible format, through electronic means.

Test Results:		
	Electrical Worker	Inspector
Polarity (independent earth):		
Insulation resistance:		
Earth continuity:		
Bonding:		
Other (specify):		

(6) Electrical Safety Certificate

I certify that the installation, or part of the installation, to which the Electrical Safety Certificate applies is connected to a power supply and is safe to use

Name: Registration/Practising Licence Number:

Signature: Date:

(if certifier is different from electrical worker)

CUSTOMER COPY - THIS IS AN IMPORTANT DOCUMENT AND SHOULD BE RETAINED



Compliance and Electrical Safety Certificate

This form has been issued by the Electrical Workers Registration Board

Unique ID: H/42



This form has been designed to be used by licensed electrical workers to certify low voltage installations or part installations that comply with Part 2 of AS/NZS 3000 and are safe to be connected to a 230/400 volt multiple earth neutral (MEN) system of electrical supply.

(1) Location of installation

Address: 26 Mallard PL

(2) Customer Information

Name: Barbara Flatley
Postal Address: 26 Mallard PL
Phone and Email: 03 2600357

(3) Electrical Worker Information

Name: Matthew Lubbe Registration/Practising Licence Number: E263976
Organisation: Power Plus Telephone Number: 03 3653677
Email: _____
Name of person(s) being supervised: Cambell Rance Aaron

(4) Work Details

The work is (circle): ☐ additions ☐ alterations ☒ new work

The prescribed electrical work is: ☒ High Risk ☐ General ☐ Low Risk ☐ The homeowner has undertaken part of the electrical installation work.
(Please tick (✓) as appropriate)

Indicate the number of each item installed or altered

		Other Work?
Number of lighting outlets:	<u>34</u>	<u>2x heaters</u>
Number of socket outlets:	<u>31</u>	<u>2x Towel Rails</u>
Number of ranges:	<u>1</u>	<u>2x fans</u>
Number of water heaters:	<u>1</u>	

Tick (✓) if work includes:

- ☒ Mains
☒ MEN switchboard closed to point of supply
☒ Main Earthing System
☐ Electric Lines

(5) Certification of Work

I certify that the completed prescribed electrical work to which this certificate applies, has been done lawfully and safely and the information in the certificate is correct in that the installation, or part of the installation:

- ☒ has been installed in accordance with a certified design
☒ has an earthing system that is correctly rated
☒ contains fittings which are safe to connect to a power supply
☒ relies on supplier's Declaration of Conformity (attach or reference¹)
☒ relies on manufacturer's instructions (attach or reference¹)
☒ has been satisfactorily tested in accordance with Electricity (Safety) Regulations 2010
☒ is safe to connect

Electronic reference: H/42

Electrical Worker's Signature: [Signature]

Date: 20/11/14

¹ If it is impractical to attach a copy of a particular manufacturer's instructions, or of any certified design or supplier declarations of conformity, provide a reference to where the documents can be found, in a readily accessible format, through electronic means.

Test Results:		
	Electrical Worker	Inspector
Polarity (independent earth):	☒	☒
Insulation resistance:	☒	☒
Earth continuity:	☒	☒
Bonding:	☒	☒
Other (specify):		

(6) Electrical Safety Certificate

I certify that the installation, or part of the installation, to which the Electrical Safety Certificate applies is connected to a power supply and is safe to use.

Name: Matthew Lubbe

Registration/Practising Licence Number: E263976

Signature: [Signature]

Date: 20/11/14

(If certifier is different from electrical worker)

GASFITTING CERTIFICATE OF COMPLIANCE



Client Name:

Reference or Job #: ICP (if known):

Address of work:

Suburb: Town / City:

Description of gasfitting work: (If different gasfitting work was done by different people, state who did what gasfitting.)

Installed one free standing regency gas fire, installed one Smeg gas hob, installed gas pipe, installed one 2 x bottle station.

Gas supply pressure kPa Risk classification (tick one) ☐ Low-Risk ☒ General ☐ High-risk

Gas type (tick one) ☐ Natural gas ☒ LPG ☐ Biogas ☐ Other (specify)

The work has been done in accordance with a certified design: ☐ Yes ☒ No
☐ Copy of certified design attached (or provide reference)

The work relies on manufacturer's instructions: ☐ Yes ☒ No
☐ Copy of manufacturer's instructions attached (or provide reference)

The work has been done in accordance with means of compliance (specify):
☒ Yes – AS/NZS 5601.1 sections 3 to 6 ☐ Yes – AS/NZS 5601.2 sections 3 to 9 ☐ No

Were any other standards required for compliance?
☐ Yes (specify) ☒ No

Parts of the gas installation that are safe to connect to a gas supply?
☒ All ☐ Parts (specify)

Date(s) on which the work was done (if different from date of certifying gasfitting):

Name and registration number of anyone who carried out work under supervision:

☒ I confirm that I am satisfied that the work described in this certificate of compliance has been done lawfully and safely, and that the information on this certificate is correct.

Certifier name:

Registration number: Certificate Issue Date:

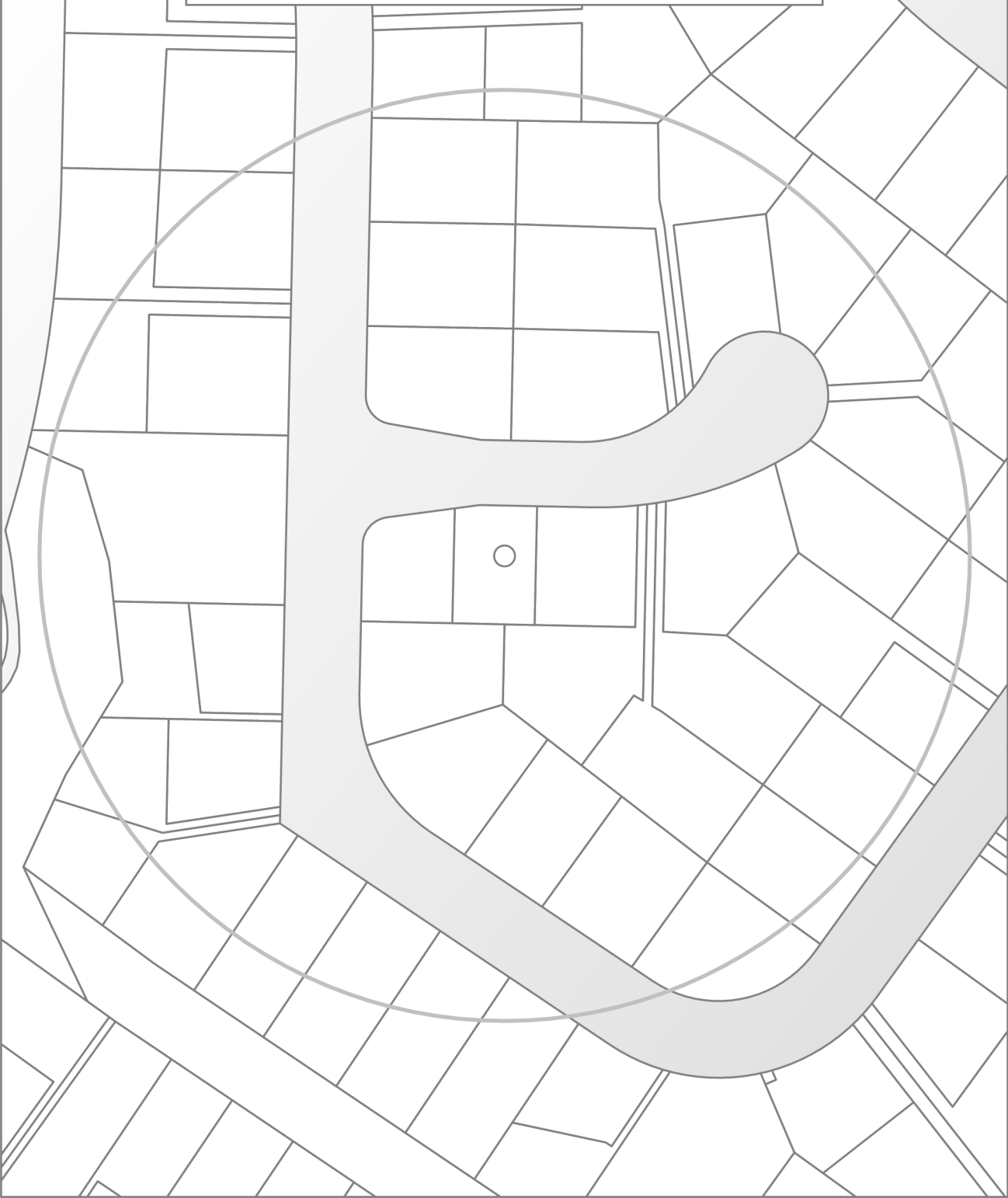
Signature:

Outline any additional information attached:

2 Mallard Place Land Use Consents



**2 Mallard Place
Subdivision Consents**



Land Use Resource Consents within 100 metres of 2 Mallard Place

Note: This list does not include subdivision Consents and Certificates of Compliance issued under the Resource Management Act.

1 Mallard Place

RMA/1998/1504

To erect a garage 2m from the road boundary. - Historical Reference RES981710

Processing complete

Applied 29/06/1998

Decision issued 03/07/1998

Granted 03/07/1998

10 Mallard Place

RMA/1999/4609

To erect a dwelling and attached garage which is 22.2 metres in length and exceeds the 35% site coverage. - Historical Reference RMA1353

Processing complete

Applied 23/11/1999

Decision issued 26/11/1999

Granted 25/11/1999

101 Kotuku Crescent

RMA/1999/3497

To erect a dwelling and attached garage which fails to comply with 4.5m road boundary setback, site coverage and 5.5m garage setback from a shared right of way. - Historical Reference RES992496

Processing complete

Applied 30/08/1999

Decision issued 03/09/1999

Granted 03/09/1999

RMA/2014/2509

Single storey residential dwelling with attached garage - Historical Reference RMA92027197

Processing complete

Applied 25/09/2014

Decision issued 03/10/2014

Granted 03/10/2014

14 Kotuku Crescent

RMA/1998/2899

To erect a garage 2.7m from the road boundary. - Historical Reference RES983312

Processing complete

Applied 10/12/1998

Decision issued 17/12/1998

Granted 17/12/1998

16 Kotuku Crescent

RMA/2002/1846

Dwelling with attached garage which intrudes the recession plane and 4m living area window setback. - Historical Reference RMA20010871

Processing complete

Applied 30/07/2002

Decision issued 30/08/2002

Granted 28/08/2002

18 Kotuku Crescent

RMA/1998/2402

Application for garage to be located within the front yard setback. Proposed to have a setback of 2m in terms of the Proposed Plan. - Historical Reference RES982747

Processing complete

Applied 08/10/1998

Decision issued 15/10/1998

Granted 15/10/1998

RMA/2001/185

Dwelling with an attached garage which comply with recession plane, site coverage, 3m living area window setback and outdoor living space. - Historical Reference RMA20004034

Processing complete

Applied 16/01/2001

Decision issued 21/02/2001

Granted 21/02/2001

18 Mallard Place

RMA/2013/2484

EQ REBUILD DWELLING WITH ATTACHED GARAGE CHARGE TO ARROW - Historical Reference RMA92024205

Processing complete

Applied 21/11/2013

Decision issued 02/12/2013

Granted 02/12/2013

20 Kotuku Crescent

RMA/1998/1550

To erect a garage 2m from the road boundary and exceeding 40m2 in front of the dwelling - Historical Reference RES981762

Processing complete

Applied 02/07/1998

Decision issued 23/07/1998

Granted 23/07/1998

24 Kotuku Crescent

RMA/2000/369

Proposed conservatory that fails to 90m2 outdoor living space with a minimum dimension of 6 metres. - Historical Reference RMA20000877

Processing complete

Applied 07/02/2000

Decision issued 23/02/2000

Granted 16/02/2000

32 Kotuku Crescent

RMA/1997/2469

To erect a dwelling with a kitchen window within the 3m living area window setback. - Historical Reference RES972836

Processing complete

Applied 07/10/1997

Decision issued 05/11/1997

Granted 05/11/1997

42 Kotuku Crescent

RMA/2008/1305

Conservatory which reduces outdoor living area - Historical Reference RMA92012149

Processing complete

Applied 23/06/2008

Decision issued 17/07/2008

Granted 17/07/2008

83 Kotuku Crescent

RMA/2015/593

Dwelling with Attached Garage - Historical Reference RMA92028817

Processing complete

Applied 06/03/2015

Decision issued 19/03/2015

Granted 12/03/2015

85 Kotuku Crescent

RMA/1998/660

To erect 2 dwellings and attached garages which fail to comply with site coverage and 3m living area window setback. - Historical Reference RES980649

Processing complete

Applied 16/03/1998

Decision issued 03/04/1998

Granted 03/04/1998

87 Kotuku Crescent

RMA/1998/660

To erect 2 dwellings and attached garages which fail to comply with site coverage and 3m living area window setback. - Historical Reference RES980649

Processing complete

Applied 16/03/1998

Decision issued 03/04/1998

Granted 03/04/1998

91 Kotuku Crescent

RMA/1998/2203

Discretionary Subdivision activity/ / - Historical Reference RES982519

Processing complete

Applied 15/09/1998

Decision issued 18/09/1998

Granted 18/09/1998

RMA/2000/3112

Dwelling with an attached garage wh comply with the outdoor living area of 90m2 and a minimum dimension of 6m. - Historical Reference RMA20003882

Processing complete

Applied 15/12/2000

Decision issued 10/01/2001

Granted 10/01/2001

93 Kotuku Crescent

RMA/1998/2203

Discretionary Subdivision activity/ / - Historical Reference RES982519

Processing complete

Applied 15/09/1998

Decision issued 18/09/1998

Granted 18/09/1998

99 Kotuku Crescent

RMA/1999/2495

To erect a dwelling that intrudes a recession Plan and exceeds the maximum building length without a 2.4 metre step in Plan. - Historical Reference RES991242

Processing complete

Applied 03/05/1999

Decision issued 07/05/1999

Granted 07/05/1999

RMA/1999/3109

To erect a garage 4.9 metres from the road boundary. - Historical Reference RES991998

Processing complete

Applied 08/07/1999

Decision issued 12/07/1999

Granted 12/07/1999

Data Quality Statement

Land Use Consents

All resource consents are shown for sites that have been labelled with an address. For sites that have been labelled with a cross (+) no resource consents have been found. Sites that have no label have not been checked for resource consents. This will be particularly noticeable on the margins of the search radius. If there are such sites and you would like them included in the check, please ask for the LIM spatial query to be rerun accordingly. This will be done free of charge although there may be a short delay. Resource consents which are on land occupied by roads, railways or rivers are not, and currently cannot be displayed, either on the map or in the list. Resource consents that relate to land that has since been subdivided, will be shown in the list, but not on the map. They will be under the address of the land as it was at the time the resource consent was applied for. Resource consents that are listed as Non-notified and are current, may in fact be notified resource consents that have not yet been through the notification process. If in doubt. Please phone (03)941 8999.

The term “resource consents” in this context means land use consents. Subdivision consents and certificates of compliance are excluded.

Subdivision Consents

All subdivision consents are shown for the sites that have been labelled with consent details. For Sites that have been labelled with a cross (+) no records have been found. Sites that have no label have not been checked for subdivision consents. This will be particularly noticeable on the margins of the search radius. If there are such sites and you would like them included in the check, please ask for the LIM spatial query to be rerun accordingly. This will be done free of charge although there may be a short delay.

The term “subdivision consents” in this context means a resource consent application to subdivide land. Non subdivision land use resource consents and certificates of compliance are excluded.

This report will only record those subdivision applications which have not been completed i.e once a subdivision has been given effect to and the new lots/properties have been established the application which created those lots will not be shown

All subdivision consent information is contained on the map and no separate list is supplied