

Land Information Memorandum



Property address:

1/126 Halswell Junction Road

LIM number: H07467093

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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 15 March 2025
Date received 4 March 2025

Property details

Property address 1/126 Halswell Junction Road, Oaklands, Christchurch
Valuation roll number 23444 41600 A
Valuation information Capital Value: \$710,000
Land Value: \$170,000
Improvements Value: \$540,000
Please note: these values are intended for Rating purposes
Legal description Flat 1 DP 75904 on Lot 5 DP 68654 having share in 651 m2
Existing owner Pita Qaqa Biunacagilaba Rokosuka
Kate Isabel Rokosuka
1/126 Halswell Junction Road
Christchurch 8025

Council references

Rate account ID 73064601
LIM number H07467093
Property ID 1025847

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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.

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.

- **Borelog/Engineer Report Image Available**

Borelog/Engineer Report Image Available

- **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.

- **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.

- **Consultant Report Available**

The Tonkin & Taylor Darfield Earthquake 4 September 2010 Geotechnical Land Damage Assessment & Reinstatement Stage 1 Report indicates areas of observed surface manifestations of liquefaction resulting from the earthquake. This property is within one of the identified areas. The report can be viewed at www.eqc.govt.nz/our-publications/darfield-earthquake-geotechnical-land-damage-assessment-reinstatement-stage-1/

Related Information

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

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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

- 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.
- This property is shown to be served by Christchurch City Council Sewer.
- The council plan shows no public stormwater lateral to this site.

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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.

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 30/06/2025: \$4,072.23

	Instalment Amount	Date Due
Instalment 1	\$1,017.99	31/08/2024
Instalment 2	\$1,017.99	30/11/2024
Instalment 3	\$1,017.99	28/02/2025
Instalment 4	\$1,018.26	31/05/2025

Rates owing as at 15/03/2025: -\$68.56

(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.

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

(a) Consents

- BCN/1996/6685 Applied: 21/08/1996 Status: Completed
1/126 Halswell Junction Road Oaklands
Accepted for processing 21/08/1996
Building consent granted 07/04/1997
Building consent issued 21/04/1997
Code Compliance Certificate Granted 26/08/1997
Code Compliance Certificate Issued 26/08/1997
2 DWELLING UNITS WITH ATTACHED GARAGES- Historical Reference CON96007392
- BCN/2014/6881 Applied: 28/07/2014 Status: Completed
2/126 Halswell Junction Road Oaklands
Accepted for processing 28/07/2014
PIM Granted 14/08/2014
PIM Issued 15/08/2014
Dwelling with Attached Garage
- BCN/2014/8652 Applied: 10/09/2014 Status: Completed
2/126 Halswell Junction Road Oaklands
Accepted for processing 12/09/2014
PIM Granted 22/09/2014
Building consent granted 26/09/2014
Building consent issued 29/09/2014
Code Compliance Certificate Issued 23/06/2015
Dwelling with attached Garage
- BCN/2014/8652/A Amendment Applied: 02/10/2014 Status: Completed
2/126 Halswell Junction Road Oaklands
Accepted for processing 03/10/2014
Building consent granted 08/10/2014
Building consent issued 08/10/2014
Amendment 1 - Changing steps to ramp.
- BCN/2019/6015 Applied: 09/09/2019 Status: Completed
1/126 Halswell Junction Road Oaklands
Exemption from building consent approved 13/09/2019
Re-level

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- BCN/2020/7996 Applied: 24/03/2020 Status: Completed
1/126 Halswell Junction Road Oaklands
Certificate of acceptance approved 20/04/2020
Building Act Certificate of Acceptance considered for installation of new ensuite shower room. - Historic Reference
BAA37002026

(b) Certificates

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

(c) Notices

(d) Orders

(e) Requisitions

Related Information

- Attached is a copy of the form 9 for a certificate of acceptance (BAA) that has been issued for building work at this property. There will be items that have been accepted by Council and some that may have been excluded acceptance.
- Please find an electrical certificate/s 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

- **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 Medium density residential zone, which has been publicly notified.

- **District Plan Zone**

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

(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/1994/3826 - Subdivision Consent
Fee Simple SUBDIVISION - Historical Reference RMA9741
Status: Processing complete
Applied 01/07/1994
- RMA/1995/3671 - Subdivision Consent
Cross Lease SUBDIVISION - Historical Reference RMA12293
Status: Processing complete
Applied 23/06/1995

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- RMA/1995/1960 - Certificate of compliance
1/126 Halswell Junction Road Oaklands
Certificate of Compliance for two unit development on proposed Lot (5). - Historical Reference RES952213
Status: Processing complete
Applied 21/06/1995
21/06/1995
Certificate issued 21/06/1995
- RMA/1996/3075 - Subdivision Consent
1/126 Halswell Junction Road Oaklands
Cross Lease SUBDIVISION - Historical Reference RMA10909
Status: Processing complete
Applied 30/05/1996

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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

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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 Thursday. 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 Thursday. Please leave your recycling at the Kerbside by 6:00 a.m. Your nearest recycling depot is the Parkhouse Road EcoDrop.
- Your refuse is collected Fortnightly on the Week 1 collection cycle on a Thursday. Please leave your rubbish at the Kerbside by 6:00 a.m. Your nearest rubbish depot is the Parkhouse Road EcoDrop.

(b) Other

• Floor Levels Information

Christchurch City Council holds a variety of information relevant to building/property development across the city. This includes minimum finished floor levels that 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 site, it can be viewed at <https://ccc.govt.nz/floorlevelmap/>, otherwise site specific advice can be obtained by emailing 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 Halswell-Hornby-Riccarton Community Board.

• Tsunami Evacuation Zone

This property is not in a tsunami evacuation zone. It is not necessary to evacuate in a long or strong earthquake or during an official Civil Defence tsunami warning. Residents may wish to offer to open their home to family or friends who need to evacuate from a tsunami zone, and should plan with potential guests to do so in advance. More information can be found at <https://ccc.govt.nz/services/civil-defence/hazards/tsunami-evacuation-zones-and-routes/>

• Electoral Ward

Property located in Halswell 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

• Spatial Query Report

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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.

Related Information

- The Council has received a third party work completion report/information relating to the building exemption application on this property. It has been placed on the property file. The Council does not accept any liability for the contents, or representations, made within the report/information. The report/information is not included in the Land Information Memorandum (LIM) because the Council has not verify the information/report supplied. If a copy of the property file is required you can request this through our online form by visiting ccc.govt.nz & search property file or visit a Council Service Centre.

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December 2012

Christchurch City Council
Approved Consent Document
BCN/2014/8652
Steve Hull
293 Pages
25/09/2014

GEOTECHNICAL ASSESSMENT REPORT

Halswell Group of Houses

Submitted to:
Arrow International Limited

REPORT



Report Number. 1078102455-001-R-Rev0-1660

Distribution:

Simon Brackstone - Arrow International Limited





GEOTECHNICAL ASSESSMENT REPORT - HALSWELL GROUP OF HOUSES

RECORD OF ISSUE

Company	Client Contact	Version	Date Issued	Method of Delivery
Arrow International Ltd	Simon Brackstone	Rev A – Draft	14 November 2012	Aconex Email
Arrow International Ltd	Simon Brackstone	Rev 0	7 December 2012	Aconex Email



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GEOTECHNICAL ASSESSMENT REPORT - HALSWELL GROUP OF HOUSES

APPENDICES

APPENDIX A

Report Limitations

APPENDIX B

Site Plans and Inferred Stratigraphic Sections

APPENDIX C

Previous Geotechnical Investigations

APPENDIX D

Current Geotechnical Investigations

APPENDIX E

Laboratory Testing Results



1.0 INTRODUCTION

Arrow International Limited (Arrow) has engaged Golder Associates (NZ) Limited (Golder) to undertake a geotechnical assessment for a group of houses located along the northern side of Halswell Junction Road, (bounded by Oldham Crescent to the west and extending to 118 Halswell Junction Road to the east), Halswell, Christchurch. Arrow, on behalf of Southern Response Earthquake Services Limited (Southern Response), is undertaking a combined assessment of the group of twenty-one houses which comprise Numbers 118, 118a, 120, 122, 122a, 124, 124a, 1/126, 2/126, 128, 130, 130a, 132, 132a, 134, 136, 138, 140 and 142 Halswell Junction Road, and Nos. 2 and 10 Oldham Crescent.

The site comprises the land on which the group of twenty-one houses which have been damaged stand as a result of the 2010-2011 Canterbury earthquakes. It is understood, from correspondence with Arrow, that there are grades of status regarding these houses, as follows:

- 1) EQC/EQR repair, out of scope (five houses – Numbers 118a, 122a, 1/126, 136 Halswell Junction Road and 2 Oldham Crescent);
- 2) Foundation repair is required (four houses – Numbers 120, 122, 138 and 142 Halswell Junction Road);
- 3) Demolition and rebuild is required (ten houses – Numbers 118, 124, 2/126, 128, 130, 130a, 132, 132a, 140 Halswell Junction Road and 10 Oldham Crescent); and
- 4) No action at the time of writing (two houses – Numbers 124a and 134 Halswell Junction Road).

A total of eight insurance companies provide the insurance cover for the group of houses and five Project Management Organisations (PMOs) have interest in the properties.

The combined geotechnical investigation and assessment was requested in order to identify geotechnical considerations for rebuild and repair options for the structures included within the combined site. For clarity, in this report the term “site” refers to the land occupied by the twenty-one houses as identified in Appendix B1

The scope of work for the geotechnical investigation is as follows:

- Review existing geotechnical data in the vicinity of the site (including data from EQC, Environment Canterbury and any existing reports).
- Review available information on the previous performances of the properties in response to previous earthquake events.
- Review local topographical and geological data.
- Carry out a geotechnical investigation comprising 23 Cone Penetration Tests (CPTs), seven boreholes, with Standard Penetration Tests (SPTs), and laboratory testing on selected recovered soil samples.
- Assess liquefaction susceptibility and associated settlement and/or lateral spreading at the site.
- Provide preliminary geotechnical engineering comments on foundation options for each property.

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 (DBH 2011) and the “*Interim guidance for repairing and rebuilding foundations in Technical Category 3*” published in April 2012 (DBH 2012).

The primary purpose of the geotechnical investigation is to assess the further risk of liquefaction induced settlement to the repaired or rebuilt houses from a future earthquake and to define foundation options consistent with the current guidance (DBH 2012). A detailed assessment of all geotechnical aspects of the property beyond liquefaction hazard was not included in this scope of work.



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 properties. This report does not address the reinstatement of land levels. At the time of preparation of this report no specific information was available to Golder on the proposed building layout and loadings, or on the presence and depths of existing buried services. It is recommended that Golder review and provide additional geotechnical input and recommendations as part of detailed design.

Our work on this assignment is carried out for the exclusive use of Arrow and Southern Response. Your attention is drawn to the document, "Report Limitations", as attached. The statements presented in that document are intended to advise you of what your realistic expectations of this report should be, and to present you with recommendations on how to minimise the risks to which this report relates which are associated with this project. The document is not intended to exclude or otherwise limit the obligations necessarily imposed by law on Golder Associates (NZ) Ltd, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

Other Considerations in Selecting Foundation Types and Finished Floor Levels for TC3

Section C1.5 and C5.1.3 of DBH 2012 identify the following non geotechnical investigation issues that may affect the repair or rebuilding of house foundations on a specific site. These are:

- EQC assessment of liability for land damage reinstatement (Section C1.5).
- Future building platform heights which are limited for the time being to 250 mm above the surrounding land.
- Compliance with Insurance Contract Provisions which, unless specifically provided to us by the Project Manager, have not been taken account of during the foundation assessment.

The above issues all lie outside the scope of work carried out as part of this geotechnical assessment.

2.0 SITE DESCRIPTION

2.1 Site Location and Topography

The site is located approximately 8.3 km to the southwest of the Christchurch city centre and approximately 1 km to the northwest of Halswell town centre. This site is bounded to the southwest by Halswell Junction Road, to the northwest by Oldham Crescent and residential properties, to the northeast by residential properties and Nottingham Stream, and to the southeast by residential properties also located along Halswell Junction Road.

The site has a total area of approximately 1.58 hectares, and generally has a slight slope (less than 1°) down towards Nottingham Stream, towards the northeast. Nottingham Stream, which runs along the boundaries of Numbers 118, 122, 122a, 128 Halswell Junction Road and Number 10 Oldham Crescent, has an estimated free-face height of approximately 1.0 m and a width of between 1.0 m and 2.0 m.

A site plan is presented as Figure B1 in Appendix B.

2.2 Technical Category

The site is located within an area classified by DBH as Technical Category 3 (TC3), "an area which is likely to suffer moderate to significant land damage from liquefaction during future earthquakes".



2.3 Land Damage Mapping

The area was mapped by the Earthquake Commission (EQC) as having undergone *no lateral spreading but minor to moderate quantities of ejected material* as a result of the 4 September 2010 earthquake and *no observed ground cracking or ejected liquefied material* as a result of the 13 June 2011 earthquakes. Aerial photographs on the Canterbury Geotechnical Database indicate liquefaction ejecta within the site as a result of the 22 February 2011 earthquake.

Observations of one ground crack, running parallel to Nottingham Stream and approximately 50 to 200 mm wide, have been mapped through the site by the EQC. Other minor unclassified cracks have been shown to trend from a southeast through to northwest direction and are shown on the site plan, Figure B1 in Appendix B.

The site is not mapped to be in the *Major* global lateral movement category in accordance with Table C2.2 DBH 2012. Numbers 118, 122, 122A, 124, 124A 2/126, 128 Halswell Junction Road, 10 Oldham Crescent and part of 118a, 120, 130, 130a Halswell Junction Road are located within 50 m of Nottingham Stream and could be placed in the *Major* category for global lateral movement in the absence of any evidence to the contrary, according to Table C2.3 of DBH 2012.

2.4 Flood hazard mapping

Flood risk and interim floor levels (minimum floor level for new building) are not available for this site at the time of writing (<http://maps.cera.govt.nz/advanced-viewer/?Viewer=Ccc-Floor-Levels> on 13 November 2012) from the Christchurch City Council Flooding Database. The flood risk will need to be understood for this site to evaluate the appropriate foundation options.



3.0 EXISTING BUILDINGS

Many of the details regarding the construction of the dwelling, foundation/structural damage and building status, had not been provided to Golder at the time of writing. The available information is summarised in Table 1 below.

A site visit to each property was undertaken by Golder on 24 January 2012 and 17 September 2012. A summary of this information is presented in Table 1 below and illustrated on Figure B1 in Appendix B.



GEOTECHNICAL ASSESSMENT REPORT - HALSWELL GROUP OF HOUSES

Table 1: Summary of damage to existing dwellings.

Address	Building Description	Foundation Type	Foundation/Structural Damage Reported by Others	Detailed Repair/Rebuild Analysis (DRA) Provided ¹	Local Land Damage ² Observed by Golder Associates	Status
2 Oldham Crescent	Single storey, stone block walls, metal tile roof	C2	N/A - under EQC cap, does not require assistance from private insurers.	N/A	N/A	EQC/EQR repair – out of scope
10 Oldham Crescent			No information provided	No	Cracking in the driveway.	Demolish and Rebuild
118 Halswell Junction Road			15 to 25 mm cracking of foundation slab	Yes	Cracked driveway, localised tilting of concrete slabs. Liquefaction ejecta present	
118a Halswell Junction Road			Stone block exterior, concrete tile roof	No information provided	No	Cracking across driveway
120 Halswell Junction Road	Concrete Exterior, flat roof, Art Deco style	B2	Cracks noted in the foundation.	No	Cracking in paved areas up to 20 mm wide	Repair
122 Halswell Junction Road	Brick veneer, timber frame, metal roof tiles.	C2	Broken services noted outside the house. Localised undermining of foundation noted.	No	Cracking up to 40 mm wide in paved areas. Lateral movement up to 50 mm wide indicated by the gap between the house foundation and surrounding ground. Slumping of asphalt driveway.	
122a Halswell Junction Road			No information provided	No	Cracking to the asphalt driveway.	EQC/EQR repair – out of scope – works by Mainzeal
124 Halswell Junction Road				No	Cracking up to 40 mm wide in driveway concrete.	Rebuild
124a Halswell Junction Road	Owner absent, property omitted from assessment					
1/126 Halswell Junction Road	Brick veneer, timber frame, metal roof tiles	C2	Cracking of foundation slab noted during walkover.	No	Cracking up to 30 mm wide across driveway.	EQC/EQR repair – out of scope – works by Mainzeal
2/126 Halswell Junction Road			Cracking of foundation slab	Yes	Liquefaction ejecta on the land surrounding the house	Demolish and rebuild
128 Halswell Junction Road			Major subsidence and liquefaction ejecta, house tilt settlement of over 170 mm	Yes	Owners stated that significant liquefaction ejecta present at the time of the earthquakes, cracking in asphalt driveway	
130 Halswell Junction Road			No information provided	No	Areas with liquefaction ejecta noted.	
130a Halswell Junction Road				No	Fence posts have tilted, cracking in the concrete driveway.	



GEOTECHNICAL ASSESSMENT REPORT - HALSWELL GROUP OF HOUSES

Address	Building Description	Foundation Type	Foundation/Structural Damage Reported by Others	Detailed Repair/Rebuild Analysis (DRA) Provided ¹	Local Land Damage ² Observed by Golder Associates	Status
132 Halswell Junction Road	Brick veneer, timber frame, metal roof tiles	C2	No information provided	No	Cracking up to 30 mm wide in the driveway.	Demolish and Rebuild
132a Halswell Junction Road			Significant cracking of the concrete floor slab, racking to walls	Yes	Extensive liquefaction ejecta.	
134 Halswell Junction Road	Owner is not interested in geotechnical report					
136 Halswell Junction Road	Single storey, stone block veneer, timber framed	B2	No information provided	No	Extensive cracking up to 20 mm wide to the concrete driveway.	EQC/EQR repair – out of scope – works by Hawkins
138 Halswell Junction Road			Cracking of the foundation, differential settlement of concrete piles, step-cracking in brickwork, conservatory concrete slab cracked	Yes	Cracking and movement of concrete driveway slabs.	Repair
140 Halswell Junction Road		C2	Cracking in concrete floor slab (up to 25 mm wide), movement of the floor slab/walls	Yes	Liquefaction ejecta around the property	Demolish and Rebuild
142 Halswell Junction Road	Concrete block veneer, timber frame, metal roof tiles.	B2	Cracking to external foundation ¹	Yes	Liquefaction ejecta in the rear section, under the house and along the driveway.	Repair

Notes:

¹ Detailed repair / rebuild analysis (DRA) information only available for the houses insured by Southern Response. Information provided by Arrow.

² Indications of land damage were identified during site walkover undertaken by Golder Associates.



4.0 GEOLOGICAL SETTING

4.1 Geological Deposits

Christchurch is known to be underlain by a series of interbedded coarse and fine grained sedimentary deposits. The gravel and sand have been laid down by rivers, coastal processes and wind-blown deposits. Fine grained sediments have been deposited in near-offshore marine environments, estuaries, lakes, wet lands and on flood plains. Organic deposits including peat, wood and shells are distributed throughout the deposits underlying the Christchurch area. In the vicinity of the investigation area, the surface geological unit belongs to the Yaldhurst Member of the Springston Formation, which comprises dominantly alluvial sand and silt overbank deposits, alluvial gravel, and sand and silt of historic river flood channels.

The interbedded deposits make for a relatively complex hydrogeological system of unconfined and confined aquifers in the gravel and sand. Some aquifers are confined by relatively impermeable fine grained deposits. The geotechnical properties of the interbedded deposits vary laterally and significant variability of behaviour can occur at the scales of metres and tens of metres.

4.2 Faults

A number of seismically active faults in the South Island affect the earthquake hazard in the Christchurch area. These include the faults responsible for the recent sequence of earthquakes.

Faults directly associated with the tectonic plate boundary between the Pacific and Australian Plates which runs through the South Island have a major role in Christchurch's seismic hazard. For example, the Alpine Fault transects the South Island from southwest to northeast and, at its closest, is located about 130 km west of Christchurch. It is considered that the Alpine Fault has the potential to produce earthquakes of the greatest magnitude and duration likely to affect the Christchurch area. There are numerous other less active faults in the Canterbury Region that also pose a risk to Christchurch.

4.3 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.

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 at a recent meeting by the Department of Building and Housing (DBH). We have adopted these loadings for our assessment. Horizontal peak ground acceleration (PGA) values for liquefaction assessment in Canterbury have been established as follows:

- Serviceability limit state (SLS): 0.13 g
- Ultimate limit state (ULS): 0.35 g

The design magnitude earthquake is M7.5.



4.3.1 Local peak ground accelerations experienced during 2010-2011 Canterbury earthquakes

The peak ground acceleration for the significant recent earthquakes, recorded at the nearest strong motion seismic recording station located at Halswell School (HALS) approximately 1.5 km to the southeast of the site, is summarised in Table 2. Additionally, nearby seismic recording stations are located at Hillmorton High School (HHSS) located approximately 3.8 km to the northeast of the site and Christchurch Cashmere High School (CMHS) located approximately 5.5 km northeast of the site.

Table 2: PGA values recorded at the nearest strong motion recorder.

Earthquake Magnitude and Date	Peak Ground Acceleration (g)*		
	HALS (1.5 km)	HHSS (3.8 km)	CMHS (5.5 km)
M7.1, 4 September 2010	-	-	0.26
M6.3, 22 February 2011	-	-	0.80
M5.6, 13 June 2011	-	-	0.16
M6.3, 13 June 2011	-	-	0.19
M6.0, 23 December 2011	0.18	0.14	0.19

Notes:

* Peak ground accelerations were obtained from <ftp://ftp.geonet.org.nz/strong/processed/Proc/>

Median and standard deviation band PGA data, obtained from the Canterbury Geotechnical Database, indicate the following PGAs may have been experienced at the site.

Table 3: Median and Standard Deviation PGA data.

Earthquake Magnitude and Date	Peak Ground Acceleration (g)*	
	Median	Standard Deviation Band
M7.1, 4 September 2010	0.29 – 0.30	0.375 – 0.40
M6.3, 22 February 2011	0.33 – 0.34	0.425 – 0.45
M6.3, 13 June 2011	0.13	0.45 – 0.475

Notes:

* Conditional data obtained from the Canterbury Geotechnical Database



5.0 PREVIOUS INVESTIGATIONS

A review of publically available geotechnical information on the Canterbury Geotechnical Database has identified the presence of two Environment Canterbury well logs (M36_0892 and M36_0897) and one Cone Penetration Test (CPT_1183) within approximately 40 m of the site. A review of this data has indicated that the ground conditions beneath the site are likely to comprise:

- Alluvial materials (comprising sand, silt and clayey silt) to approximately 8.0 m below ground level (bgl)
- Gravel to a depth of approximately 17.0 m bgl
- Clay/silt layer, approximately 2.0 to 3.0 m thick to approximately 19.0 m bgl
- Gravel (Riccarton Gravel)

The CPT report and borehole log are provided in Appendix C.

6.0 CURRENT GEOTECHNICAL INVESTIGATIONS

The current geotechnical investigation was carried out between July 2012 and September 2012. The fieldwork comprised the following:

- Twenty-three CPTs (designated CPT-01 to CPT-23)
- Seven drilled boreholes (designated BH1 to BH7)

Figure B1 in Appendix B shows the test locations of the current investigation along with previous investigation locations.

6.1 Set-out and Access

Test locations were nominated by Golder and were positioned in areas accessible for a tracked mounted drill rig and clear of underground services. Elevations included in the table are shown on the borehole and CPT reports have been surveyed by Harrison Grierson.

6.2 Cone Penetration Tests

Cone Penetration Tests (CPTs) with pore pressure measurement were performed using a track mounted rig. Real time readings were observed and recorded at the surface with a dedicated laptop computer. The CPT set-up and testing was carried out by Golder.

The CPTs were evenly located over the site to provide representative subsurface profiling. Equilibrium tests were performed during the CPT at selected depth intervals. The CPTs were terminated when the required push rate could not be maintained due to either hard/dense ground characteristics or obstructions. Tests were pushed to a maximum depth of 8.9 m bgl (RL+16.2 m on the Christchurch Drainage Datum known as CDD).



6.3 Borehole Drilling

A track mounted drill rig (Hans England) was used to drill boreholes, which were positioned adjacent to selected CPT locations to assist in correlating field observations. Borehole drilling was carried out under the supervision of a geotechnical engineer/engineering geologist from Golder.

Boreholes were commenced using auger methods and then casing installed and the boreholes extended using wash boring techniques. The boreholes were drilled to a maximum depth of about 15 m bgl (RL+10.1 m CDD) and Standard Penetration Tests (SPTs) were undertaken at regular depth intervals. The SPT hammer energy ratio (C_E) has been measured as 0.92.

7.0 FIELDWORK FINDINGS

7.1 Subsurface Conditions

Detailed descriptions of subsurface conditions encountered at the site are described in Report of Piezo-Cone Probes, and Soil Borehole Logs in Appendices D.

The results indicate that the ground conditions beneath the site comprise highly variable alluvial deposits, which range in composition, density and consistency. Graphical representations of subsurface conditions encountered at the test locations are presented as sectional profiles on Figures B5 to B8 in Appendix B. The locations of the cross sections are presented on Figure B2 in Appendix B.

Generally, interpretation of the geotechnical data indicates the subsurface soils beneath the site comprise the following approximate stratigraphic sequence:

- **Layer 1:** A surficial layer of firm (inferred) sandy SILT and loose silty SAND and generally less than 1 m thickness (from approximately RL+25 m CDD to approximately RL+24 m CDD).
- **Layer 2:** Interbedded very loose to loose, saturated, dilative SAND and silty SAND. It is this unit that is particularly susceptible to liquefaction and ranges in thickness from 4 m to 6 m (from approximately RL+24.0 m CDD to approximately RL+18.0 m CDD). Figure B3 in Appendix B illustrates the extent of this layer as the dominant sub-surface soil type.
- **Layer 3:** Soft to firm, low plasticity SILT and sandy SILT occasionally interbedded with very loose silty SAND. This layer is saturated, contractive and generally exhibits poor drainage behaviour upon loading. This sandy silt/silty sand material is potentially liquefiable during cyclical loading.

There is a silt bed (with minor or negligible sand content) within Layer 3 which is generally resistant to liquefaction. The thickness of this bed is variable across the site but is generally less than about 1 m in thickness.

The whole layer is approximately 3 m in thickness (including the silt bed) and underlies the dilative sands of Layer 2. It appears as the dominant soil type across the eastern side of the site (Numbers 118, 118a, 120, 122, 122a, and 124 Halswell Junction Road), and about a 15 m corridor along the southern boundary (refer to blue shaded area on Figure B3 in Appendix B) i.e., replacing Layer 2. The base of this layer is generally at approximately RL+17.0 m CDD.

- **Layer 4:** Dense to very dense sandy GRAVEL was encountered below the silt material to the full depth of the investigation of approximately 15 m bgl (RL+9.0 m CDD). Generally this layer is saturated, free-draining and resistant to liquefaction. It is noted that there are localised medium dense zones which may be susceptible to liquefaction under strong shaking events.

The general trends of the CPTs and SPT results are presented in Figure 1 below.



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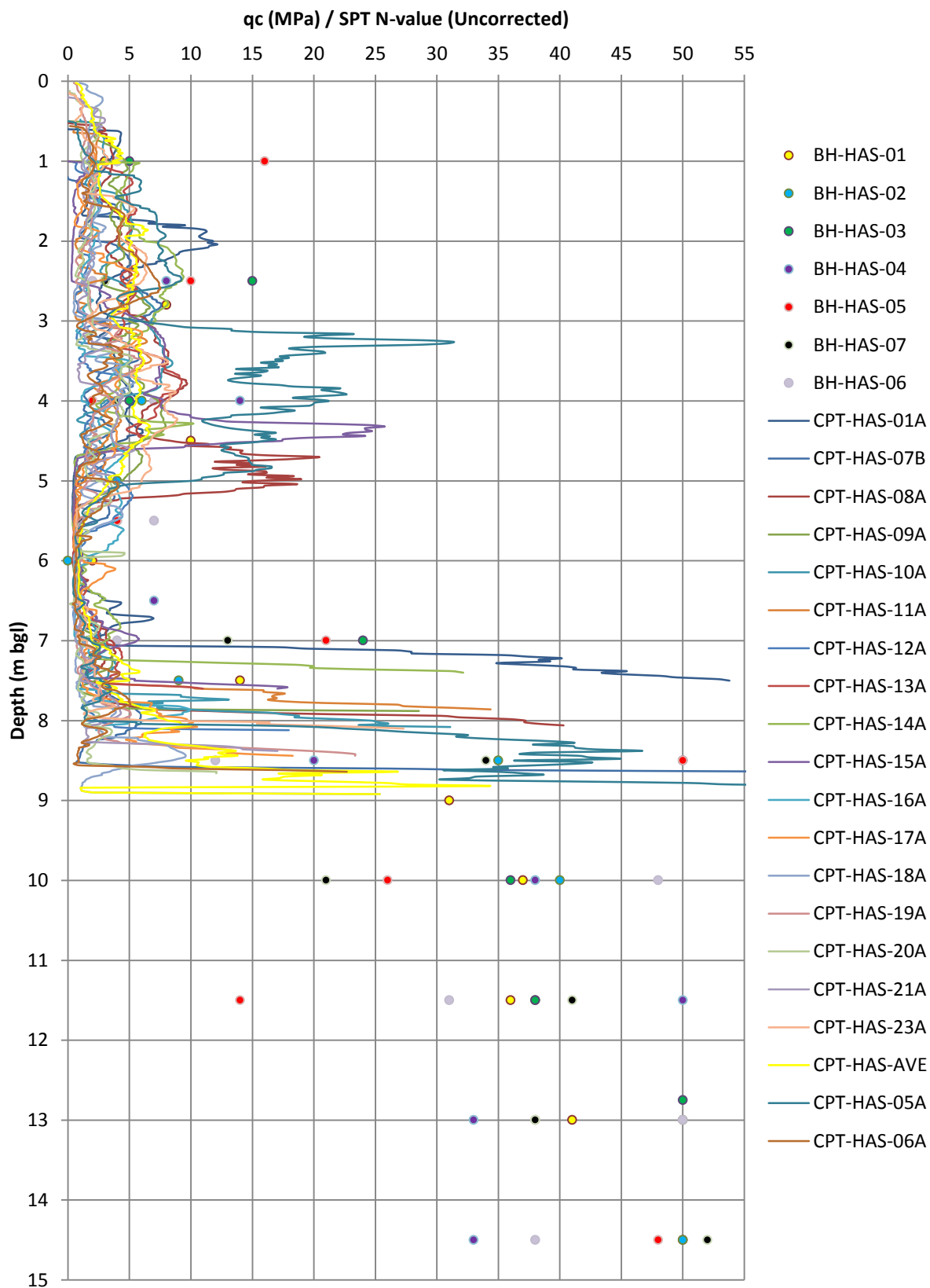


Figure 1: CPT/SPT depth profiles.



7.2 Groundwater

The hydrostatic pore pressure was measured in equilibrium tests during each CPT. Water level observations were also measured within the boreholes. The depth to groundwater at each of the test locations is summarised in Table 4.

Table 4: Summary of measured groundwater depths and RLs.

Test ID	Test RL (m CDD)	Date Measured	Groundwater	
			Depth bgl (m)	RL (m CDD)
CPT-01	24.2	30/07/2012	1.4	22.8
CPT-02	24.3	30/07/2012	1.4	22.9
CPT-03	24.2	30/07/2012	N/A	N/A
CPT-04	24.0	30/07/2012	1.4	22.6
CPT-05	24.9	31/07/2012	2.0	22.9
CPT-06	25.0	31/07/2012	2.1	22.9
CPT-07	25.2	31/07/2012	2.2	22.0
CPT-08	24.6	01/08/2012	1.7	22.9
CPT-09	24.6	01/08/2012	1.7	22.9
CPT-10	24.6	01/08/2012	1.6	23.0
CPT-11	24.4	01/08/2012	1.5	22.9
CPT-12	25.1	06/08/2012	2.0	23.1
CPT-13	24.4	06/08/2012	1.5	22.9
CPT-14	24.0	06/08/2012	1.2	22.8
CPT-15	24.2	06/08/2012	1.4	22.8
CPT-16	25.3	07/08/2012	2.1	23.2
CPT-17	24.5	07/08/2012	1.3	23.2
CPT-18	25.3	07/08/2012	2.5	23.8
CPT-19	25.1	07/08/2012	1.8	23.3
CPT-20	25.1	08/08/2012	1.9	23.2
CPT-21	25.0	08/08/2012	1.9	23.1
CPT-22	24.9	08/08/2012	2.0	22.9
CPT-23	24.9	08/08/2012	2.0	22.9
BH1	24.6	24/08/2012	1.4	23.2
BH2	25.0	28/08/2012	1.8	23.2
BH3	24.1	31/08/2012	0.6	23.5
BH4	25.0	04/09/2012	1.7	23.3
BH5	24.0	08/09/2012	0.9	23.1
BH6	25.2	14/09/2012	1.3	23.9
BH7	24.4	12/09/2012	1.4	23.0

Groundwater was encountered between RL+22.6 m CDD and RL+23.9 m CDD, with an average depth of 1.6 m bgl. The groundwater levels are expected to fluctuate seasonally with varying precipitation and runoff, tending to rise during periods of prolonged precipitation, and decline during the drier summer months.



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7.3 Laboratory Testing

Laboratory testing of selected samples recovered from the boreholes was carried out to assess moisture content, particle size distribution, and plasticity. The samples were sent to Civil Engineering Laboratory Services Ltd. The laboratory test results are summarised in Table 5.

Table 5: Summary of laboratory test results.

Test Location	Test Depth (m)	Description	Field Moisture Content (%)	Plasticity (%)			Grading (%)		
				Liquid Limit	Plastic Limit	Plasticity Index	Fines	Sand	Gravel
BH 01	2.80 – 3.25	(SW) SAND with some silt	26.1	-	-	-	14	86	0
	4.50 – 4.95	(SW) SAND with minor silt and trace of gravel	25.0	-	-	-	7	88	5
	6.00 – 6.45	(SW) SAND with trace of silt	-	-	-	-	2	98	0
	9.00 – 9.45	(GP) sandy GRAVEL with minor silt	-	-	-	-	6	28	66
BH 02	2.50 – 2.95	(ML) SILT with minor sand	29.6	N/A	NP	NP	91	9	0
	6.00 – 6.95	(ML) SILT	36.8	39	28	11	-	-	-
BH 03	1.00 – 1.45	(SM) silty SAND with trace of gravel	20.9	-	-	-	21	77	2
	4.00 – 4.45	(SM) silty SAND	25.3	-	-	-	29	71	0
	5.50 – 5.95	(ML) SILT	20.4	26	22	4	-	-	-
BH 04	2.50 – 2.95	(SW) SAND with trace of silt	26.4				4	96	0
	5.50 – 5.95	(ML) SILT	35.2	39	30	9	-	-	-
	6.00 – 6.95	(ML) SILT	24.7	26	21	5	-	-	-
BH 05	2.50 – 2.95	(SP) SAND with some silt	-	-	-	-	12	87	1
	4.00 – 4.45	(ML) SILT	37.0	30	26	4	-	-	-



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Test Location	Test Depth (m)	Description	Field Moisture Content (%)	Plasticity (%)			Grading (%)		
				Liquid Limit	Plastic Limit	Plasticity Index	Fines	Sand	Gravel
BH 06	4.00 – 4.45	(SP) SAND with some silt	23.9	24	NP	NP	-	-	-
	8.50 – 8.95	(SP) gravelly SAND with some silt	-	-	-	-	18	57	25
BH 07	4.00 – 4.45	(SP) SAND with some silt	33.3	27	NP	NP	-	-	-
	5.50 – 5.95	(ML) sandy SILT	27.8	23	19	4	69	30	1
	7.00 – 7.45	(ML) sandy SILT	26.1	35	24	11	-	-	-

Notes:

NP – Non Plastic

Detailed laboratory test reports are provided in Appendix E.



8.0 GEOTECHNICAL LIQUEFACTION ASSESSMENT

8.1 Liquefaction

Liquefaction typically occurs in saturated, generally non-cohesive and low plasticity soils as a result of strong ground shaking in severe earthquakes. The susceptibility of a site to soil liquefaction is a function of particle size distribution, groundwater level and soil density. Soil liquefaction effects can impact on ground surface settlement, bearing capacity and slope stability.

The alluvial deposits beneath the site have been found to be highly variable in nature and composition, such that a number of layers and lenses of materials have been identified as being susceptible to liquefaction.

A liquefaction assessment has been undertaken. The details and results are presented in the following section.

8.2 Liquefaction Potential

The liquefaction assessment was carried out using the procedures given in “*Soil Liquefaction during Earthquakes*” (Idriss and Boulanger 2008) along with the modifications for fines content and settlements recommended in Section C3.5.1 DBH 2012. The assessment considers the response of the site to the SLS and ULS ground motions including susceptibility to liquefaction and the consequences of liquefaction such as post-liquefaction settlement and lateral displacement. Recognising that the calculation of liquefaction triggering and settlement is inexact, the DBH 2012 recommends considering estimated values as an “index” that may then be used to categorise the site. This index is the estimated settlement that could occur in the upper 10 m of the soil profile following an SLS level earthquake.

The following PGA values published in DBH 2012 have been adopted in the liquefaction analysis:

- Serviceability limit state (SLS): 0.13 g
- Ultimate limit state (ULS): 0.35 g

The earthquake design magnitude adopted in the analysis was M7.5.

The groundwater measurements indicate the water level at the site is approximately between RL +22.6 m CDD and RL+23.9 m CDD, with an average depth of 1.6 m bgl. As mentioned earlier, the groundwater levels are expected to fluctuate seasonally with varying precipitation and runoff, tending to rise during periods of prolonged precipitation such as usually occurs in winter, and decline during the drier summer months. Based on this information, a groundwater level of 1.0 m bgl has been assumed for the assessment reported herein.

It should be noted that the liquefaction assessment has been carried out using a combination of CPTs and boreholes. The CPTs encountered effective refusal in dense and very dense gravel at a maximum depth of 8.9 m bgl (RL+16.2 m CDD). Due to the high resolution (continuous trace) obtained from the CPTs; the liquefaction assessment has been based on the findings of the CPTs in the upper soil profile (to approximately 8.0 m bgl). The SPT borehole results were used to characterise the liquefaction potential of the materials between approximately 8.0 m bgl and 15.0 m bgl (within the medium dense to very dense sandy gravel).



8.3 Susceptibility to Liquefaction

8.3.1 SLS earthquake

The liquefaction assessment results indicate that, below the water table, the following soil deposits are susceptible to liquefaction under the SLS earthquake:

- Very loose to loose SAND and silty SAND from about RL+24.0 m CDD to RL+18.0 m CDD (i.e., 1.0 m bgl to approximately 7.0 m bgl)
- Soft to firm sandy SILT and very loose silty SAND extending to about RL+17.0 m CDD

8.3.2 ULS earthquake

The liquefaction assessment results indicate that, below the water table, the following soil deposits are susceptible to liquefaction under the ULS earthquake:

- Very loose to loose SAND and silty SAND from about RL+24.0 m CDD to RL+18.0 m CDD (i.e., 1.0 m bgl to approximately 7.0 m bgl)
- Soft to firm sandy SILT and very loose silty SAND extending to about RL+17.0 m CDD
- Discrete medium dense zones of sandy GRAVEL extending to about RL+13.0 m CDD (i.e., to approximately 11.5 m bgl)

8.3.3 Additional layers susceptible to liquefaction

It is not known whether soils below the tested depths are susceptible to liquefaction. Should the groundwater level rise above that indicated in Section 8.2, the thickness of potentially liquefiable soil may increase.

8.4 Post-Liquefaction Settlement

8.4.1 SLS index value and category for upper 10 m

In accordance with DBH 2012, the post-liquefaction global settlement at the site, in response to the SLS earthquake, in the upper 10 m of the soil profile, is to be assessed for the purpose of providing index values. The liquefaction assessment has provided index values which range from approximately 15 mm to 160 mm. These values are consistent with the *Minor to Moderate* and *Potentially Significant* categories in accordance with Table C2.5 of DBH 2012. Figure B4 illustrates the distribution of the vertical land settlement categories.



8.4.2 SLS and ULS settlement for tested depth

The post-liquefaction induced global settlement over the tested depth is estimated to be:

- For the area in the *Minor to Moderate* category, indicated on Figure B4:
 - 80 mm for the SLS earthquake event
 - 140 mm for the ULS earthquake event
- For the area in the *Potentially Significant* category, indicated on Figure B4:
 - 160 mm for the SLS earthquake event
 - 235 mm for the ULS earthquake event

8.4.3 Differential settlement

It is difficult to assess the magnitude of any future differential settlement. Therefore, it is conservatively assumed that the differential settlement over the length of the house may approach the total settlement values.

8.4.4 Additional settlement

Additional post-liquefaction settlement could occur in soils below the tested depths if these deposits are susceptible to liquefaction. The post-liquefaction settlement estimates do not account for ground surface deformation resulting from loss of soil (in the form of liquefaction ejecta) nor from vertical ground deformation associated with lateral displacement, tectonic deformation, or long-term consolidation settlement of fine-grained sediments and peats.

8.5 Settlement Discussion

It is noted that the vertical ground movement (vertical LiDAR) survey information available on the Canterbury Geotechnical Database indicates approximately +0.1 m (heave) to -0.2 m (settlement) movement has occurred in the vicinity of the site as a result of the 2010-2011 Canterbury earthquakes. This correlates well with calculated settlements and it is expected that some settlement has occurred globally.

8.6 Liquefaction-Induced Lateral Spread

8.6.1 Assessment

In accordance with DBH 2012, Section C2.2 the lateral spread susceptibility at the site in response to the ULS earthquake is to be assessed. According to Idriss and Boulanger (2008), the following factors should be taken into consideration in the assessment of a site's susceptibility to lateral spread:

- Presence of a free face. Lateral spreading is unlikely to be of significant concern where the depth to the uppermost liquefiable layer (below the free face) is greater than twice the height of the free face.
- Distance from a free face. Lateral displacements within a laterally spreading mass will generally decrease with distance from a free face.
- Continuity of the liquefiable layer beneath and beyond the site.



The nearest free face, the Nottingham Stream, is located along the northern boundary of the site and has an estimated height of 1.0 m. The uppermost liquefiable layer of soil at the site was assessed at a depth of 1.0 m bgl to 8.0 m bgl. It is assumed that the geology between the site and the free face is consistent for our assessment. Evidence of lateral spread was observed at the site as indicated by the mapping of ground cracks undertaken by Golder and presented in Figure B1 in Appendix B.

Ground surface deformation associated with lateral spread at a particular site can be considered in terms of global lateral displacement and lateral stretch. Global lateral displacement is the amount of uniform translation of the ground surface at a site while lateral stretch is the amount of extension, or the differential translation of the ground surface across a site.

It is noted that horizontal ground movement (horizontal LiDAR) survey information available on the Canterbury Geotechnical Database indicates approximately 0.3 m of lateral movement in the south-eastern direction has occurred at the site. This is generally not in the direction towards Nottingham Stream which is the direction of the movement observed in our site visit. It is possible that the horizontal LiDAR information is not accurate for this site as the site is located near the edge of the survey model.

8.6.2 Global lateral displacement

Our assessment suggests that the global lateral displacement for the site is likely to be in the *Major* category. This is based on observations made at the time of our site visits and proximity to the Nottingham Stream.

8.6.3 Lateral stretch

It is difficult to assess the amount of global lateral spread that may be present as lateral stretch. The lateral stretch for the site is likely to be in the *Major* category with the exception of 2 Oldham Crescent, which can be assumed to be in the *Minor to Moderate* category in accordance with Table C2.4 of DBH 2012 and based on the observed damage at the site due to the 2010-2011 Canterbury earthquakes.

9.0 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS FOR DEVELOPMENT

At the time of writing it was understood that of the buildings on site, some were to be repaired and some were to be rebuilt as indicated in Table 1. Based on the repair/rebuild status of each of the buildings, which has been provided by the PMOs, it is understood that there are a total of four repairs, ten rebuilds, five under cap, which require no assistance from its private insurer and two which requires no geotechnical assistance (assumed to have cashed out). Based on the information contained within Table 1, we provide the following approaches to repairing or rebuilding structures on the site.



9.1 Repair Options for Foundations

The feasibility of any repairs would be a function of the current condition of the foundations, which are unknown at present. Treatment options would depend on access for machinery and materials on to the site and into the dwelling. Information on differential settlement (detailed floor level survey) and functionality of services is required to assess the type of repairs to be carried out. Tables 2.2 and 2.3 of the DBH 2011 give guidance on whether foundation damage requiring specific engineering input is present. Further input is required from a structural engineer to make an assessment of the buildings, in accordance with Table 2.3 of the DBH 2012, to determine the level of repairs necessary for the structures.

If foundation re-levelling is required, the following three methods may be adopted at the site:

- Underpinning - Jacking up the foundation using piles to lift up the foundation walls and then using grout to fill the resultant voids between the foundation wall and the underling soils after re-levelling is complete. The dense sandy gravel at about 8 m bgl is considered a suitable underpinning bearing stratum.
- High strength resins – High strength resin is injected into the ground below the foundation wall at discrete points. As the resin is injected the underlying soils are densified by the expanding resin, which also lifts the house. Any gaps between the foundation perimeter wall and the soil are filled by the resin.
- Low mobility grout (LMG) – This method involves drilling and inserting grout injection points to allow the low mobility grout to raise the structure immediately below the perimeter wall foundation. The grout bulbs require soils with sufficient bearing strength at a depth of 4.0 m bgl to create enough reaction to lift the house.

It is noted that the site is susceptible to liquefaction settlement and lateral movement during future earthquake events. It is possible that on-going repair works (re-levelling, etc.) will be required to manage future settlements.

Furthermore, consideration should be given as to whether the foundations are to be repaired to pre-earthquake condition or to be brought to the new standard of foundation construction in TC3. It is recommended that Golder reviews and provides additional geotechnical input and recommendations when these decisions have been made.

9.2 Rebuild of foundations

In our opinion, the lots on which the dwellings are to be rebuilt (refer to Table 1), are generally suitable for rebuilding conditional on implementation of a design that considers the presence of sandy or silty 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 piled 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 on surface structures designed to accommodate seismically induced loadings, resultant vertical and differential settlements, and lateral spreading deformation.



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

Consideration could be given to carrying out ground improvement in the upper liquefiable deposits to create a “bridging layer” in the order of 2 to 3 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 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) and which may require a specific design for treatment by cement mixing.
- 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.
- Space constraints and the effects of vibrations on nearby structures.

Given the above constraints, consideration may be given to ground improvement (refer to Section C5.3 of DBH 2012) using any of the following:

- Creating a bridging layer constructed using shallow excavation and replacement or re-compaction of the in-situ soils. Based on our geotechnical assessment, we anticipate that ground improvement Type 1c (rapid impact compaction, refer to Page 96 of DBH 2012) is likely to be an option for areas shaded in orange (predominantly clean sand) on Figure B3 provided the potential effects of vibrations on neighbouring properties and services are carefully considered. Site layout constraints may apply. In areas shaded blue on the same figure, ground improvement Type 2b (in-situ mixing, refer to Page 99 of DBH 2012) to a depth of about 5 m bgl is likely to be an option; however, a specific mix design for sandy silt will be required. These ground improvements are to be coupled with a rigid re-levellable TC2 Options 2, 3 or 4 of the DBH 2011.
- Constructing a bridging layer with short Rammed Aggregate Piers, which involves driving aggregate columns at close centre spacing to densify the ground. Alternatively, driven compaction piles (such as timber piles driven to shallow depths at close centre-to-centre spacing) may merit consideration.

The design intent of ground improvement is to return the site to meet the requirements of TC2 expected future land performance (i.e., SLS settlements of less than 50 mm and ULS settlements of less than 100 mm). Shallow ground improvement (to approximately 5 m bgl) will satisfy this design intent for all houses requiring rebuilding, except for 10 Oldham Crescent. The settlements results indicate ULS settlements greater than 100 mm in the sandy gravel material below 8 m bgl (below approximately RL+16.5 m CDD). Deep ground improvement will be required at 10 Oldham Crescent in order to satisfy the DBH design requirements. Details are presented below.

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

Consideration could be given to carrying out ground improvement at the building area to a depth which is sufficient to reduce the estimated liquefaction induced vertical settlements under the SLS event to less than 50 mm and under the ULS event to less than 100 mm (i.e., to meet TC2 type foundation performance criteria). As with Option 1, this method would be coupled with a relatively rigid foundation system although, due to the reduction in anticipated residual post-liquefaction settlement/displacement of the site following ground improvement, the raft could be less stiff and/or there may be a lesser requirement for maintenance following future seismic events.



Consideration may be given to deep ground improvement (refer to Section C5.3 of DBH 2012) using any of the following:

- Ground improvement Type 3 (deep soil mixing, refer to Page 100 of DBH 2012). Soil mix columns are constructed using a jet grouting rig and a grout batching plant. The grout jet nozzles produce columns of grout strengthened soil. A minimum of 16% to 20% of the site beneath the new dwelling must be treated. The appropriate diameter and spacing would have to be determined by the specialist contractor, although it is common to create 1 m diameter columns on a 2.0 m grid. Obstructions (e.g., gravel layers, wood) may cause difficult conditions for in-place mixing. Site layout constraints may apply. The treated area must extend a minimum of 1.5 m beyond the building footprint.
- Ground improvement Type 4 (stone columns; refer to Page 101 of DBH 2012). Stone columns are built using a drill rig fitted with a vibrating or auger probe and follower tube. The follower tube is used to tremie graded aggregate to the tip of the probe during extraction. The probe is also used during extraction for aggregate compaction. Stone columns should target a replacement ratio of 18% to 20%. Typically 0.8 m diameter columns are constructed on a 1.75 m grid. The treated area should extend a minimum of 2.0 m beyond the building footprint.
- Ground improvement Type 5 (low mobility grout (LMG), refer to Page 105 of DBH 2012). LMG columns are constructed by forming a series of stacked bulbs of pumped grout using a driven casing and a grouting rig. Typically the columns are 0.8 m in diameter on a 2.0 m grid, to give treatment of 12% to 15% of the ground beneath the new dwelling. The treated area must extend a minimum of 1.5m beyond the building footprint. Obstructions (e.g., gravel layers, wood) may cause difficult conditions for in-place mixing. Site layout constraints may apply.
- Rammed Aggregate Piers (RAP) – A RAP is constructed by forming a hole in the soil. The resultant void is filled with 50 mm to 100 mm crushed rock which is rammed and vibrated to the bottom with a rammer tool that forces the rock out laterally into the surrounding soil during construction. Once the bottom bulb is constructed, layers of well-graded crushed rock are successively placed and rammed to ground level (averaging a 300 mm compacted lift thickness). This ramming creates a very dense, stiff, rock pier that also densifies the surrounding soil. The RAP construction technique also increases the strength of the soil around it. This technique is readily available in Christchurch. The treated area must extend a minimum of 2.0 m beyond the building footprint.

It is noted that the all properties requiring rebuilding are suitable for deep ground improvement, which would be expected to improve land performance during future earthquakes and result in lower levels of settlement. It is noted that deep ground improvement is required for 2 Oldham Crescent to satisfy the DBH design requirements.



9.2.3 Surface Structures in accordance with the DBH guidelines

Consideration could be given to supporting the dwellings on surface structures with shallow foundations in accordance with the DBH 2012 TC3 guidelines, Section C5.4.

Figure B4 in Appendix B indicates the zone (shaded in green) where predicted SLS liquefaction induced settlement is less than 100 mm in the upper 10 m of the soil profile (i.e., *Minor to Moderate* category for vertical land settlement). Rebuilding within the green shaded zone may adopt a Type 2A surface structure. Areas in the orange shaded zone will require a Type 2B surface structure as the estimated liquefaction induced settlement under a SLS event is greater than 100 mm but less than 200 mm.

Table 6 summarises the foundation requirements:

Table 6: Suitability of surface structure types.

Type 2A Surface Structures	Type 2B Surface Structures
124, 2/126, 128, 130, 130a, 132a Halswell Junction Road	118, 132, 140 Halswell Junction Road and 10 Oldham Crescent

Notes:

At the time of writing information on the construction style of the new buildings and/or insurance contract provisions was not available to us and has, therefore, not been considered.

9.2.4 End-Bearing Pile Supported Foundation Solution

Section C5.2 of the DBH 2012 TC3 guidelines indicates that deep piles are not considered to be suitable for major lateral spreading situations. The liquefaction assessment has indicated that the site has been categorised as *Major* for global lateral movement and all the properties, excluding 2 Oldham Crescent, have been categorised *Major* for lateral stretch. Therefore, pile foundations are not considered to be an appropriate foundation solution.

10.0 CLOSURE

At the time of preparation of the geotechnical assessment and recommendations presented above, no specific information was available to Golder on the proposed building loadings, or on the presence and depths of existing buried utilities. Further, details regarding the existing foundations for the buildings that are to be repaired were not available. It is recommended that Golder reviews and provides additional geotechnical input and recommendations as part of detailed design.

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



11.0 REFERENCES

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APPENDIX A

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APPENDIX B

Site Plans and Inferred Stratigraphic Sections



Legend

- Site boundary
- Golder mapped cracks
- EQC mapped cracks (50 to 200 mm crack width)
- Golder observed liquefaction ejecta
- Golder borehole
- Environment Canterbury borehole
- Golder CPT
- EQC CPT
- Property boundary

Property address and status:

- EQC/EQR repair, out of scope
- Repair required
- Demolition and rebuild required
- Owner absent or not interested in geotechnical assessment

1. AERIAL IMAGE: Land Information New Zealand NZMS Series. Copyright Reserved, 24-02-2011
2. TEST LOCATIONS ARE APPROXIMATE ONLY
3. DRAWN BY: SG, REVIEWED BY: HG



TITLE | SITE PLAN OF INVESTIGATION LOCATIONS AND OBSERVED LAND DAMAGE

NOVEMBER 2012
PROJECT | 1078102455_1660

B1



- Legend**
- Site boundary
 - Golder borehole
 - Environment Canterbury borehole
 - Golder CPT
 - EQC CPT
 - Property boundary
 - Cross section line
- Property address and status:**
- XX EQC/EQR repair, out of scope
 - XX Repair required
 - XX Demolition and rebuild required
 - XX Owner absent or not interested in geotechnical assessment

1. AERIAL IMAGE: Land Information New Zealand (LINZ) Series, Copyright Reserved, 24-02-2011
2. TEST LOCATIONS ARE APPROXIMATE ONLY
3. DRAWN BY: SG, REVIEWED BY: HS



TITLE | LOCATION OF CROSS-SECTIONS

NOVEMBER 2012
PROJECT | 1078102455_1660

B2



Legend

- Site boundary
- Golder borehole
- Environment Canterbury borehole
- Golder CPT
- EQC CPT
- Property boundary
- Approximate extent of very loose sand
- Approximate extent of soft to firm sandy silt

Property address and status:

- XX EQC/EQR repair, out of scope
- XX Repair required
- XX Demolition and rebuild required
- XX Owner absent or not interested in geotechnical assessment

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TITLE | INFERRED DOMINANT SOIL TYPE ZONES

NOVEMBER 2012
PROJECT | 1078102455_1660

B3



Legend

- Site boundary
- Golder borehole
- Environment Canterbury borehole
- Golder CPT
- EQC CPT
- Property boundary

Settlement Index (DBH, 2012) Zones:

- Potentially significant > 100 mm SLS settlement in upper 10 m
- Minor to moderate. < 100 mm SLS settlement in upper 10 m

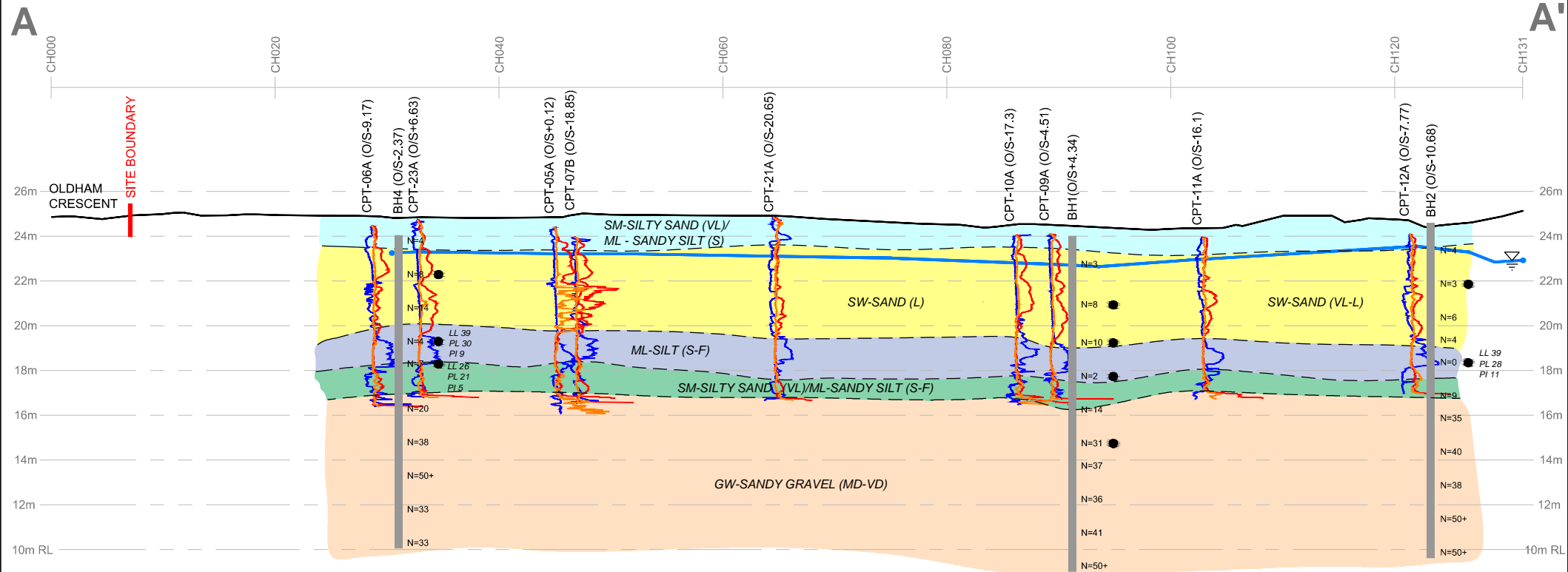
Property address and status:

- XX EQC/EQR repair, out of scope
- XX Repair required
- XX Demolition and rebuild required
- XX Owner absent or not interested in geotechnical assessment

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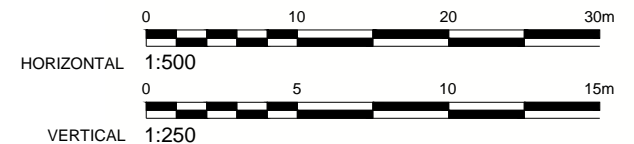



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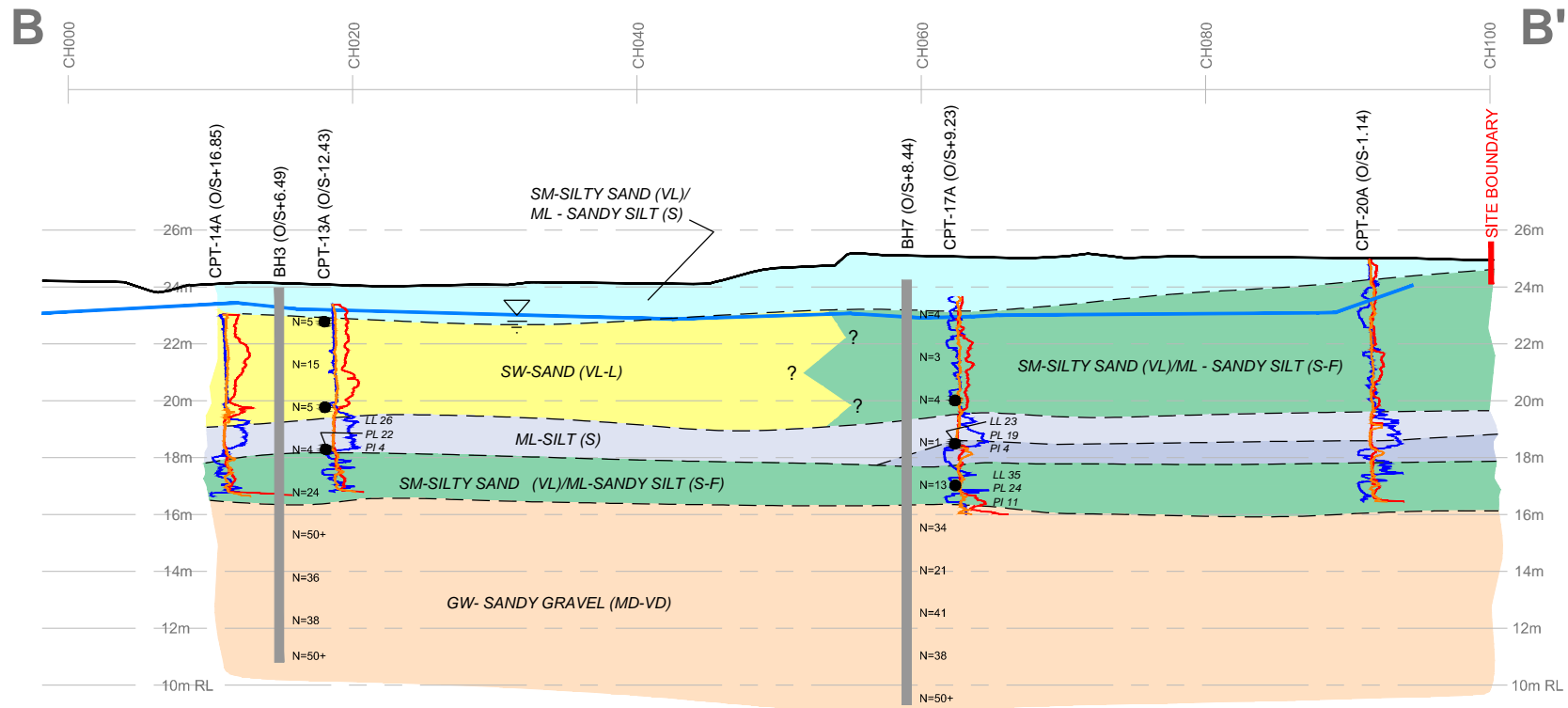
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- CPT qc
- CPT u2
- LABORATORY TEST SAMPLE
- LL = LIQUID LIMIT
- PL = PLASTIC LIMIT
- PI = PLASTICITY INDEX
- N=xx
- N-VALUE (UNCORRECTED)
- BOREHOLE
- GROUND SURFACE
- SWL SURFACE

NOTES

- RL TAKEN TO CHRISTCHURCH DRAINAGE DATUM (CDD)



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	DRAWN BY CC	DATE 18.10.12	DRAWING TITLE INFERRED STRATIGRAPHIC SECTION A-A'					
	CHECKED BY MCH	DATE 25.10.12						
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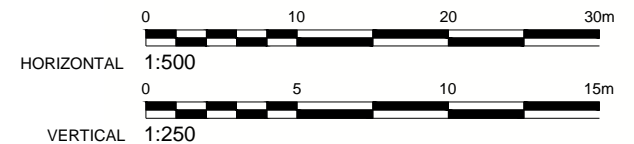



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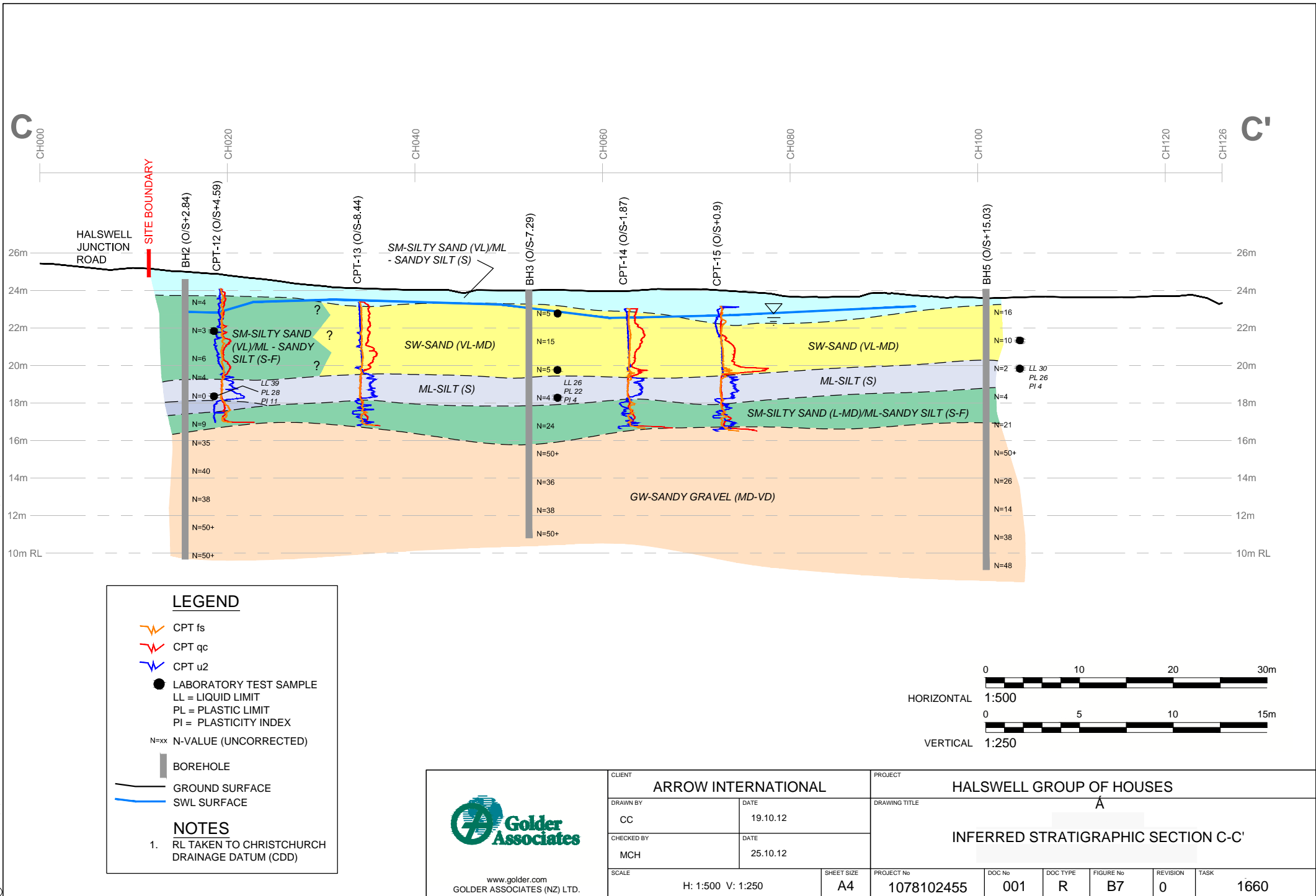
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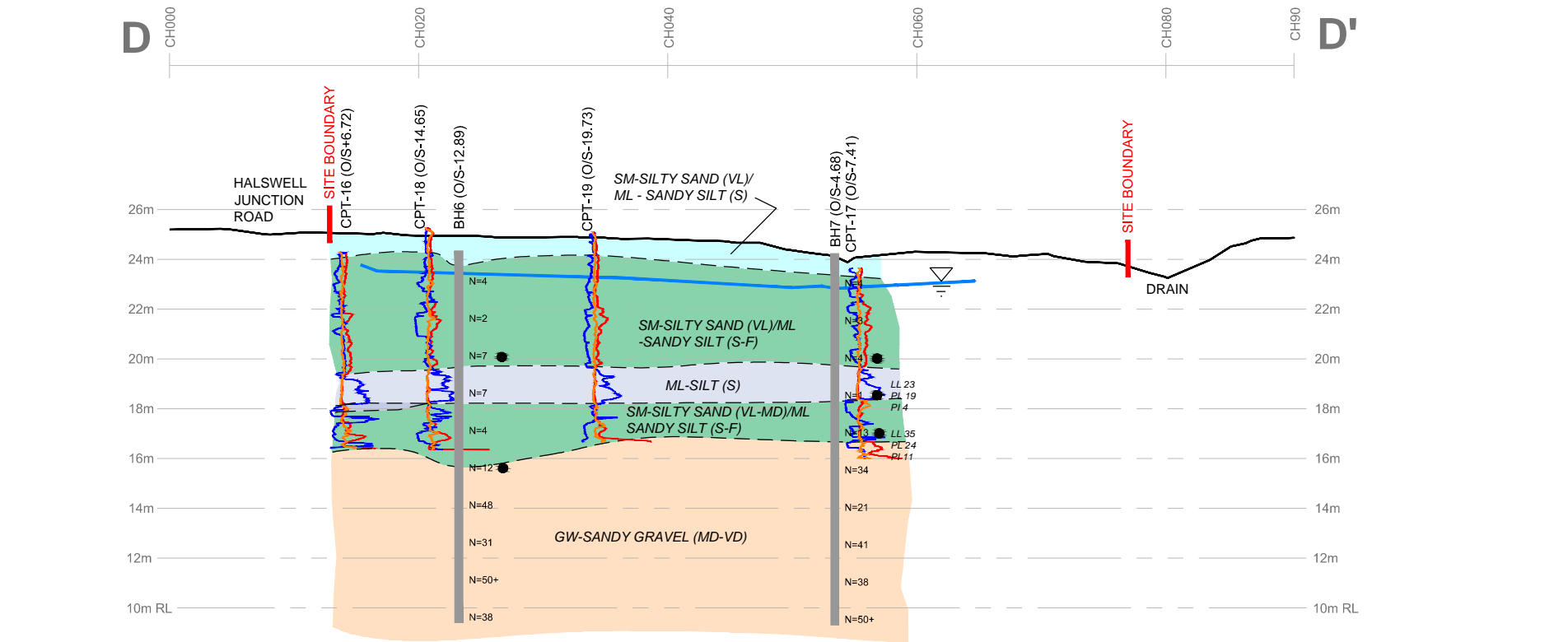
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- RL TAKEN TO CHRISTCHURCH DRAINAGE DATUM (CDD)



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	DRAWN BY CC	DATE 19.10.12	DRAWING TITLE A INFERRED STRATIGRAPHIC SECTION B-B'					
	CHECKED BY MCH	DATE 25.10.12						
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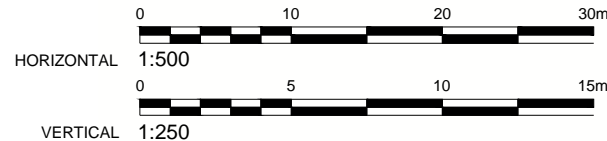



LEGEND

- CPT fs
- CPT qc
- CPT u2
- LABORATORY TEST SAMPLE
- LL = LIQUID LIMIT
- PL = PLASTIC LIMIT
- PI = PLASTICITY INDEX
- N=xx N-VALUE (UNCORRECTED)
- BOREHOLE
- GROUND SURFACE
- SWL SURFACE

NOTES

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	DRAWN BY CC	DATE 19.10.12	DRAWING TITLE A					
	CHECKED BY MCH	DATE 25.10.12	INFERRED STRATIGRAPHIC SECTION D-D'					
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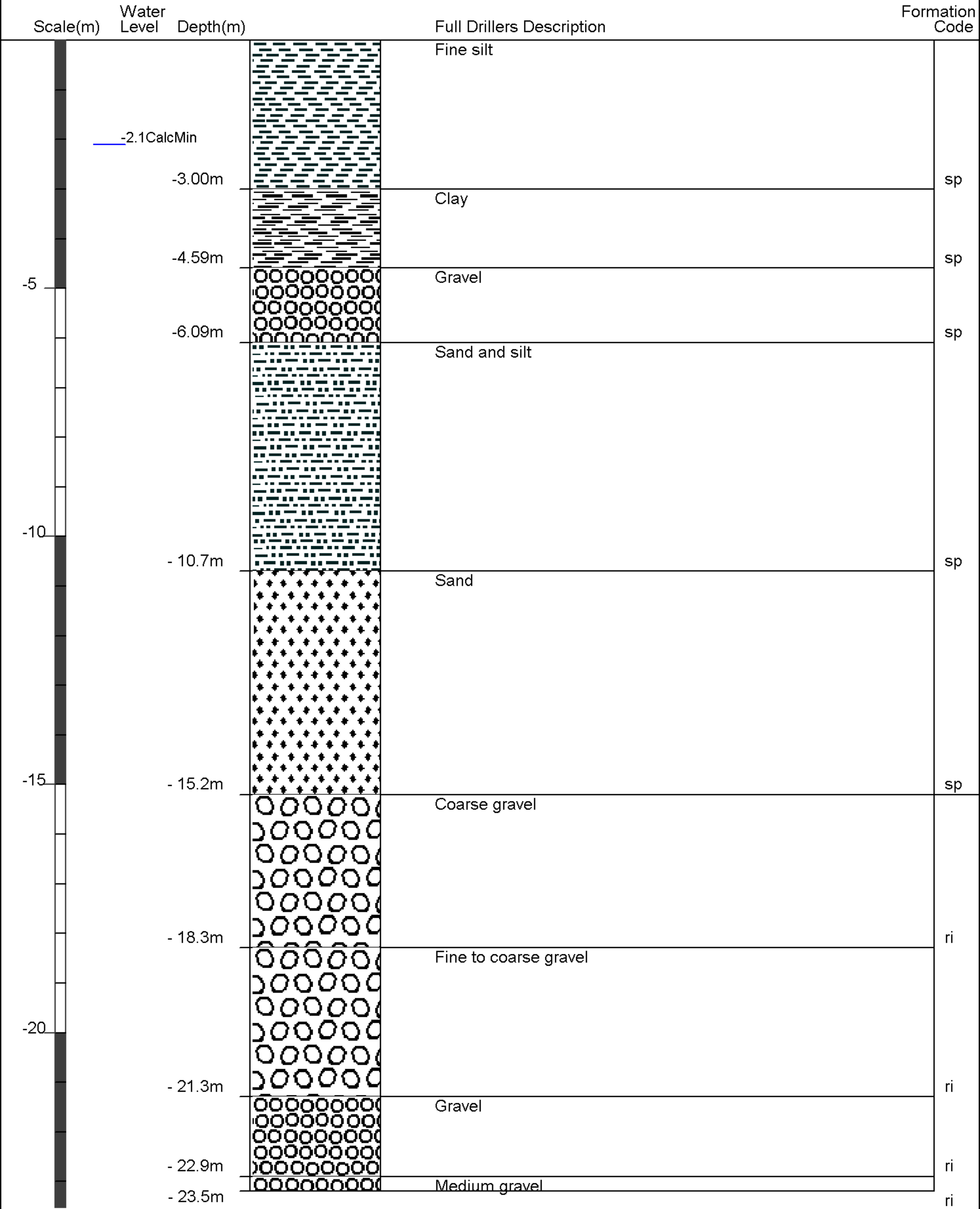


APPENDIX C

Previous Geotechnical Investigations

Borelog for well M36/0892

Gridref: M36:744-363 Accuracy : 4 (1=high, 5=low)
Ground Level Altitude : 15.7 +MSD
Driller : not known
Drill Method : Unknown
Drill Depth : -23.2m Drill Date :



Borelog for well M36/0897

Gridref: M36:744-362 Accuracy : 4 (1=high, 5=low)



Ground Level Altitude : 15.8 +MSD

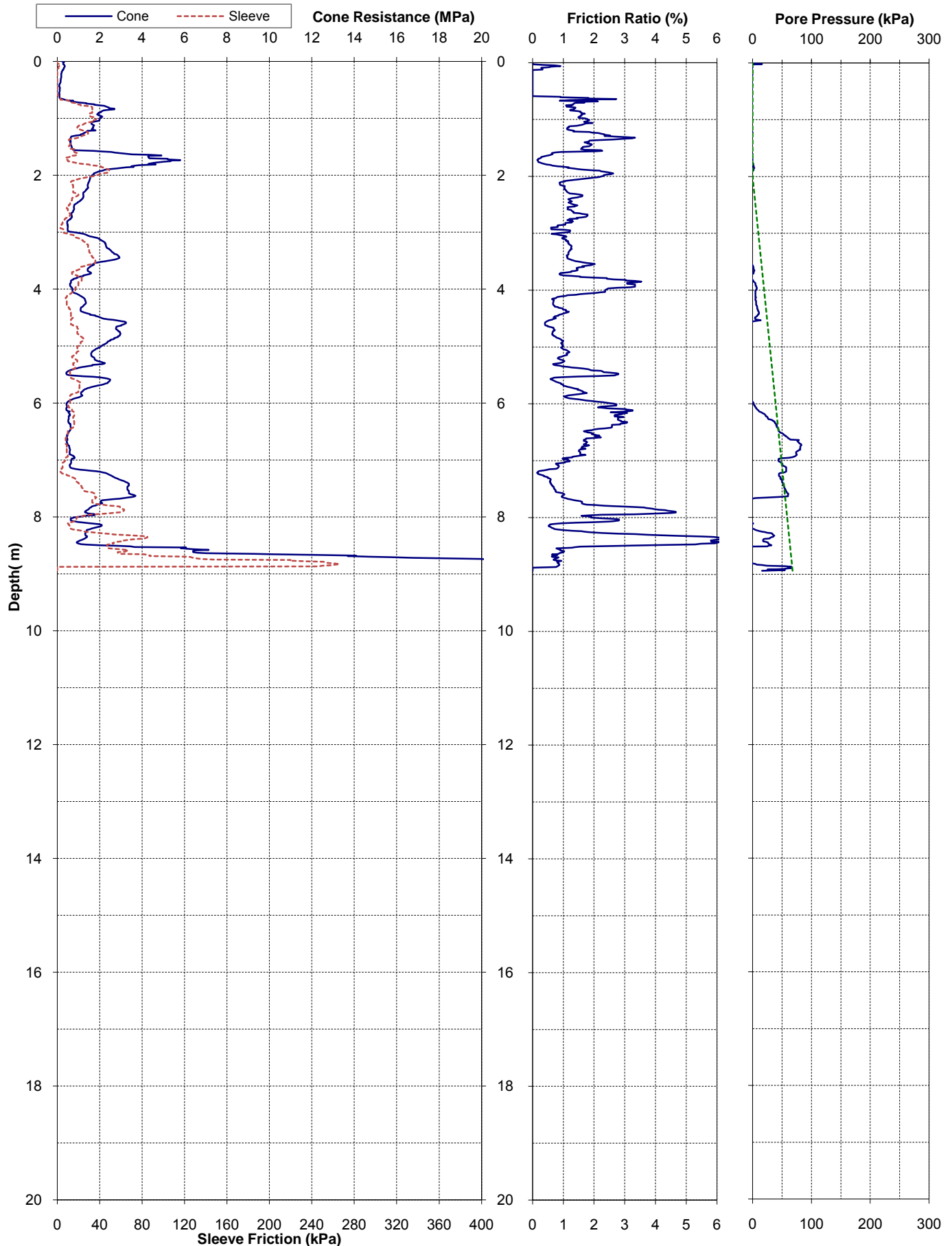
Driller : not known

Drill Method : Cable Tool

Drill Depth : -24.29m Drill Date : 1/03/1961

Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
			Earth and silt	
		-1.50m		sp
	-2.0CalcMin		Silt and fine sand, ground wl 1.8m	
		-3.00m		sp
			Clayey silt	
		-4.50m		sp
-5			Clayey silt and traces of vegetable matter	
		-7.59m		sp
			Fine pea gravel interbedded above some sand	
		-9.10m		sp
-10			Fine pea gravel to very coarse Brown gravel, some silt and sand	
		- 10.6m		sp
			Fine pea gravel to very coarse Brown gravel, less silt and sand	
		- 12.1m		sp
			Less sand, some silt	
		- 14.0m		sp
-15			Fine to coarse Brown gravels, much sand, some silt	
		- 16.7m		sp
			Clay layer	
		- 19.2m		sp
-20		- 19.3m	Pea gravel and sand	
		- 20.1m	Fine to medium gravels	ri
			Fine to coarse gravels, some sand	
		- 21.3m		ri
			Fine to coarse gravels	
		- 22.8m		ri
		- 23.1m	Clay layer	ri
		- 23.3m	Fine to coarse gravels, much sand	ri
		- 24.4m	Fine to coarse gravel, sand	
				ri

Project: Darfield 2010 Earthquake - EQC Ground Investigations				Page: 1 of 1	CPT-HAL-18	
Test Date: 20-Nov-2010	Location: Halswell	Operator: Perry				
Pre-Drill: 0.8m	Assumed GWL: 2mBGL	Located By: Survey GPS				
Position: 2474172.1mE	5736332.7mN	16.33mRL	Coord. System: NZMG & MSL			
Other Tests:			Comments:			





APPENDIX D

Current Geotechnical Investigations



Client: Arrow International
Location: Halswell Group of Houses

Description: 7 Boreholes and SPT data.

Grid: NZTM

Datum: CDD

ProjectID:	1078102455_1660
------------	-----------------

Reference: BH1

North (m): 5174674

East (m): 1564288


Elevation (m): 24.6

Hole Depth (m): 14.95

Orientation (°): -

Inclination (°): 90

Driller Texco	Logger MK	Remarks Groundwater encountered at 1.4 m during drilling.	Hole Depth 14.95m Page 1 of 1
Drill Method / Rig Hans England / RT			
Start Date 22/08/2012	Checked By KRB	Borehole logged in accordance with NZGS guideline "Field description of soil and rock" 2005 Vane tests completed in accordance with NZGS guideline	
End Date 24/08/2012			

 Soil Borehole Log		Project Name: Southern Response Canterbury Earthquake Recovery Project Client: Arrow International Location: Halswell Group of Houses Description: 7 Boreholes and SPT data.						ProjectID: 1078102455_1660				
								Reference: BH2				
								North (m): 5174642 East (m): 1564302 Elevation (m): 25.0 Hole Depth (m): 14.95 Orientation (°): - Inclination (°): 90				
		Grid: NZTM			Datum: CDD							
Formation	Graphic Log	Description	RL	USC	Moisture Condition	Consistency / Density	Water Observations	Depth	TCR (%)	SPT N-value (Uncorrected)	Samples & In-situ Testing	Backfill & Installation
		HARD FILL Fine to medium SAND; dark brown becoming light grey brown. Dry; poorly graded.	23.6	SP				0.50			SPT N = 4 Depth: 1.00m Type: Raymond Split Spoon 1, 1 / 1, 1, 1, 1	Gravel
		Silty fine to medium SAND; light brown. Very loose to loose; moist; well graded.	22.4	SM	M	VL-L		1.00				Bentonite
		Sandy SILT; grey. Very soft; wet; low plasticity; sand, fine to medium.						1.50			SPT N = 3 Depth: 2.50m Type: Raymond Split Spoon 1, 0 / 0, 1, 1, 1	
								2.00				
								2.50			SPT N = 6 Depth: 4.00m Type: Raymond Split Spoon 2, 2 / 1, 2, 1, 2 SPT N = 4 Depth: 5.00m Type: Raymond Split Spoon 1, 0 / 0, 1, 1, 2 SPT N = 0 Depth: 6.00m Type: Raymond Split Spoon 0, 0 / 0, 0, 0, 0	
								3.00				
								3.50			SPT N = 9 Depth: 7.50m Type: Raymond Split Spoon 1, 0 / 2, 2, 2, 3 SPT N = 35 Depth: 8.50m Type: Raymond Split Spoon 5, 6 / 8, 6, 9, 12	
								4.00				
								4.50			SPT N = 40 Depth: 10.00m Type: Raymond Split Spoon 6, 7 / 8, 8, 12, 12 SPT N = 38 Depth: 11.50m Type: Raymond Split Spoon 11, 8 / 10, 9, 9, 10	
								5.00				
								5.50			SPT N = 50+ Depth: 13.00m Type: Raymond Split Spoon 9, 9 / 10, 13, 18, 14 SPT N = 50+ Depth: 14.50m Type: Raymond Split Spoon	
								6.00				
		SILT with trace sand; grey. Very soft; wet; low plasticity; Sand, fine to medium.	18.6	ML		VS		6.50			SPT N = 50+ Depth: 14.50m Type: Raymond Split Spoon	
								7.00				
		becoming firm below 7.5 m	17.1					7.50			SPT N = 50+ Depth: 14.50m Type: Raymond Split Spoon	
								8.00				
			16.4			F		8.50			SPT N = 50+ Depth: 14.50m Type: Raymond Split Spoon	
								9.00				
		Sandy fine to coarse GRAVEL; grey. Dense; wet; well graded; subangular; sand, fine to medium.	16	GW	W	MD-D		9.50			SPT N = 50+ Depth: 14.50m Type: Raymond Split Spoon	
								10.00				
		Fine to medium SAND; grey. Dense; wet; well graded.		SW				10.50			SPT N = 50+ Depth: 14.50m Type: Raymond Split Spoon	
								11.00				
		Sandy fine to medium GRAVEL; greyish brown. Dense; wet; well graded; subangular to subrounded; sand, fine to medium.	14.6					11.50			SPT N = 50+ Depth: 14.50m Type: Raymond Split Spoon	
								12.00				
		Sandy fine to medium GRAVEL with minor silt; light brownish grey. Dense; wet; well graded; subangular to subrounded; sand, fine to medium.		GW				12.50			SPT N = 50+ Depth: 14.50m Type: Raymond Split Spoon	
								13.00				
			11.6					13.50			SPT N = 50+ Depth: 14.50m Type: Raymond Split Spoon	
								14.00				
		becoming very dense below 13.0 m	10.1			VD		14.50			SPT N = 50+ Depth: 14.50m Type: Raymond Split Spoon	
		Sandy fine to medium GRAVEL; brownish grey. Very dense; wet; well graded; subangular to subrounded; sand, fine to medium.	9.65								EOH: 14.95 m	
Driller Texco Drill Method / Rig Hans England / RT Start Date 27/08/2012 End Date 28/08/2012 Logger MK Checked By KRB Remarks Standing water level at 1.8 m bgl at 07:30 on 28/08/12 Borehole logged in accordance with NZGS guideline "Field description of soil and rock" 2005 Vane tests completed in accordance with NZGS guideline												
											Hole Depth 14.95m	
Page 1 of 1												



Project Name: Southern Response Canterbury Earthquake Recovery Project
Client: Arrow International
Location: Halswell Group of Houses
Description: 7 Boreholes and SPT data.

ProjectID: 1078102455_1660
Reference: BH3
North (m): 5174668
East (m): 1564330
Elevation (m): 24.1
Hole Depth (m): 13.20
Orientation (°): -
Inclination (°): 90

Soil Borehole Log

Grid: NZTM


Datum: CDD


Formation	Graphic Log	Description	RL	USC	Moisture Condition	Consistency / Density	Water Observations	Depth	TCR (%)	SPT N-value (Uncorrected)	Samples & In-situ Testing	Backfill & Installation
		Sandy SILT; dark brown. Moist; low plasticity; sand, fine.	23.41	ML				0.50				
		Sandy SILT with some organic material; greyish brown. Moist; low plasticity; sand, fine; organic material, rootlets.	22.51					1.00			SPT N = 5 Depth: 1.00m Type: Raymond Split Spoon 1, 2 / 1, 1, 2, 1	Gravel
		Sandy SILT; grey. Moist; low plasticity; sand, fine. SILT with some sand; grey. Moist; low plasticity; sand, fine.	21.51	SW		L		1.50				Bentonite
		Fine SAND with trace silt; grey. Loose; moist; well graded.	20.01	SP		MD		2.00			SPT N = 15 Depth: 2.50m Type: Raymond Split Spoon 3, 3 / 3, 4, 4, 4	
		Medium SAND; grey. Medium dense; moist; poorly graded.	20.01					2.50				
		Silty fine to medium SAND; grey. Loose; moist; well graded.	18.51	SM	M	L		3.00			SPT N = 5 Depth: 4.00m Type: Raymond Split Spoon 1, 1 / 1, 3, 0, 1	Gravel
		SILT with trace sand and organic material; grey. Soft to firm; moist; low plasticity; sand, fine.	16.71	ML		S-F		3.50				
		SILT with trace gravel; grey. Very stiff; moist; low plasticity; gravel, fine to medium, subangular to subrounded.	15.61			F		4.00			SPT N = 4 Depth: 5.50m Type: Raymond Split Spoon 0, 0 / 1, 1, 1, 1	
		Sandy fine to coarse GRAVEL with minor silt; light grey. Very dense; wet; well graded; subangular to subrounded; sand, fine to medium.	14.01	VD				4.50			SPT N = 24 Depth: 7.00m Type: Raymond Split Spoon 1, 1 / 3, 6, 8, 7	Bentonite
		becoming dense below 10.0 m	10.81	GW	W	D		5.00			SPT N = 50+ Depth: 8.50m Type: Raymond Split Spoon 16, 18 / 15, 20, 17, 8	
		becoming very dense below 12.75 m	10.81			VD		5.50			SPT N = 36 Depth: 10.00m Type: Raymond Split Spoon 8, 9 / 9, 11, 9, 7	Gravel
								6.00			SPT N = 38 Depth: 11.50m Type: Raymond Split Spoon 8, 9 / 9, 11, 11, 7	
								6.50			SPT N = 50+ Depth: 12.75m Type: Raymond Split Spoon	
								7.00				
								7.50				
								8.00				
								8.50				
								9.00				
								9.50				
								10.00				
								10.50				
								11.00				
								11.50				
								12.00				
								12.50				
								13.00				


EOH: 13.2 m


13, 19 / 17, 11, 15, 16

Driller Texco	Logger MK	Remarks Standing water level at 0.6 m bgl at 07:30 on 30/08/12
Drill Method / Rig Hans England / RT		
Start Date 29/08/2012	Checked By KRB	
End Date 31/08/2012		
		Borehole logged in accordance with NZGS guideline "Field description of soil and rock" 2005 Vane tests completed in accordance with NZGS guideline
		Hole Depth 13.20m
		Page 1 of 1

 Soil Borehole Log		Project Name: Southern Response Canterbury Earthquake Recovery Project Client: Arrow International Location: Halswell Group of Houses Description: 7 Boreholes and SPT data.						ProjectID: 1078102455_1660					
								Reference: BH4					
								North (m): 5174714 East (m): 1564243 Elevation (m): 25.0 Hole Depth (m): 14.95 Orientation (°): - Inclination (°): 90					
Grid: NZTM						Datum: CDD							
Formation	Graphic Log	Description	RL	USC	Moisture Condition	Consistency / Density	Water Observations	Depth	TCR (%)	SPT N-value (Uncorrected)	Samples & In-situ Testing	Backfill & Installation	
		Sandy SILT; grey. Moist; soft; low plasticity; sand, fine.	23.74	ML		S		0.50			SPT N = 4 Depth: 1.00m Type: Raymond Split Spoon 1, 1 / 1, 1, 1, 1	Gravel	
		Fine SAND; grey. Loose; moist; poorly graded.	22.53	SP	M			1.00				Bentonite	1.00
		Fine to medium SAND; grey. Loose; wet; well graded.	21.03			L		2.50			SPT N = 8 Depth: 2.50m Type: Raymond Split Spoon 2, 2 / 2, 2, 2, 2	Gravel	
		becoming medium dense below 4.0 m	20.03	SW				3.00					
		Sandy SILT; grey. Soft; wet; low plasticity; sand, fine.	18.53		W	S		5.50			SPT N = 14 Depth: 4.00m Type: Raymond Split Spoon 3, 3 / 3, 3, 4, 4	Gravel	
		SILT with minor sand; grey. Firm; wet; low plasticity; sand, fine.	16.53	ML				6.00					
		Sandy fine to medium GRAVEL with some silt; brown. Medium dense; saturated; well graded; subangular; sand, fine to medium; silt, low plasticity.	15.73	GW				8.50			SPT N = 4 Depth: 5.50m Type: Raymond Split Spoon 0, 0 / 1, 1, 1, 1 SPT N = 7 Depth: 6.50m Type: Raymond Split Spoon 1, 2 / 2, 2, 1, 2	Bentonite	7.00
		Fine to medium SAND with trace gravel; dark grey. Medium dense; saturated; well graded; gravel, fine to medium, subangular.	14.86	SW				6.50					
		Sandy fine to coarse GRAVEL with minor silt; greyish brown. Dense to very dense; saturated; well graded; subrounded to subangular; sand, fine to medium.	10.08	GW	S			9.00			SPT N = 20 Depth: 8.50m Type: Raymond Split Spoon 7, 5 / 5, 5, 5, 5	Bentonite	9.00
								9.50					
								10.00			SPT N = 38 Depth: 10.00m Type: Raymond Split Spoon 5, 6 / 7, 11, 10, 10	Gravel	
								10.50					
								11.00			SPT N = 50+ Depth: 11.50m Type: Raymond Split Spoon 10, 13 / 13, 13, 15, 1	Gravel	
								11.50					
								12.00			SPT N = 33 Depth: 13.00m Type: Raymond Split Spoon 4, 7 / 7, 6, 10, 10	Gravel	
								12.50					
								13.00			SPT N = 33 Depth: 14.50m Type: Raymond Split Spoon	Gravel	
								13.50					
								14.00					
								14.50					
EOH: 14.95 m													
Driller Texco		Logger MK		Remarks Standing water level at 1.7 m bgl at 08:15 on 04/09/12									
Drill Method / Rig Hans England / RT													
Start Date 03/09/2012		Checked By KRB											
End Date 04/09/2012				Borehole logged in accordance with NZGS guideline "Field description of soil and rock" 2005 Vane tests completed in accordance with NZGS guideline									
												Hole Depth 14.95m	
Page 1 of 1													

 Soil Borehole Log		Project Name: Southern Response Canterbury Earthquake Recovery Project Client: Arrow International Location: Halswell Group of Houses Description: 7 Boreholes and SPT data.										ProjectID: 1078102455_1660							
												Reference: BH5							
												North (m): 5174721 East (m): 1564335 Elevation (m): 24.0 Hole Depth (m): 14.95 Orientation (°): - Inclination (°): 90							
Grid: NZTM										Datum: CDD									
Formation	Graphic Log	Description	RL	USC	Moisture Condition	Consistency / Density	Water Observations	Depth	TCR (%)			SPT N-value (Uncorrected)			Samples & In-situ Testing	Backfill & Installation			
									25	50	75	100	10	20		30	40		
		Sandy SILT; dark brown. Moist; low plasticity; sand, fine to medium.	23.6	ML				0.50						SPT N = 16 Depth: 1.00m Type: Raymond Split Spoon 2, 4 / 4, 5, 3, 4	Gravel				
		Fine to medium SAND; light grey. Moist; well graded.	23.23	SW			1.00												
		Gravelly fine to medium SAND with trace cobbles; light grey. Moist; well graded; gravel, medium to coarse, subangular to subrounded; cobbles, subrounded.	23.23	GW	M	MD		1.50											
		Sandy fine to medium GRAVEL; grey. Medium dense; moist; well graded; subangular to subrounded; sand, fine to medium.	21.57	GW				2.00						SPT N = 10 Depth: 2.50m Type: Raymond Split Spoon 6, 4 / 3, 2, 3, 2	Bentonite	2.00			
		Fine to medium SAND with minor silt; grey. Loose to medium dense; wet; well graded.	20.87	SW		L-MD		2.50											
		Sandy SILT; grey. Very soft; wet; low plasticity; sand, fine.	19.87					3.00											
		SILT with trace organic material; grey. Very soft; wet; low plasticity.	18.57	ML		VS		3.50						SPT N = 2 Depth: 4.00m Type: Raymond Split Spoon 0, 0 / 1, 0, 0, 1	Gravel	3.00			
		becoming soft below 5.5 m	16.92			S		4.00											
		Sandy fine to coarse GRAVEL with some silt; brownish grey. Medium dense; moist; well graded; subrounded to subangular; sand, fine to medium.	15.57			MD		4.50											
		becoming very dense below 8.5 m	14.07		W	VD		5.00						SPT N = 4 Depth: 5.50m Type: Raymond Split Spoon 1, 2 / 1, 1, 1, 1	Bentonite	9.00			
		becoming medium dense below 10.0 m	11.07	GW		MD		5.50											
		becoming dense below 13.0 m	9.12			D		6.00											
EOH: 14.95 m																			
SPT N = 21 Depth: 7.00m Type: Raymond Split Spoon 1, 1 / 3, 5, 6, 7 SPT N = 50+ Depth: 8.50m Type: Raymond Split Spoon 12, 10 / 9, 9, 27, 15 SPT N = 26 Depth: 10.00m Type: Raymond Split Spoon 12, 7 / 6, 6, 7, 7 SPT N = 14 Depth: 11.50m Type: Raymond Split Spoon 6, 4 / 4, 3, 4, 3 SPT N = 38 Depth: 13.00m Type: Raymond Split Spoon 5, 12 / 12, 11, 8, 7 SPT N = 48 Depth: 14.50m Type: Raymond Split Spoon 14, 15 / 15, 16, 7, 10																			
Driller Texco		Logger MK		Remarks Groundwater encountered at 0.9 m bgl during drilling.															
Drill Method / Rig Hans England / RT																			
Start Date 06/09/2012		Checked By KRB		Borehole logged in accordance with NZGS guideline "Field description of soil and rock" 2005 Vane tests completed in accordance with NZGS guideline															
End Date 08/09/2012																			
Hole Depth 14.95m																			
Page 1 of 1																			

 Soil Borehole Log		Project Name: Southern Response Canterbury Earthquake Recovery Project Client: Arrow International Location: Halswell Group of Houses Description: 7 Boreholes and SPT data.										ProjectID: 1078102455_1660							
												Reference: BH6							
												North (m): 5174621 East (m): 1564359 Elevation (m): 25.2 Hole Depth (m): 14.95 Orientation (°): - Inclination (°): 90							
Grid: NZTM										Datum: CDD									
Formation	Graphic Log	Description	RL	USC	Moisture Condition	Consistency / Density	Water Observations	Depth	TCR (%)		SPT N-value (Uncorrected)		Samples & In-situ Testing	Backfill & Installation					
									25	50	75	100		10	20	30	40		
		Silty fine to medium SAND; brownish black. Moist; poorly graded; silt, low plasticity. becoming brown at 0.3m Fine to medium SAND; grey. Moist; poorly graded. Sandy SILT; grey. Soft; moist; low plasticity; sand, fine to medium. becoming greyish brown at 1.0m	23.24	SM				0.50					SPT N = 4 Depth: 1.00m Type: Raymond Split Spoon 1, 0 / 1, 1, 1, 1	Gravel					
			23.23	SP				1.00							Bentonite	1.50			
		SILT with some sand; brownish grey. Very soft; moist to wet; low plasticity; sand, fine. Sandy SILT with trace gravel; grey. Soft to firm; moist; low plasticity; sand, fine; gravel, medium, subangular to subrounded.	21.4		M			1.50					SPT N = 2 Depth: 2.50m Type: Raymond Split Spoon 1, 0 / 0, 0, 1, 1						
			21.86		M-W	VS		2.00											
		SILT with some sand; grey. Firm; moist; low plasticity; sand, fine. with minor fine sand at 5.5 m	20.36	ML		S-F		2.50					SPT N = 7 Depth: 4.00m Type: Raymond Split Spoon 2, 2 / 2, 2, 1, 2						
			18.86			F		3.00											
		SILT with some organic material and minor sand; grey. Soft to firm; moist; low plasticity; sand, fine.	18.86					3.50					SPT N = 7 Depth: 5.50m Type: Raymond Split Spoon 0, 1 / 1, 2, 2, 2						
			15.86	SM		S-F		4.00											
		Silty fine to medium SAND with some gravel and trace organic material; grey. Medium dense; moist; poorly graded; gravel, medium, subrounded.	14.76			MD		4.50					SPT N = 4 Depth: 7.00m Type: Raymond Split Spoon 1, 1 / 1, 0, 2, 1	Gravel					
			14.76					5.00											
		Sandy fine to coarse GRAVEL with some cobbles and minor silt; brownish grey. Dense to very dense; wet; poorly graded; subrounded to subangular; sand, fine to medium.	9.41					5.50					SPT N = 12 Depth: 8.50m Type: Raymond Split Spoon 2, 2 / 0, 1, 1, 10						
			9.41					6.00											
								6.50					SPT N = 48 Depth: 10.00m Type: Raymond Split Spoon 6, 13 / 15, 12, 10, 11						
								7.00											
								7.50					SPT N = 31 Depth: 11.50m Type: Raymond Split Spoon 14, 9 / 7, 8, 8, 8						
								8.00											
								8.50					SPT N = 50+ Depth: 13.00m Type: Raymond Split Spoon 26, 34						
								9.00											
								9.50					SPT N = 38 Depth: 14.50m Type: Raymond Split Spoon						
								10.00											
								10.50											
								11.00											
								11.50											
								12.00											
								12.50											
								13.00											
								13.50											
								14.00											
								14.50											
EOH: 14.95 m																			
Driller Texco		Logger MK		Remarks Groundwater encountered at 1.3 m bgl during drilling.															
Drill Method / Rig Hans England / RT																			
Start Date 13/09/2012		Checked By KRB																	
End Date 14/09/2012				Borehole logged in accordance with NZGS guideline "Field description of soil and rock" 2005 Vane tests completed in accordance with NZGS guideline															
														Hole Depth 14.95m					
Page 1 of 1																			

 Soil Borehole Log		Project Name: Southern Response Canterbury Earthquake Recovery Project Client: Arrow International Location: Halswell Group of Houses Description: 7 Boreholes and SPT data.						ProjectID: 1078102455_1660 Reference: BH7				
		Grid: NZTM						Datum: CDD				
		North (m): 5174650 East (m): 1564370 Elevation (m): 24.4 Hole Depth (m): 14.95 Orientation (°): - Inclination (°): 90										
Formation	Graphic Log	Description	RL	USC	Moisture Condition	Consistency / Density	Water Observations	Depth	TCR (%)	SPT N-value (Uncorrected)	Samples & In-situ Testing	Backfill & Installation
		Hard Fill	23.47					0.50			SPT N = 4 Depth: 1.00m Type: Raymond Split Spoon 1, 1 / 1, 1, 1	Gravel
		Sandy SILT; black. Very soft to soft; moist; low plasticity; sand, fine. becoming grey with brown mottling below 0.9 m	21.77					1.00				Bentonite
		becoming dark grey; sand becoming fine to medium below 2.5 m	20.27		M	S		2.50			SPT N = 3 Depth: 2.50m Type: Raymond Split Spoon 1, 1 / 1, 0, 1, 1	
		some organic material, rootlets, below 4.0 m	18.62	ML				3.00				
		SILT with some organic material; grey. Very soft; wet; low plasticity.	17.27		M-W	VS		4.00			SPT N = 4 Depth: 4.00m Type: Raymond Split Spoon 0, 1 / 0, 1, 1, 2	
		Sandy SILT; grey. Stiff, moist; low plasticity; sand, fine to medium.	16.57		M	St		5.00				
		Sandy fine to coarse GRAVEL with trace silt; brownish grey. Medium dense to dense; moist to wet; well graded; subrounded to subangular; sand, fine to medium.	9.32					6.00			SPT N = 1 Depth: 5.50m Type: Raymond Split Spoon 0, 0 / 0, 0, 0, 1	Gravel
								7.00				
								7.50			SPT N = 13 Depth: 7.00m Type: Raymond Split Spoon 2, 2 / 3, 3, 3, 4	
								8.00				
								8.50			SPT N = 34 Depth: 8.50m Type: Raymond Split Spoon 9, 8 / 7, 8, 11, 8	
								9.00				
								9.50			SPT N = 21 Depth: 10.00m Type: Raymond Split Spoon 7, 8 / 5, 6, 5, 5	
								10.00				
								10.50			SPT N = 41 Depth: 11.50m Type: Raymond Split Spoon 15, 12 / 13, 10, 11, 7	Bentonite
								11.00				
								11.50			SPT N = 38 Depth: 13.00m Type: Raymond Split Spoon 4, 10 / 10, 8, 13, 7	
								12.00				
								12.50			SPT N = 50+ Depth: 14.50m Type: Raymond Split Spoon	Gravel
								13.00				
								13.50				
								14.00				
								14.50				
EOH: 14.95 m												
8, 13 / 12, 12, 15, 13												
Driller Texco		Logger MK		Remarks Groundwater encountered at 1.4 m bgl during drilling.								
Drill Method / Rig Hans England / RT		Checked By KRB										
Start Date 10/09/2012		End Date 12/09/2012		Borehole logged in accordance with NZGS guideline "Field description of soil and rock" 2005 Vane tests completed in accordance with NZGS guideline								
Hole Depth 14.95m												
Page 1 of 1												



FILL



CLAY (CL, CI or CH)



GRAVEL (GP or GW)



ORGANIC SOILS (OL or OH or Pt)



SAND (SP or SW)



COBBLES or BOULDERS



SILT (ML or MH)

CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil and Rock is classified and described in Reports of Boreholes and Test Pits using the descriptions given in NZGS 2005 Field Description of Soil and Rock. The material properties are assessed by visual/tactile methods.

PARTICLE SIZE – NZGS 2005

Major Division	Sub Division	Particle Size
BOULDERS		>200 mm
COBBLES		60 to 200 mm
GRAVEL	Coarse	20 to 60 mm
	Medium	6.0 to 20 mm
	Fine	2.0 to 6.0 mm
SAND	Coarse	0.6 to 2.0 mm
	Medium	0.2 to 0.6 mm
	Fine	0.06 to 0.2 mm
SILT		0.002 to 0.006 mm
CLAY		< 0.002 mm

MOISTURE CONDITION – NZGS 2005

Symbol Term Description

D	Dry	Sands and gravels are free flowing. Clays and silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in the dry condition and may feel cool. Sands and gravels tend to cohere.
W	Wet	Soils exude free water. Sands and gravels tend to cohere.
S	Saturated	Feels cool, darkened in colour and free water is present on the sample.

CONSISTENCY AND DENSITY – NZGS 2005

Symbol	Term	Undrained Shear Strength
VS	Very Soft	< 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa
H	Hard	> 200 kPa

Symbol	Term	Density Index %	SPT "N" Value (blows/300 mm)	Dynamic Cone (blows/300 mm)
VL	Very Loose	< 15	< 4	< 2
L	Loose	15 to 35	4 to 10	1 to 3
MD	Medium Dense	35 to 65	10 to 30	3 to 7
D	Dense	65 to 85	30 to 50	7 to 17
VD	Very Dense	> 85	> 50	> 17

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material.

SPT "N-Values" are uncorrected.

No correlation is implied between Standard Penetration Test (SPT) and Dynamic Cone Penetrometer Test values.



EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED IN BOREHOLE AND TEST PIT REPORTS

DRILLING/EXCAVATION METHOD

AS*	Auger Screwing	RD	Rotary Blade or Drag Bit	NQ	Diamond Core – 47 mm
AD*	Auger Drilling	RT	Rotary Tricone bit	NMLC	Diamond Core – 52 mm
*V	V-Bit	RAB	Rotary Air Blast	HQ	Diamond Core – 63 mm
*T	TC-Bit, e.g. ADT	RC	Reverse Circulation	HMLC	Diamond Core – 63 mm
HA	Hand Auger	PT	Push Tube	BH	Tractor Mounted Backhoe
ADH	Hollow Auger	CT	Cable Tool Rig	EX	Tracked Hydraulic Excavator
DTC	Diatube Coring	NDD	Non-Destructive Digging	EE	Existing Excavation
WB	Washbore or Bailer	SON	Sonic Drilling	HAND	Excavated by Hand Methods

WATER



Water level at date shown

GROUNDWATER NOT OBSERVED The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.

GROUNDWATER NOT ENCOUNTERED The borehole/test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.

SAMPLING AND TESTING

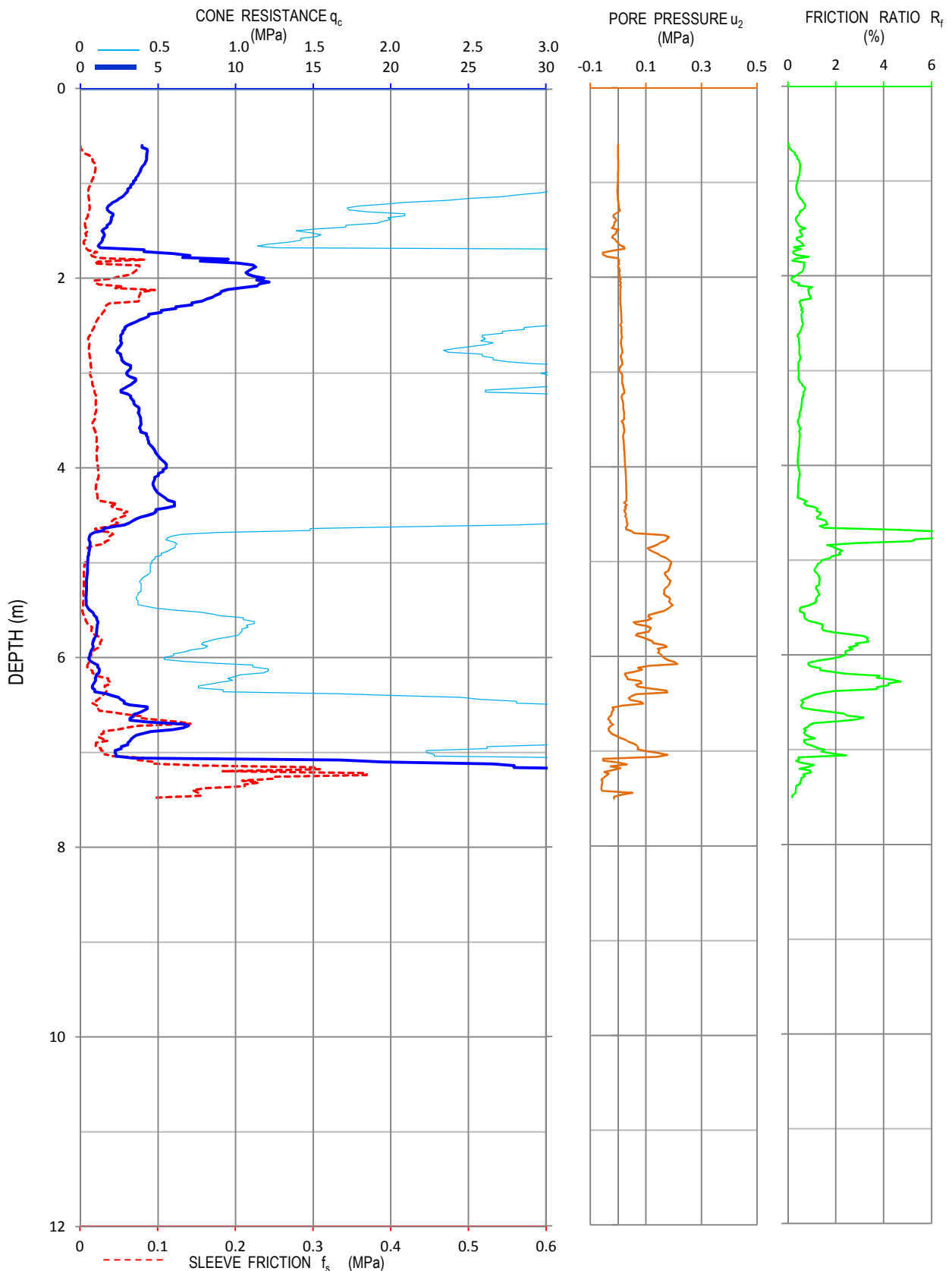
SPT	Standard Penetration Test to NZS4402 Test 6.5.1:1998
2,3 / 3,4,4,4	2,3 / 3,4,4,4 = Blows per 75 mm.
N = 15	N = Blows per 300 mm penetration following 150 mm seating
30/60 mm	Where practical refusal occurs, the blows and penetration for that interval are reported
RW	Penetration occurred under rod weight only
HW	Penetration occurred under the hammer and rod weight only
HB	Hammer double bouncing on anvil
DS	Disturbed sample
BDS	Bulk disturbed sample
G	Gas sample
W	Water sample
FP	Field permeability test over section noted
FV	Field vane shear test expressed as uncorrected shear strength s_v = peak value, s_r = residual value
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket penetrometer test expressed as instrument reading in kPa
U50	Thin walled tube sample – number indicates nominal sample diameter in millimetres
WPT	Water pressure tests
DCP	Dynamic cone penetration test
CPT	Static cone penetration test
CPTu	Static cone penetration test with pore pressure (u) measurement

CORE RECOVERY

TCR = Total Core Recovery (%)

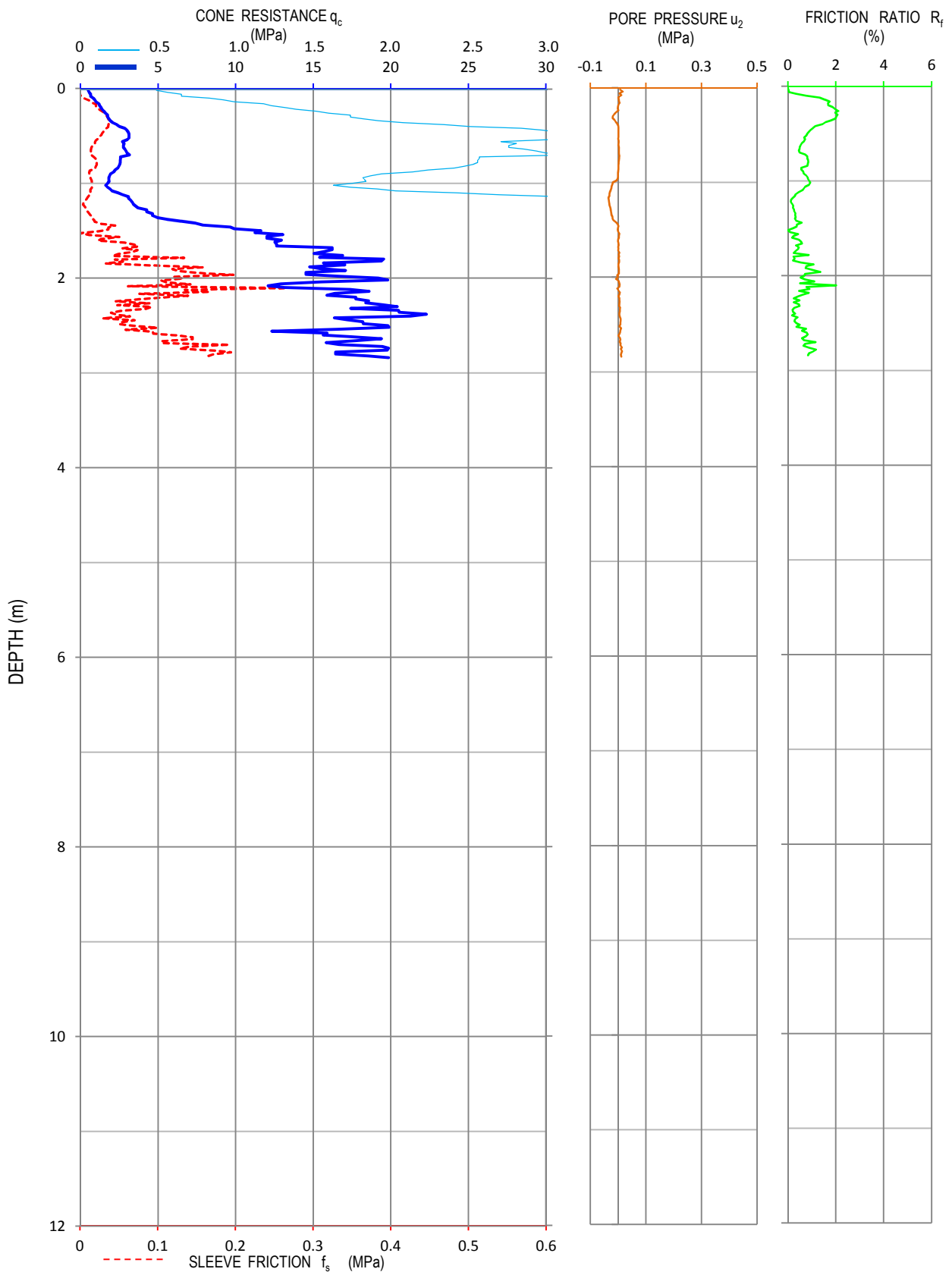
= $\frac{\text{Length of core recovered}}{\text{Length of core run}} \times 100$

CLIENT:	Arrow International Limited	COORDS:	1564311 m E	5174717 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.2 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	30/07/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	7.5 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



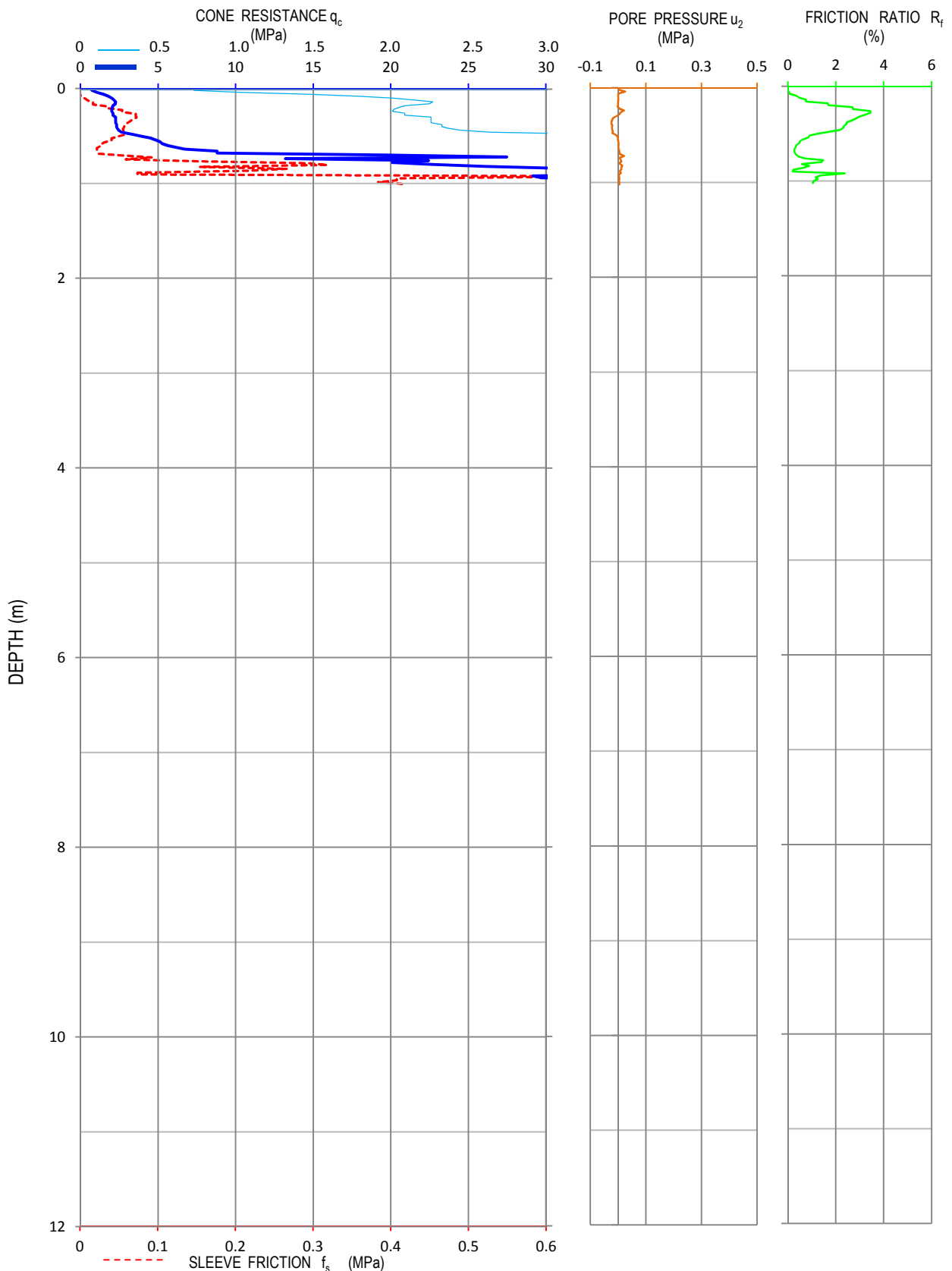
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564301 m E	5174733 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.3 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	30/07/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	2.8 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



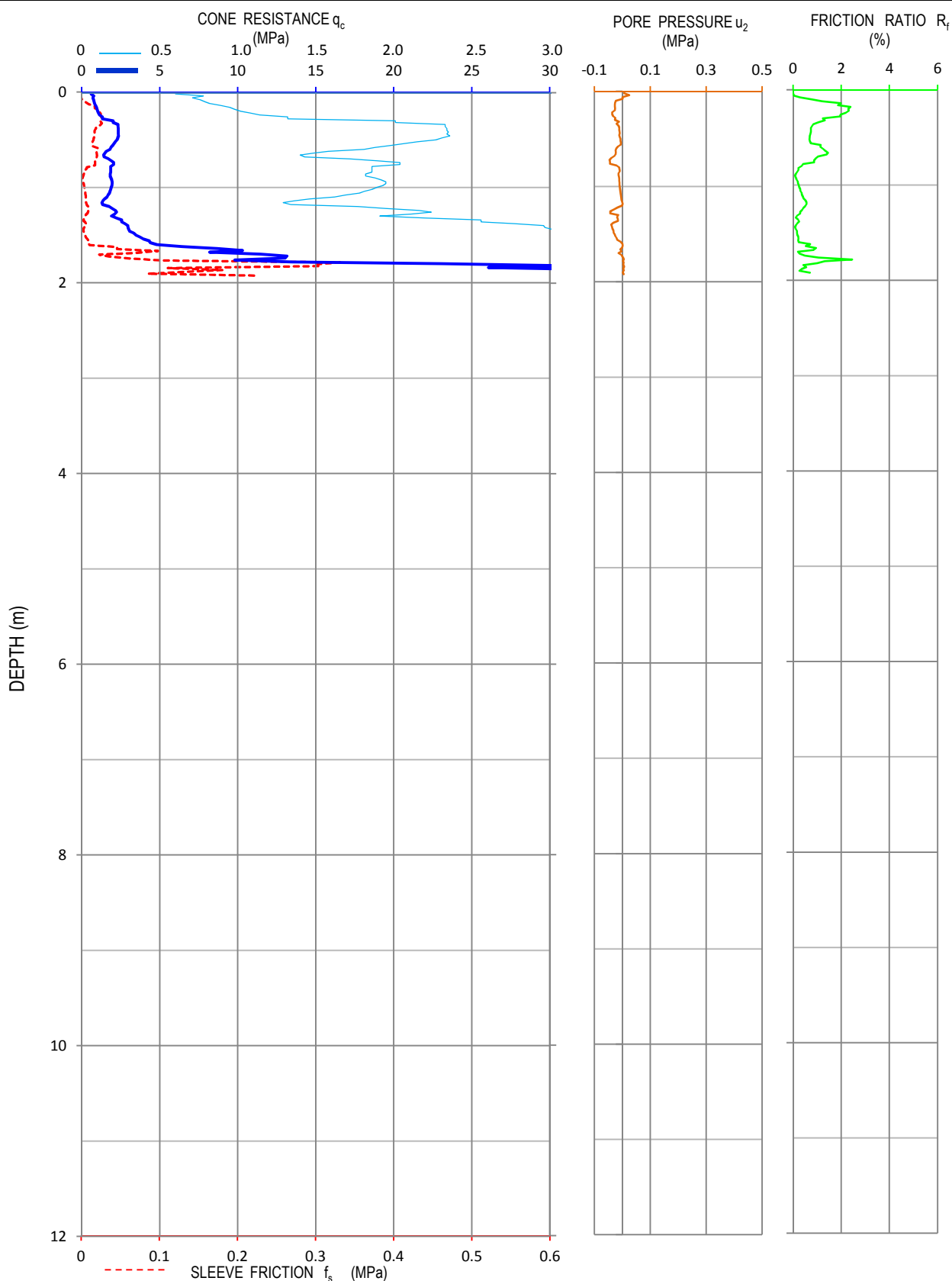
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564339 m E	5174717 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.2 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	30/07/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	1.0 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



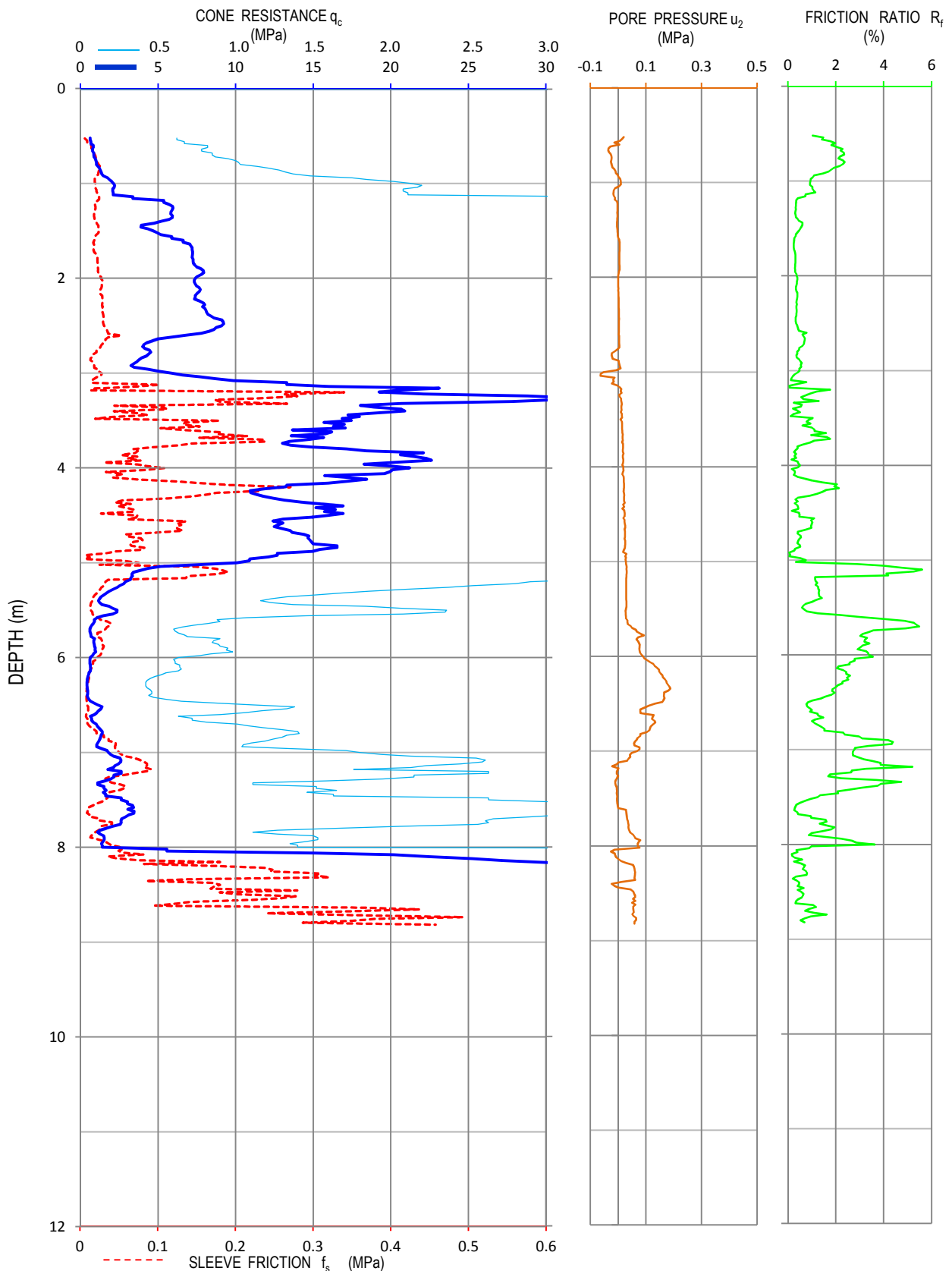
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564341 m E	5174707 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.0 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	30/07/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	1.9 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



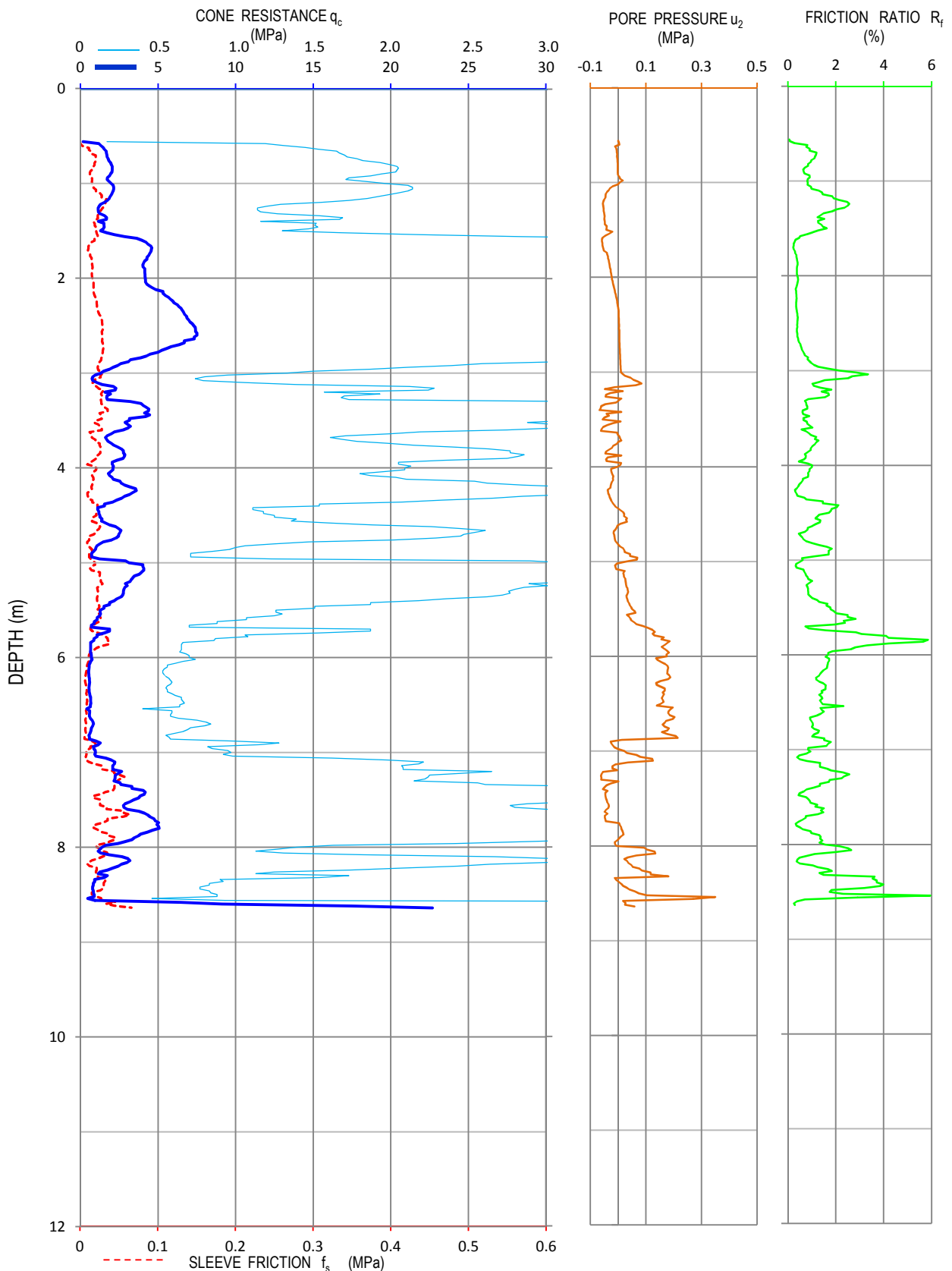
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564258 m E	5174710 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.9 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	31/07/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.8 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



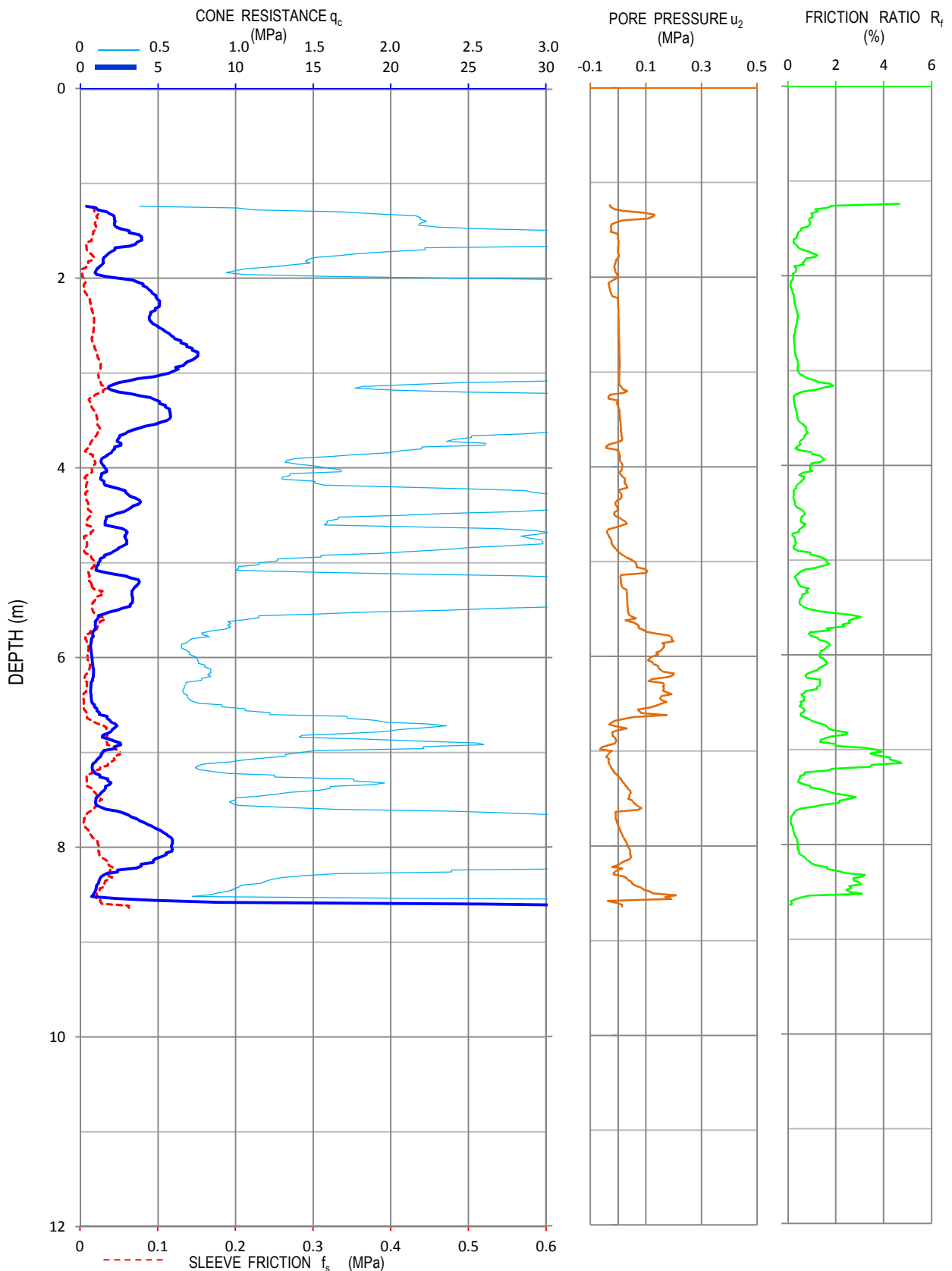
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564233 m E	5174707 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	25 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	31/07/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.6 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



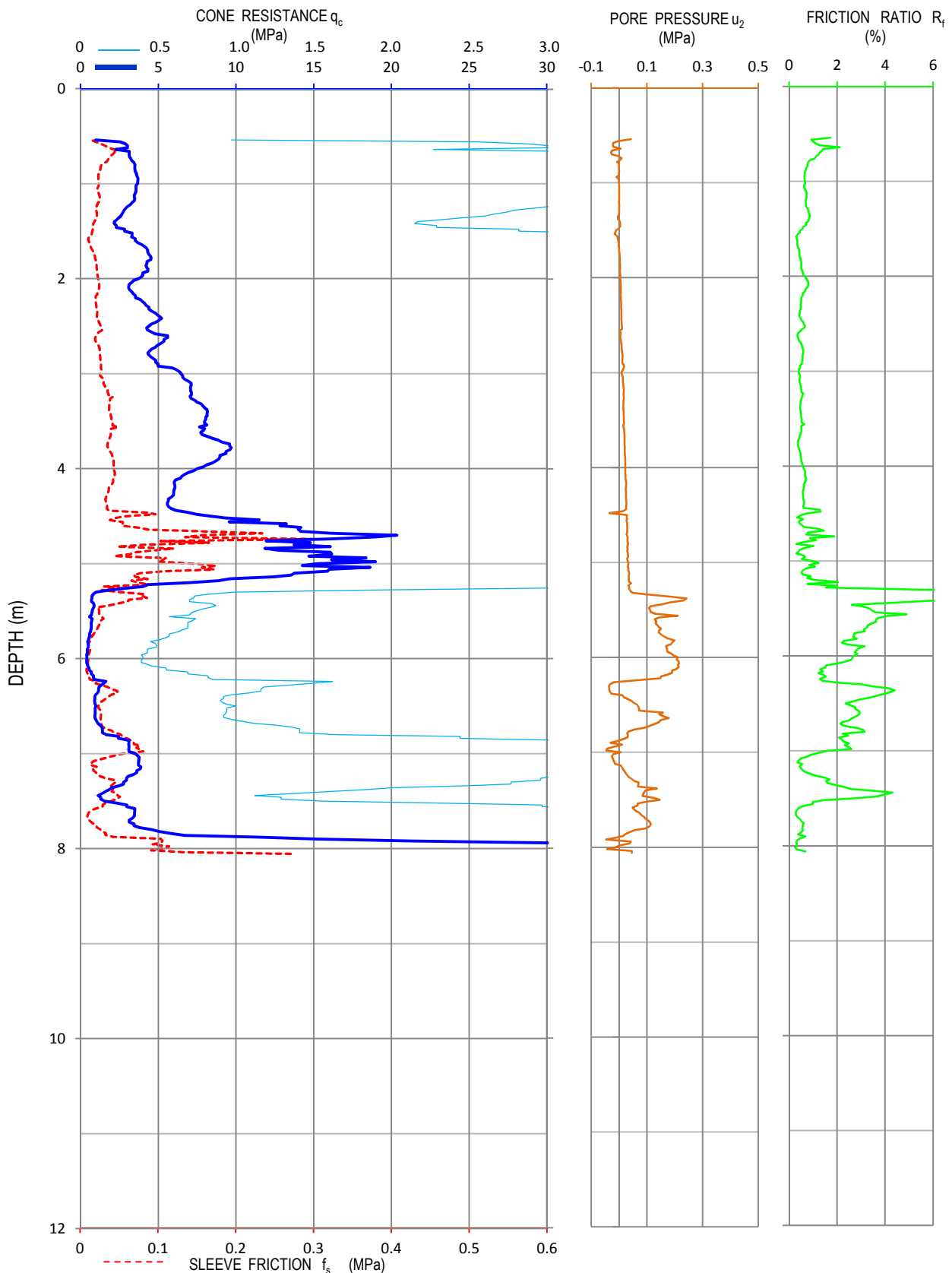
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564240 m E	5174688 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.2 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	31/07/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.6 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



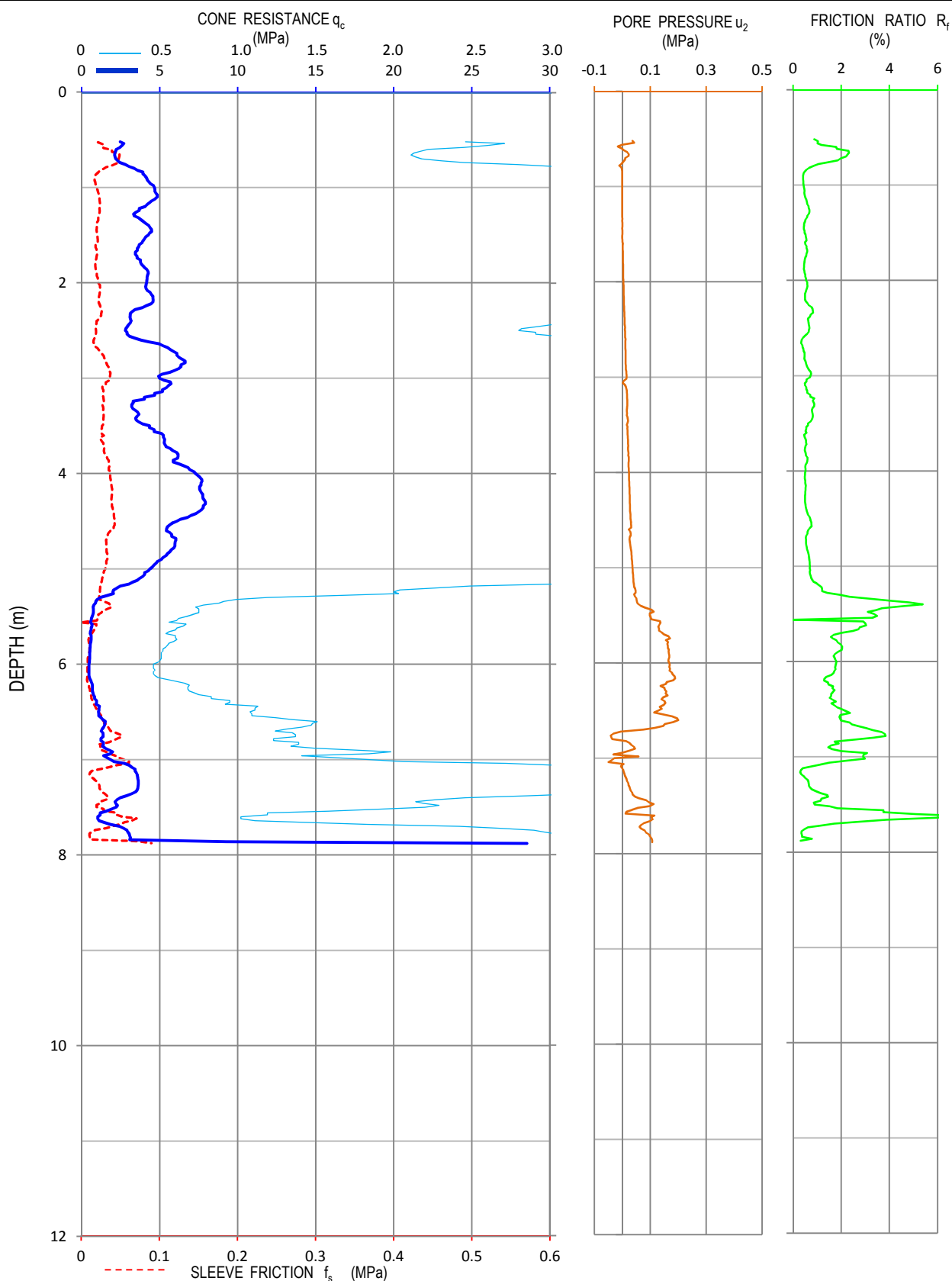
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564292 m E	5174681 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.6 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	1/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.1 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



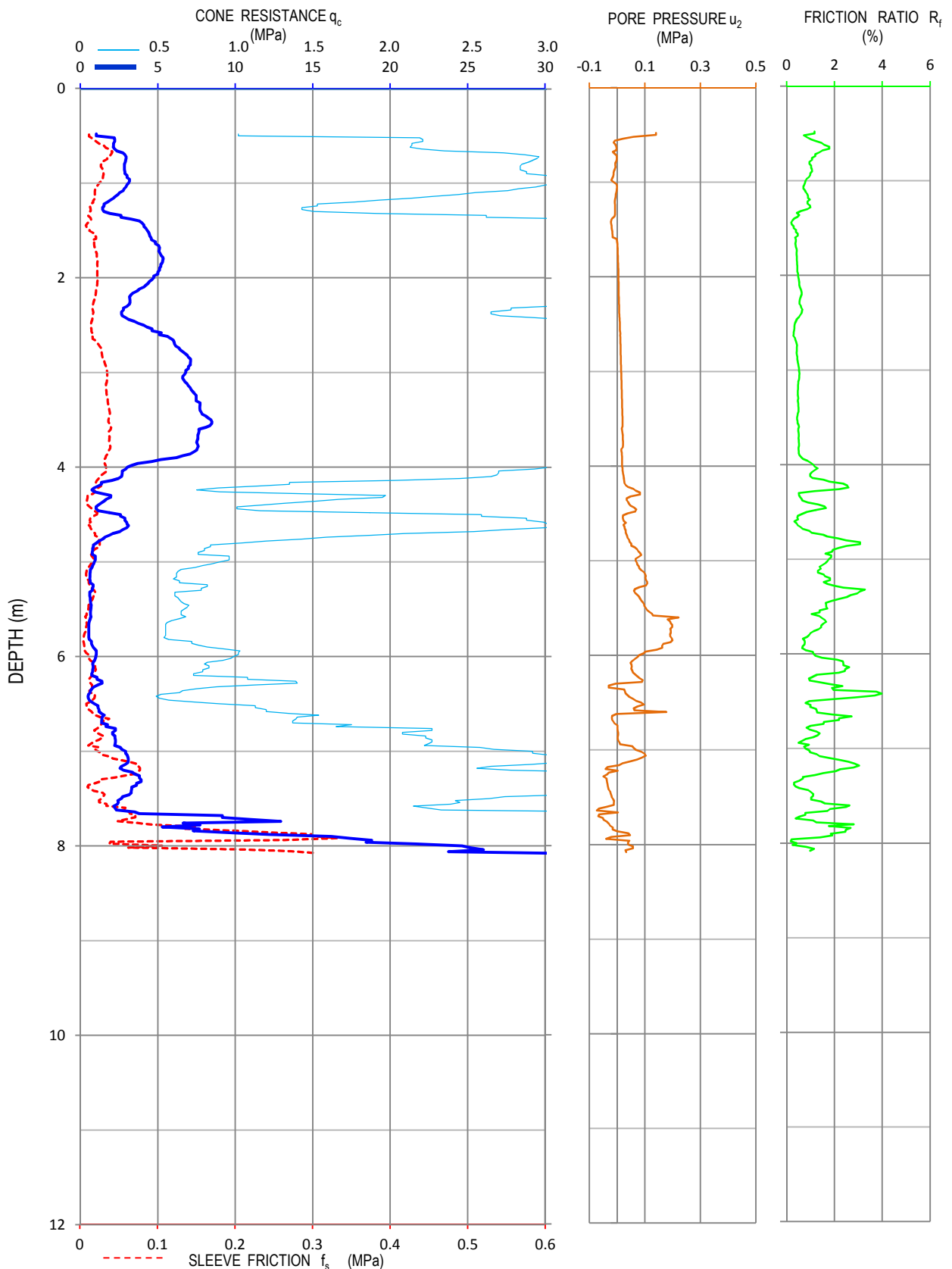
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564281 m E	5174670 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.6 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	1/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	7.9 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



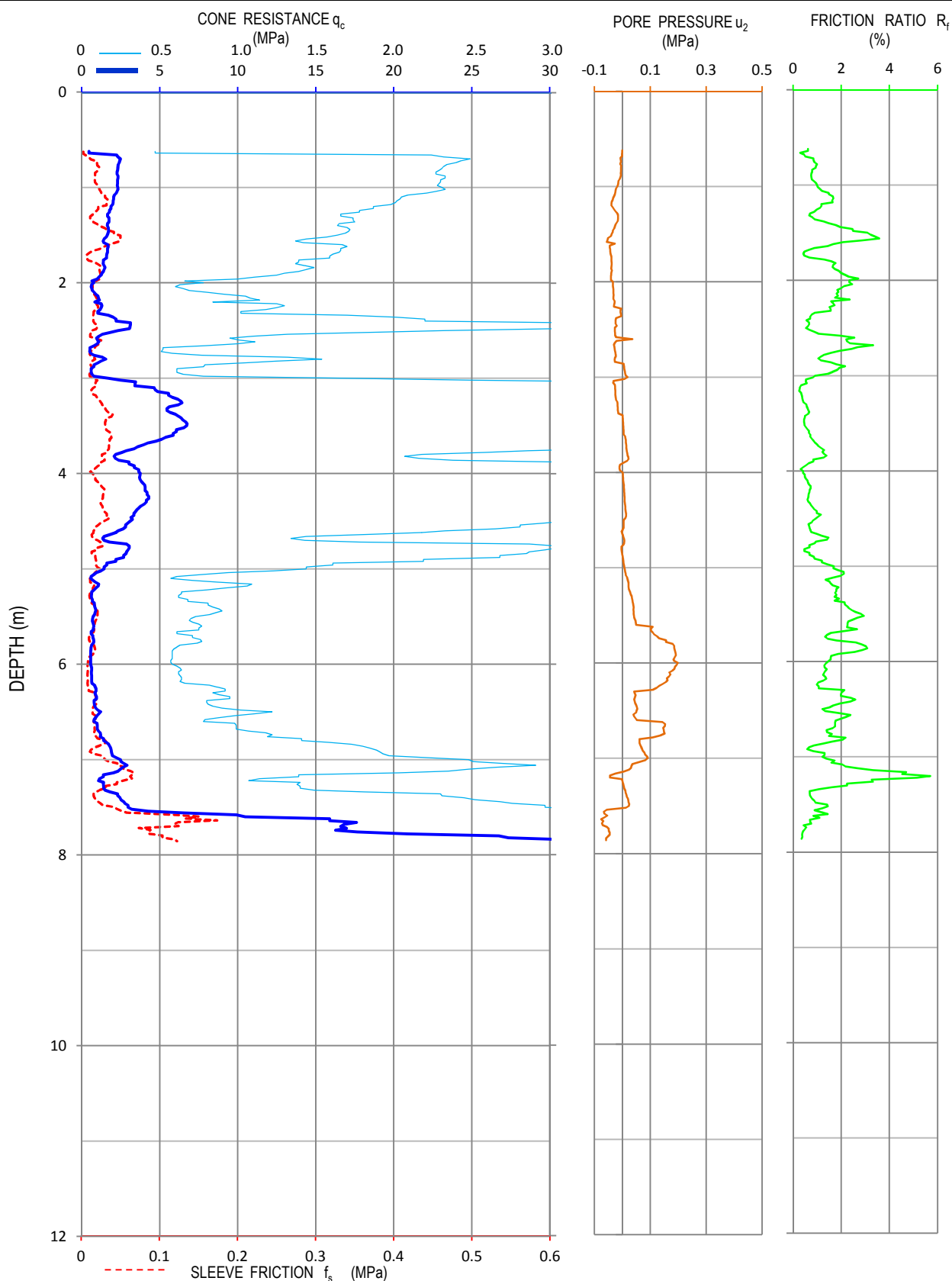
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564270 m E	5174662 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.6 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	1/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.1 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



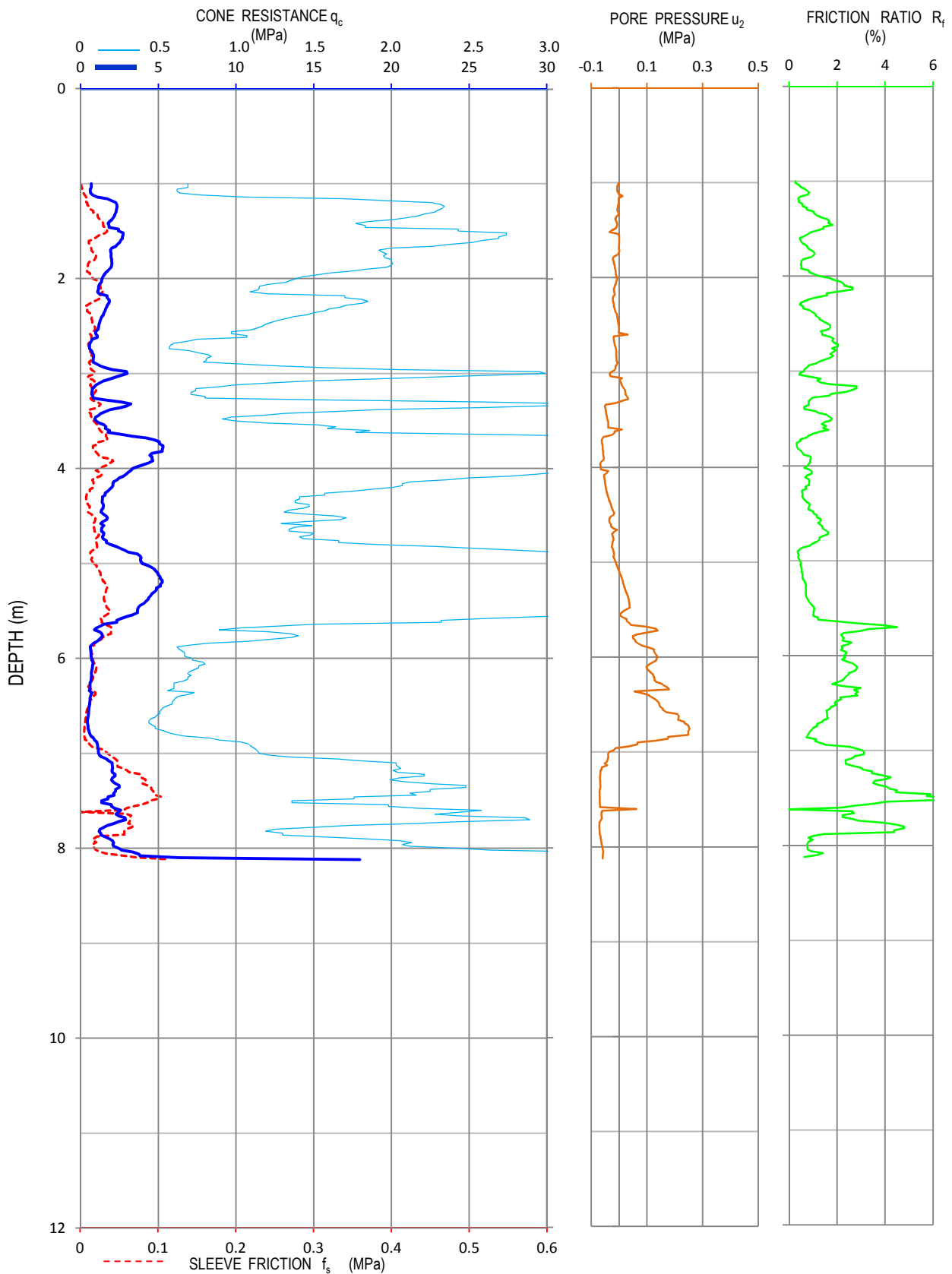
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564283 m E	5174652 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.4 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	1/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	7.9 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



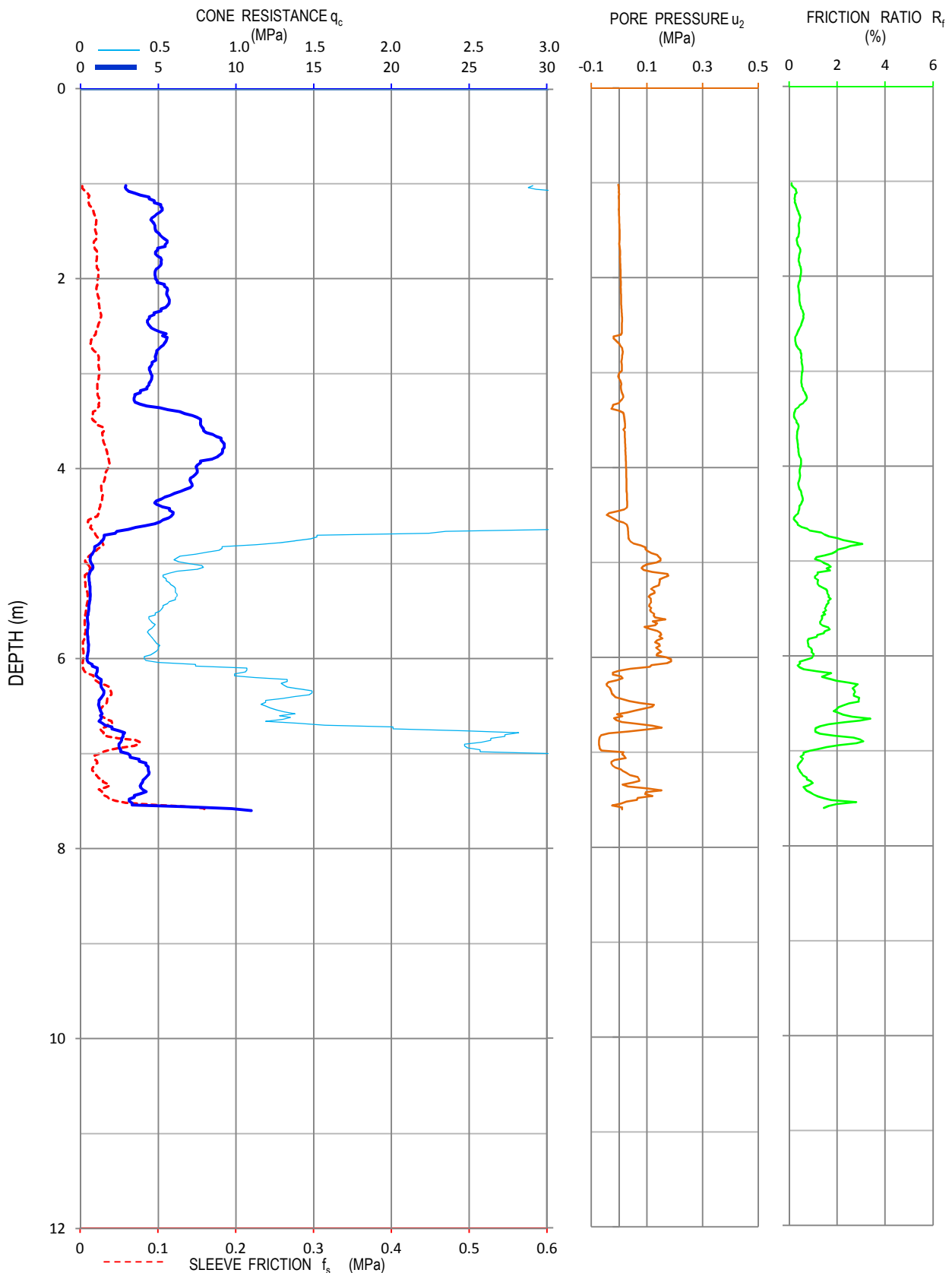
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564302 m E	5174645 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	25.1 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	6/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.1 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



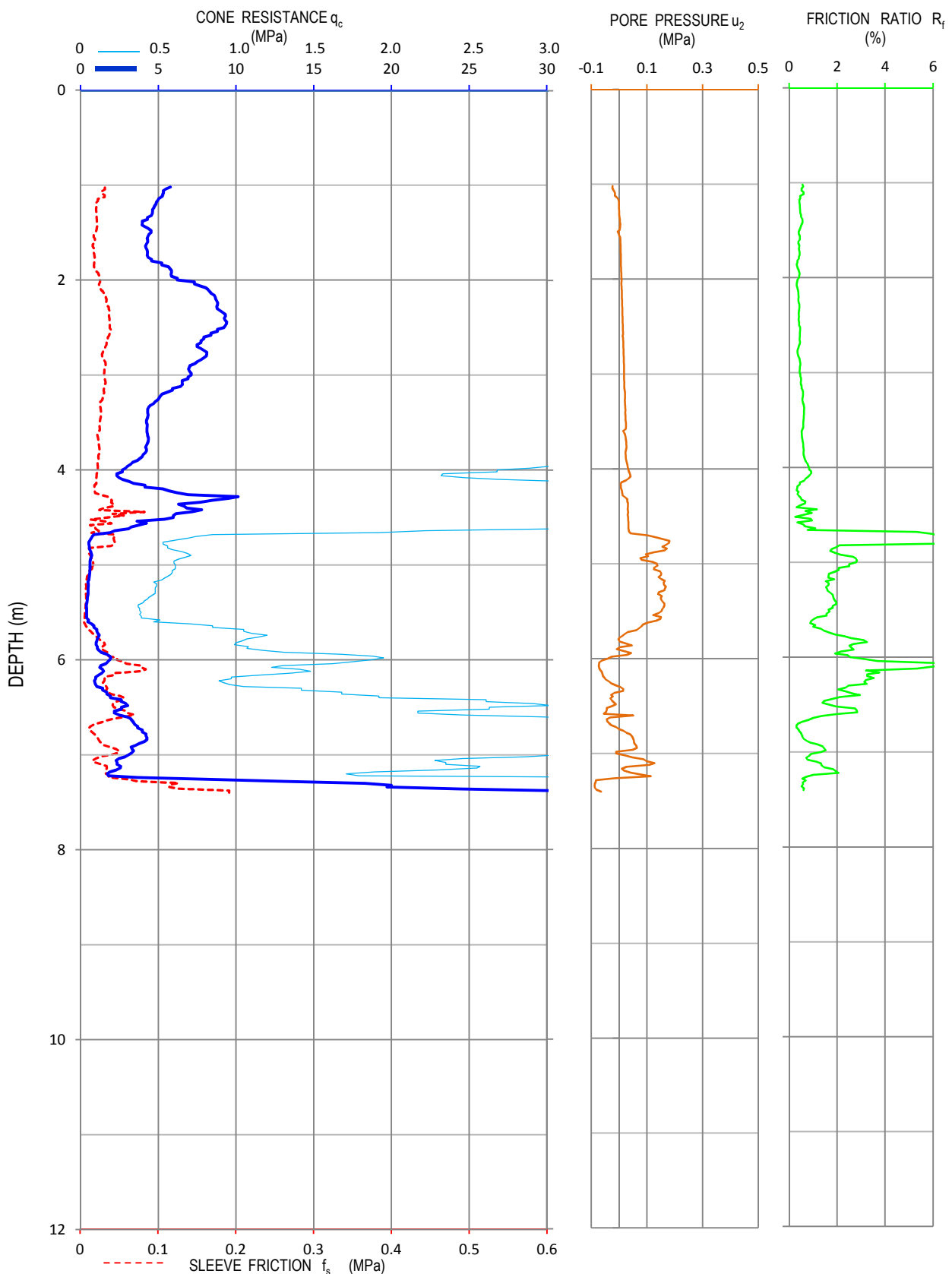
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564324 m E	5174650 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.4 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	6/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	7.6 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



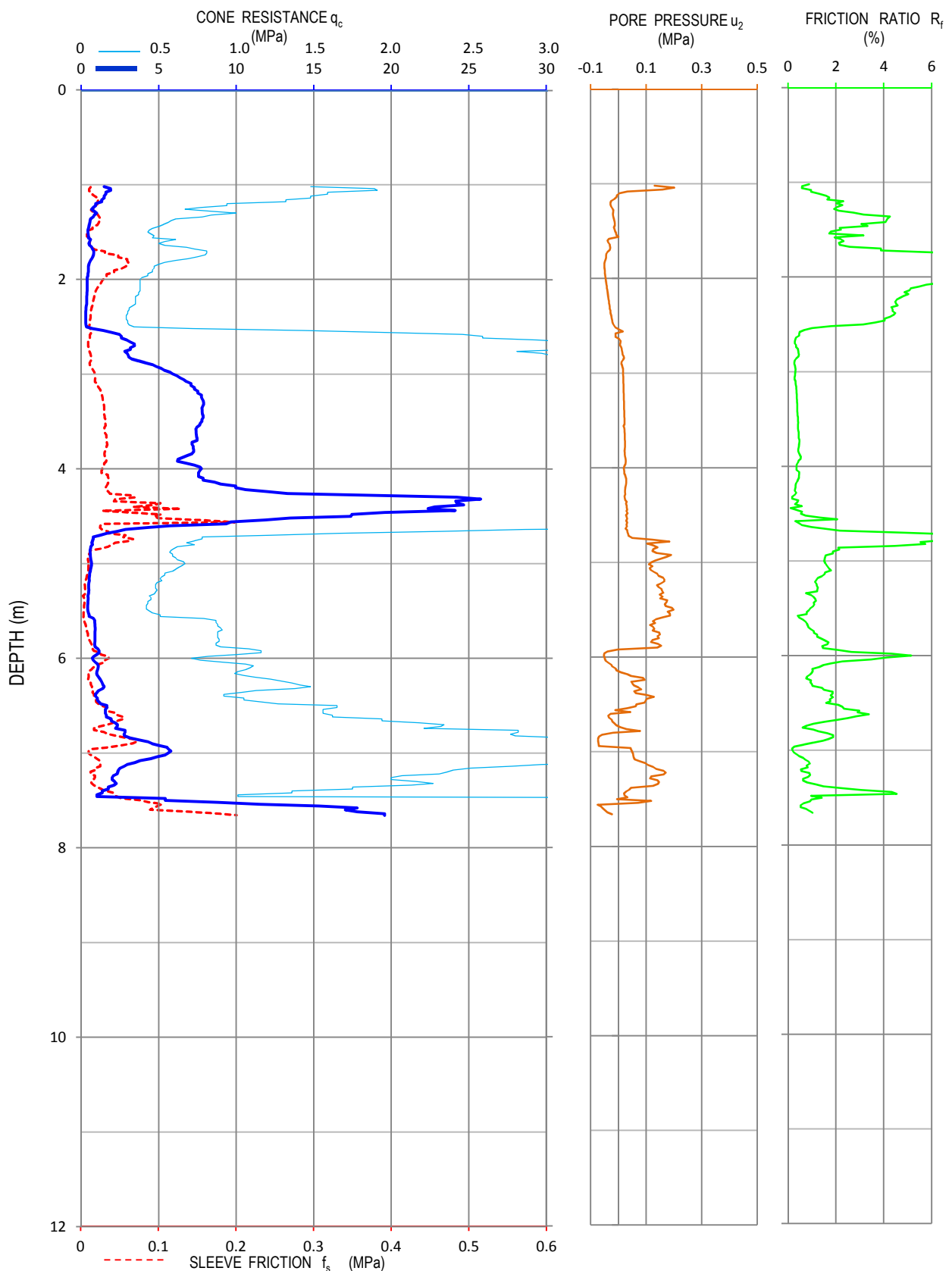
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564330 m E	5174679 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.0 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	6/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	7.4 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



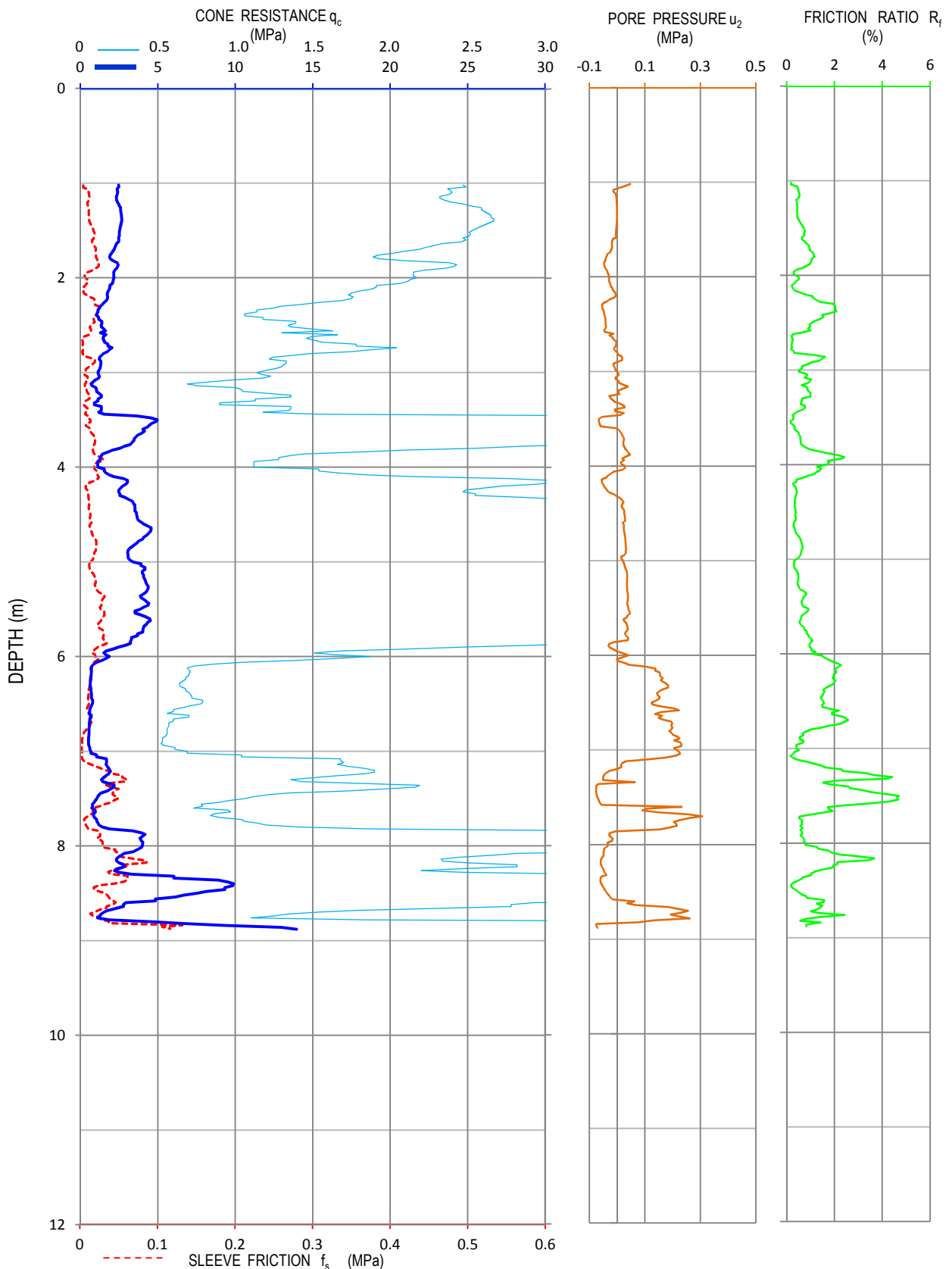
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564334 m E	5174688 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.2 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	6/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	7.7 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



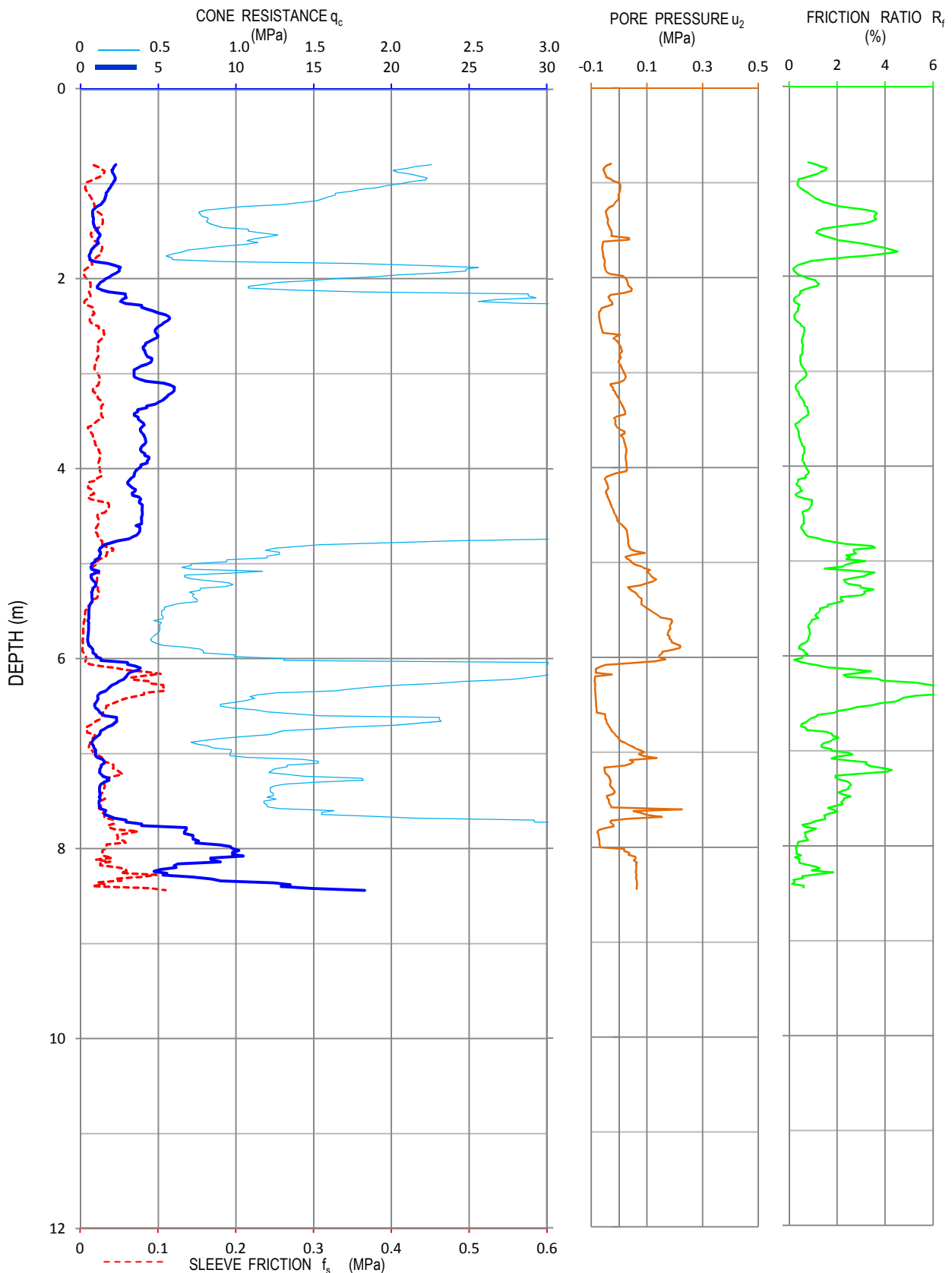
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564338 m E	5174624 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	25.3 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	7/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.9 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



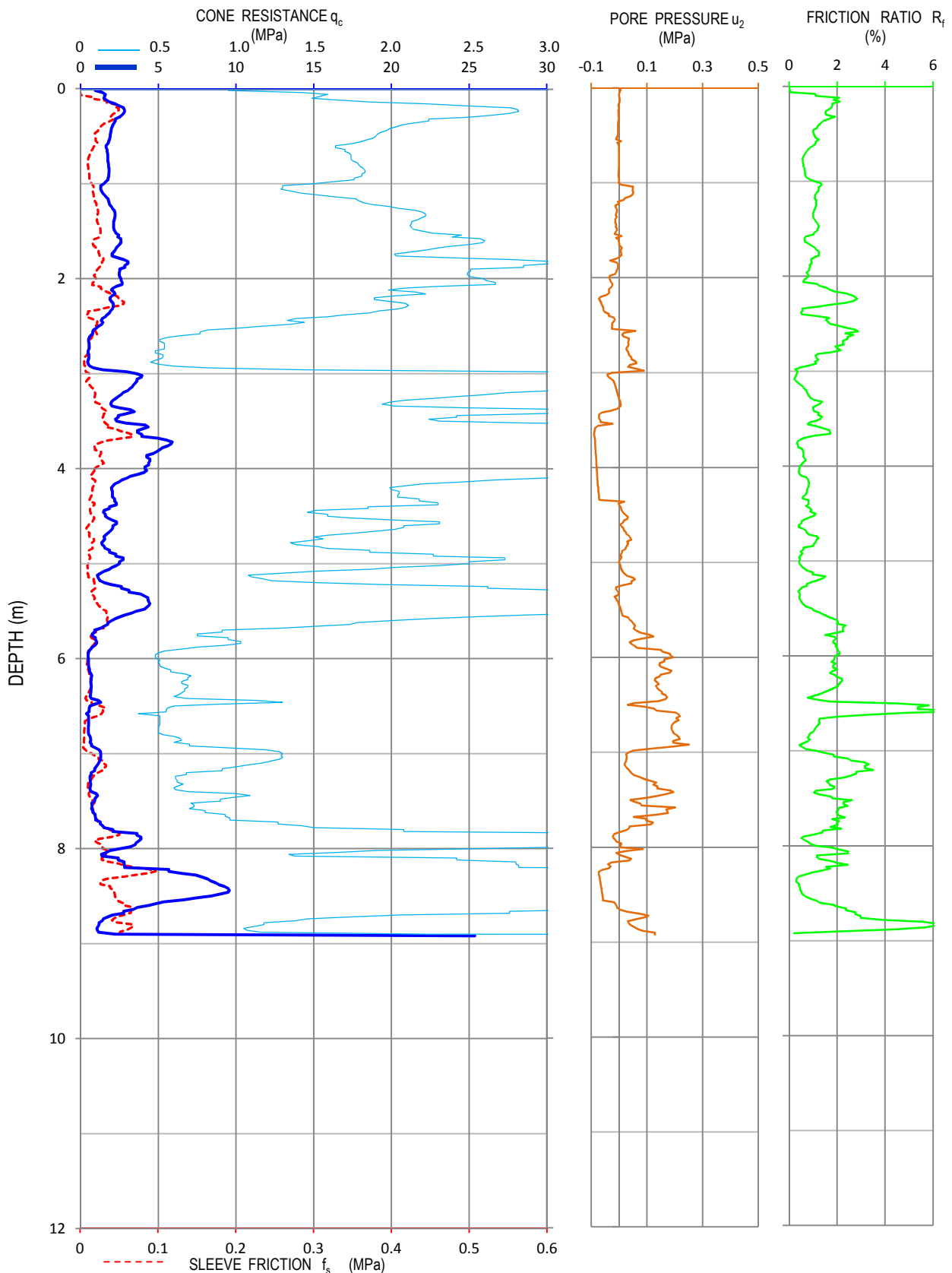
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564373 m E	5174650 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.5 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	7/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.4 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



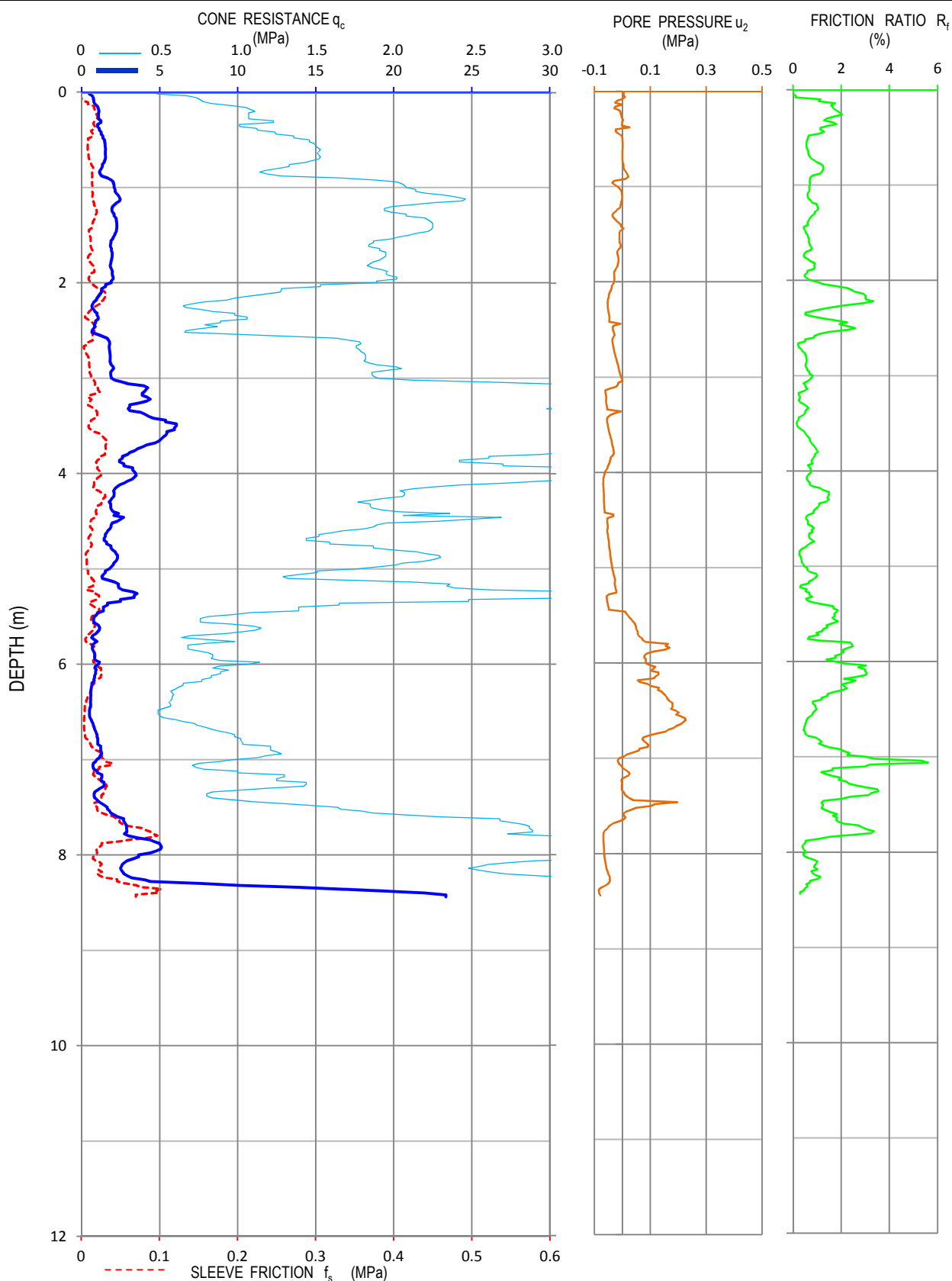
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564359 m E	5174618 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	25.3 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	7/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.9 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



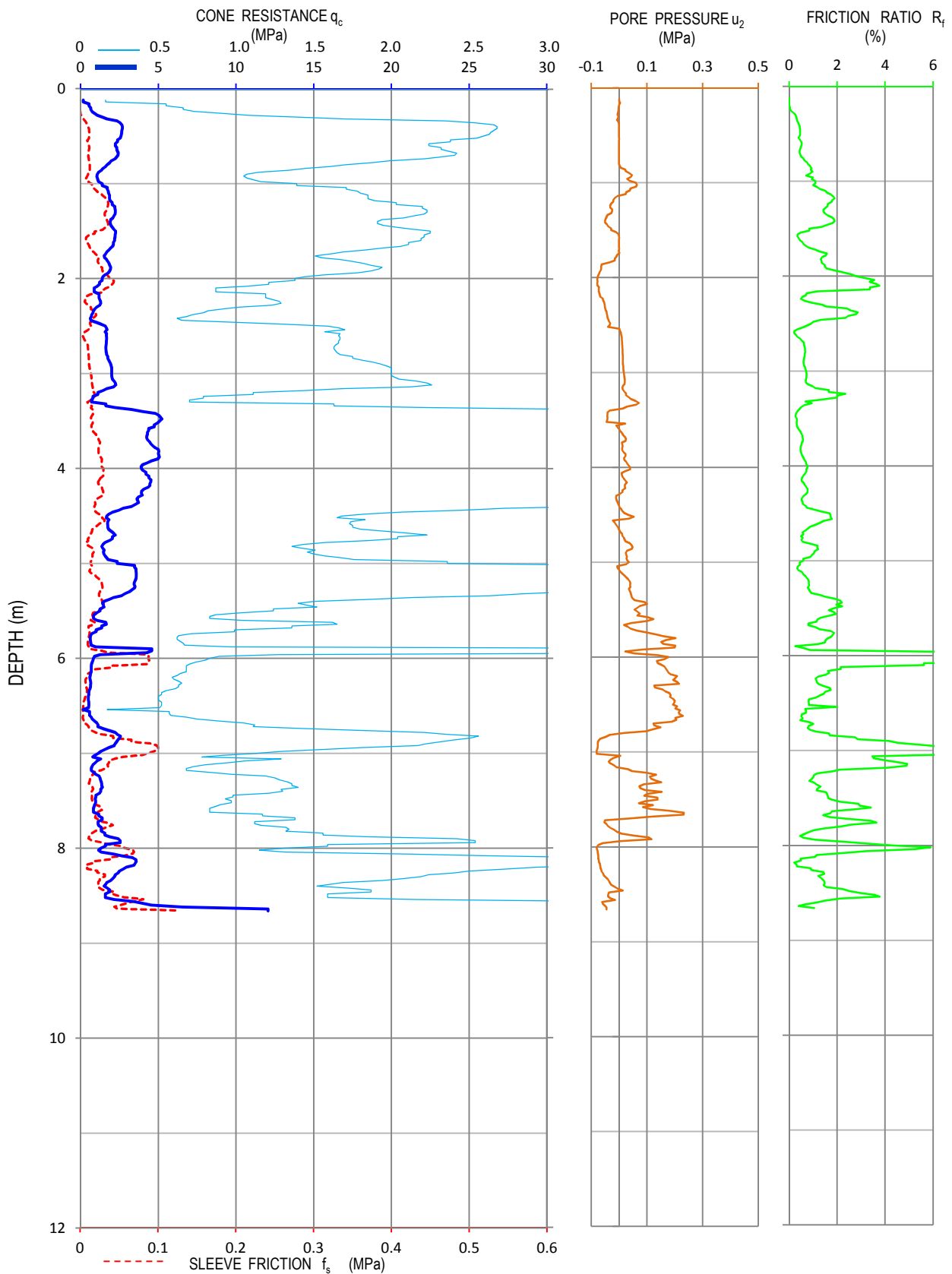
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564371 m E	5174626 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	25.1 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	7/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.4 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



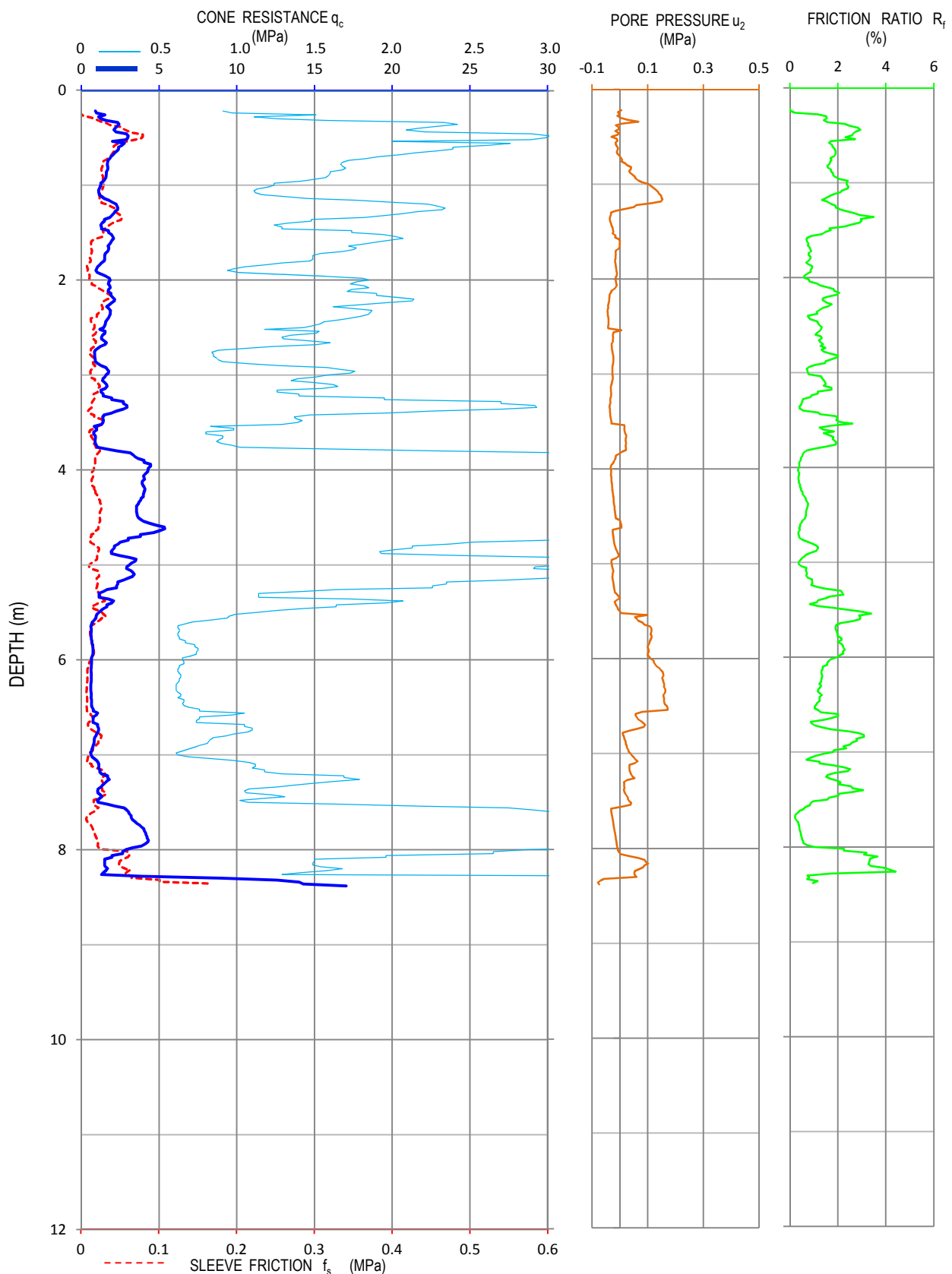
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564395 m E	5174628 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	25.1 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	8/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.7 m	CONTRACTOR:	Golder
				CONE ID:	4469
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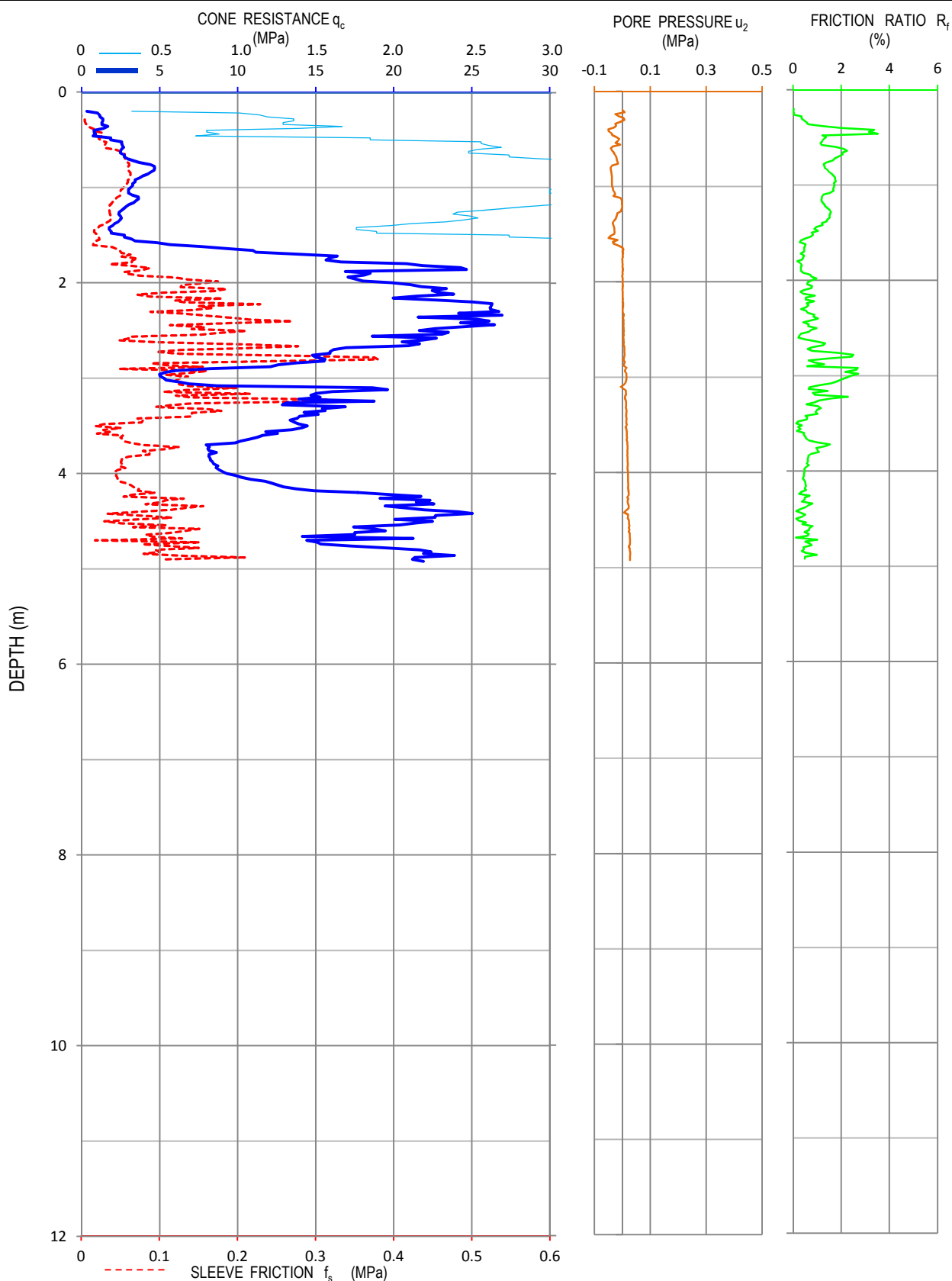
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564252 m E	5174674 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	25.0 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	8/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.4 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



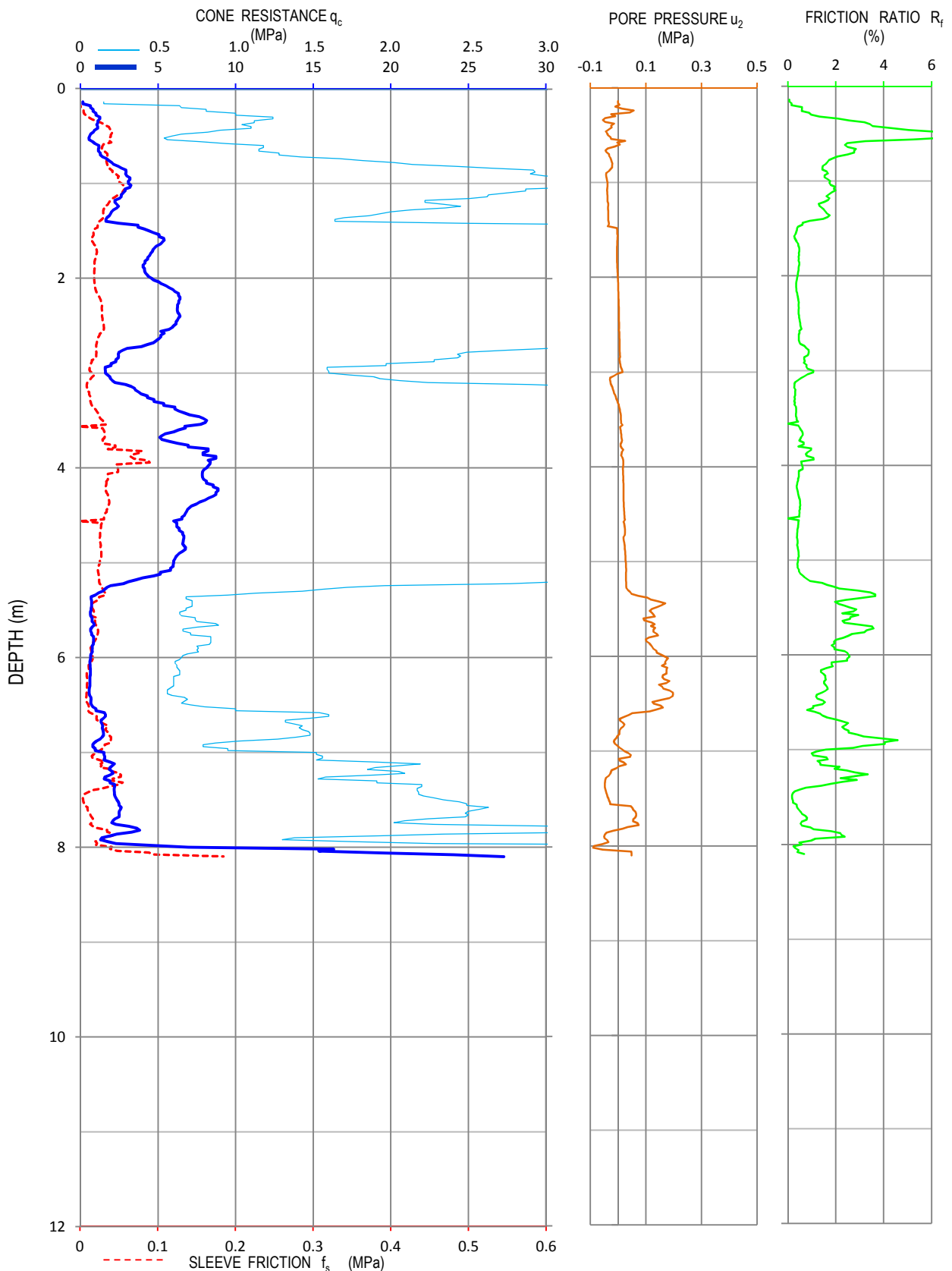
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564274 m E	5174693 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.9 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	8/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	4.9 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

CLIENT:	Arrow International Limited	COORDS:	1564246 m E	5174716 m N	NZTM Z59
PROJECT:	Earthquake Reconstruction Project	SURFACE RL:	24.9 m	DATUM:	CDD
LOCATION:	Halswell Group of Houses	INCLINATION:	-90°	DATE TESTED:	8/08/2012
JOB NUMBER:	1078102455_1660	HOLE DEPTH:	8.1 m	CONTRACTOR:	Golder
				CONE ID:	4469
				CHECKED BY:	KRB



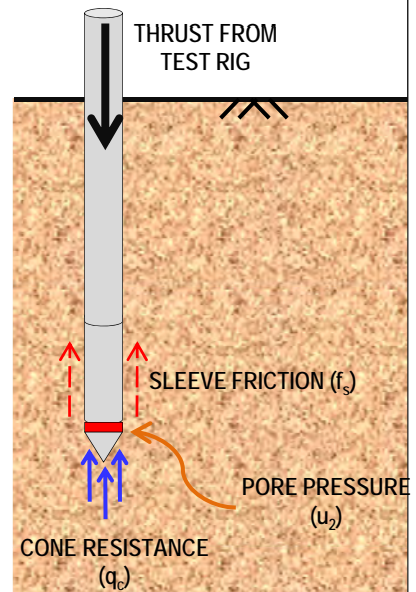
This report of piezo-cone probe must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.



EXPLANATION OF TEST METHOD, ABBREVIATIONS & TERMS USED ON FRICTION-CONE & PIEZO-CONE PROBE REPORTS

FRICTION-CONE PENETRATION TEST (CPT) / PIEZO-CONE PENETRATION TEST (CPTu)

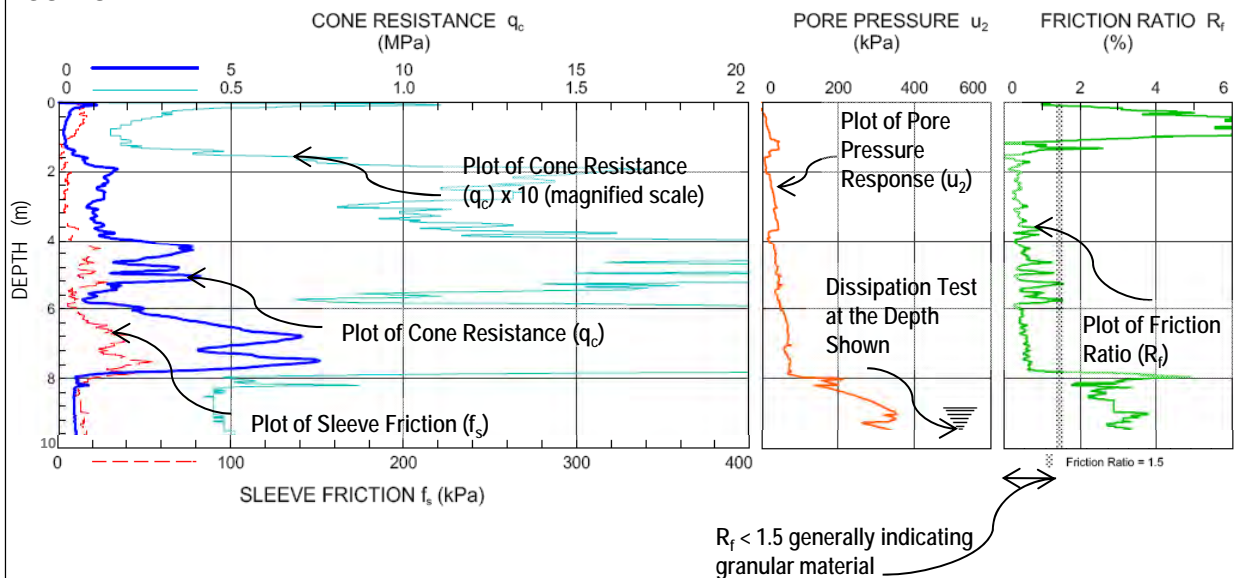
The Friction-Cone Penetration Test (CPT) uses a cone with a following friction sleeve that is fitted with electronic strain and pressure transducers and which is pushed into soil at a constant rate of 1 to 2 cm/s (in accordance with AS1289.6.5.1-1999). The readout from the cone and friction sleeve load cells provide a continuous trace of cone resistance (q_c), and sleeve friction (f_s). If a filter element is incorporated with the cone to measure the pore pressure response (u) as the cone is pushed into the soil, this is referred to as a Piezo-Cone Penetration Test (CPTu). The data obtained from the cone, friction sleeve load cells and pore pressure transducer is transmitted to a computer for data processing and presentation. Traditionally the data is transferred to the surface via a cable that is run inside hollow stem push rods typically 35.7 mm in outside diameter. However data can also be transmitted to the surface via an acoustic signal along the metal rod string and negating the need for a cable connection. This device is referred to as an acoustic cone or acoustic piezo-cone.



The measured values of q_c , f_s and u can be interpreted to assess soil stratigraphy, strength and deformation characteristics. These characteristics may be interpreted using published methods such as outlined in *Cone Penetration Testing in Geotechnical Practice* (Lunne et al 1997).

Dissipation tests can be undertaken during a CPTu by halting the push at a selected depth and measuring the rate of decay in the pore pressure generated. As the cone is stationary, the pore pressure will dissipate to the *in situ* hydrostatic pore pressure. By recording and plotting this rate of dissipation, a measure of the horizontal permeability and consolidation characteristics of the soil can then be inferred.

OUTPUT EXAMPLE



SYMBOLS

q_c — Measured Cone Resistance
 f_s — Sleeve Friction
 u_2 — Pore Pressure
 R_f — Friction Ratio = $\frac{\text{Sleeve Friction} \times 100}{\text{Cone Resistance}}$
 $= \frac{f_s \times 100}{q_c}$

q_t — Corrected Cone Resistance: $q_t = q_c + u_2 (1-a)$
 a — Area Ratio = $\frac{\text{Cross-Sectional Area of Cone Shaft}}{\text{Projected Area of Cone}}$
 u_1 — Pore Pressure Measured in Cone Tip
 u_2 — Pore Pressure Measured Behind the Cone



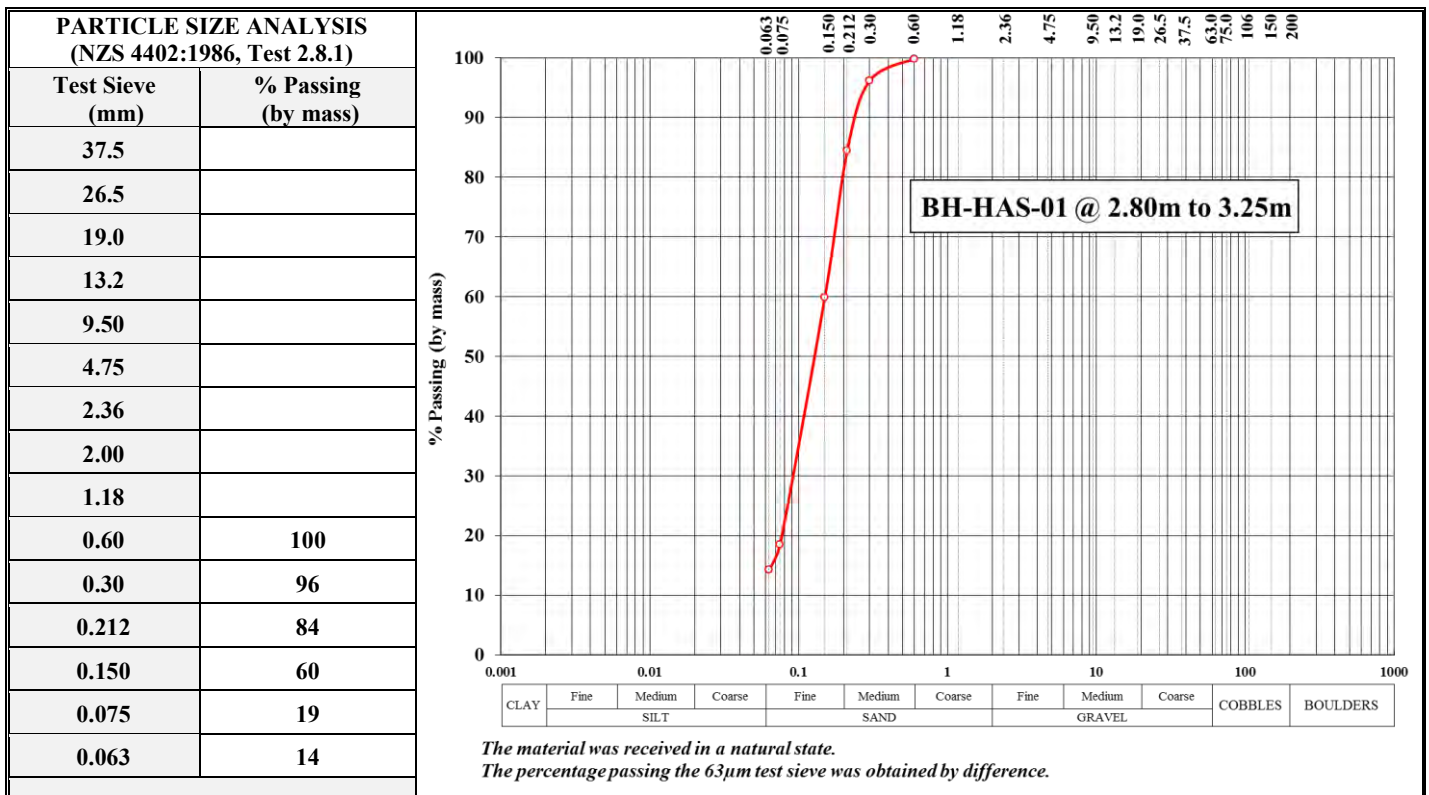
APPENDIX E

Laboratory Testing Results



TEST REPORT – HALSWELL ROAD INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	M. Furniss
Job Description:	Halswell Rd / Halswell Junction Rd – J/N 1078102455-1660	Sample Source:	BH-HAS-01 @ 2.80m to 3.25m
Sample Description:	SAND with some silt	Sampled By:	M. Furniss
Date & Time Sampled:	22-Aug-12 (Trial 134)	Sample Method:	Borehole



WATER CONTENT RESULT - NZS 4402:1986, Test 2.1

Water Content: (As Received)

26.1 %

Note: The sample received was in a natural state.

Note:

- IANZ endorsement of this report applies to the samples as received.
- IANZ endorsement of this report does not apply to the sample description.
- This report may not be reproduced except in full.

Tested By: P.R. Gibson

Date: 13 to 19-Sep-12

Transcriptions Checked By:

All tests reported
herein have been
performed in
accordance with
the laboratory's
scope of
accreditation





Central Testing Services

18 Ngapara Street, P.O. Box 397, ALEXANDRA, Central Otago, NZ
Telephone (03) 448 7644, Fax (03) 448 7401, Email alan.julius@xtra.co.nz

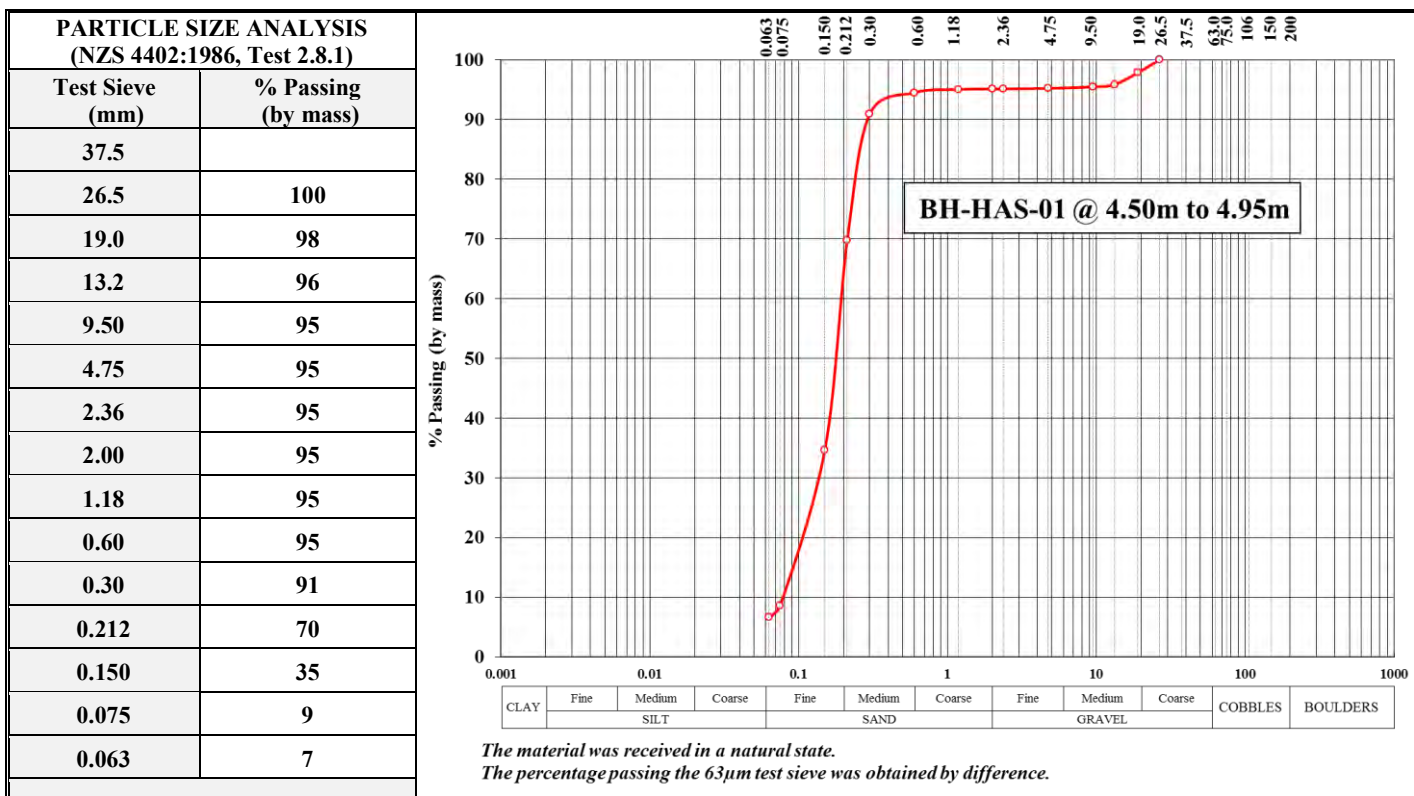
Page 2 of 10 Pages

Reference No: 12/1217

Date: 20 September 2012

TEST REPORT – HALSWELL ROAD INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	M. Furniss
Job Description:	Halswell Rd / Halswell Junction Rd – J/N 1078102455-1660	Sample Source:	BH-HAS-01 @ 4.50m to 4.95m
Sample Description:	SAND with minor silt and trace of / minor gravel	Sampled By:	M. Furniss
Date & Time Sampled:	22-Aug-12 (Trial 134)	Sample Method:	Borehole



WATER CONTENT RESULT - NZS 4402:1986, Test 2.1	
Water Content: (As Received)	25.0 %
Note: The sample received was in a natural state.	

Note:

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Tested By: P.R. Gibson

Date: 13 to 19-Sep-12

Transcriptions Checked By:

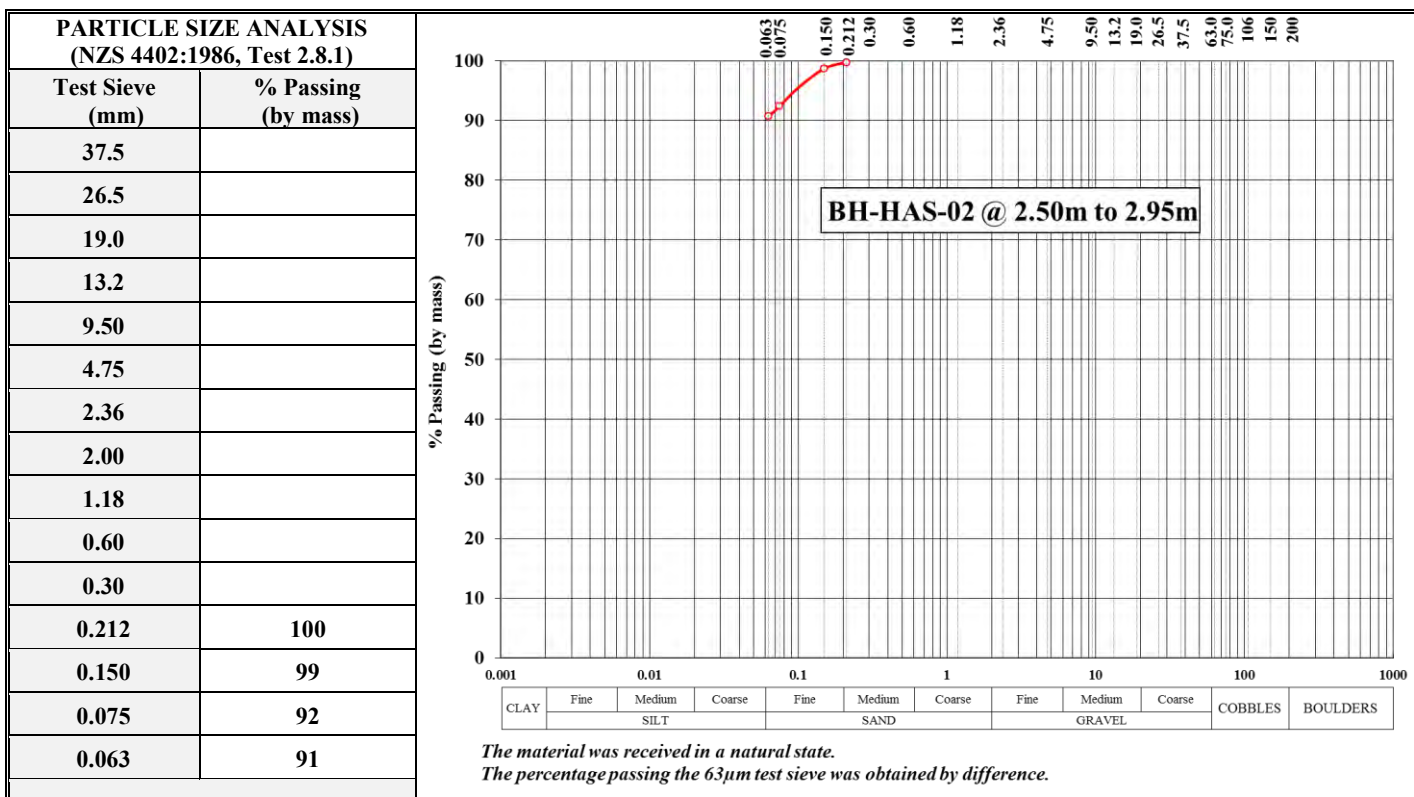
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accreditation





TEST REPORT – HALSWELL ROAD INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	M. Furniss
Job Description:	Halswell Rd / Halswell Junction Rd – J/N 1078102455-1660	Sample Source:	BH-HAS-02 @ 2.50m to 2.95m
Sample Description:	SILT with minor sand	Sampled By:	M. Furniss
Date & Time Sampled:	27-Aug-12 (Trial 132)	Sample Method:	Borehole



WATER CONTENT & PLASTICITY INDEX RESULTS - NZS 4402:1986, Test 2.1, 2.2, 2.3 & 2.4	
Water Content: (As Received)	29.6 %
Liquid Limit: (LL)	Not Applicable (NA)
Plastic Limit: (PL)	Non Plastic (NP)
Plasticity Index: (PI)	Non Plastic (NP)
Note: The sample received was in a natural state. The plasticity index material tested was whole soil.	

Note:

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Tested By: P.R. Gibson

Date: 13 to 19-Sep-12

Transcriptions Checked By:

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accreditation





TEST REPORT – HALSWELL ROAD INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	M. Furniss
Job Description:	Halswell Rd / Halswell Junction Rd – J/N 1078102455-1660	Sample Source:	BH-HAS-02 @ 6.00m to 6.45m
Sample Description:	SILT with minor / some clay	Sampled By:	M. Furniss
Date & Time Sampled:	27-Aug-12 (Trial 132)	Sample Method:	Borehole

WATER CONTENT & PLASTICITY INDEX RESULTS - NZS 4402:1986, Test 2.1, 2.2, 2.3 & 2.4	
Water Content: (As Received)	36.8 %
Liquid Limit: (LL)	39
Plastic Limit: (PL)	28
Plasticity Index: (PI)	11
<i>Note: The sample received was in a natural state. The plasticity index material tested was whole soil.</i>	

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Tested By: P.R. Gibson

Date: 13 to 19-Sep-12

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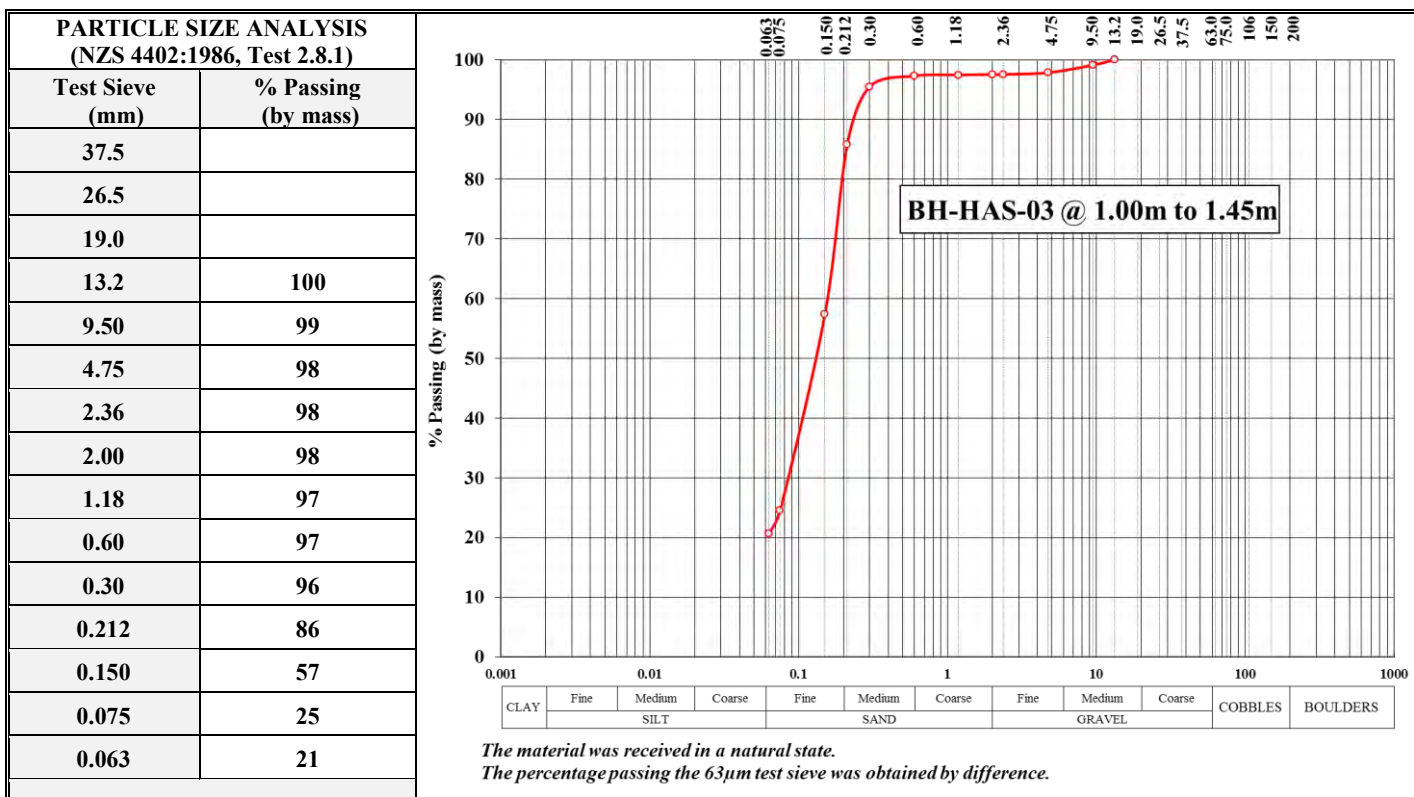
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TEST REPORT – HALSWELL ROAD INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	M. Furniss
Job Description:	Halswell Rd / Halswell Junction Rd – J/N 1078102455-1660	Sample Source:	BH-HAS-03 @ 1.00m to 1.45m
Sample Description:	Silty SAND with trace of gravel	Sampled By:	M. Furniss
Date & Time Sampled:	28-Aug-12 (Trial 128)	Sample Method:	Borehole



WATER CONTENT RESULT - NZS 4402:1986, Test 2.1

Water Content: (As Received)

20.9 %

Note: The sample received was in a natural state.

Note:

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Tested By: P.R. Gibson

Date: 13 to 19-Sep-12

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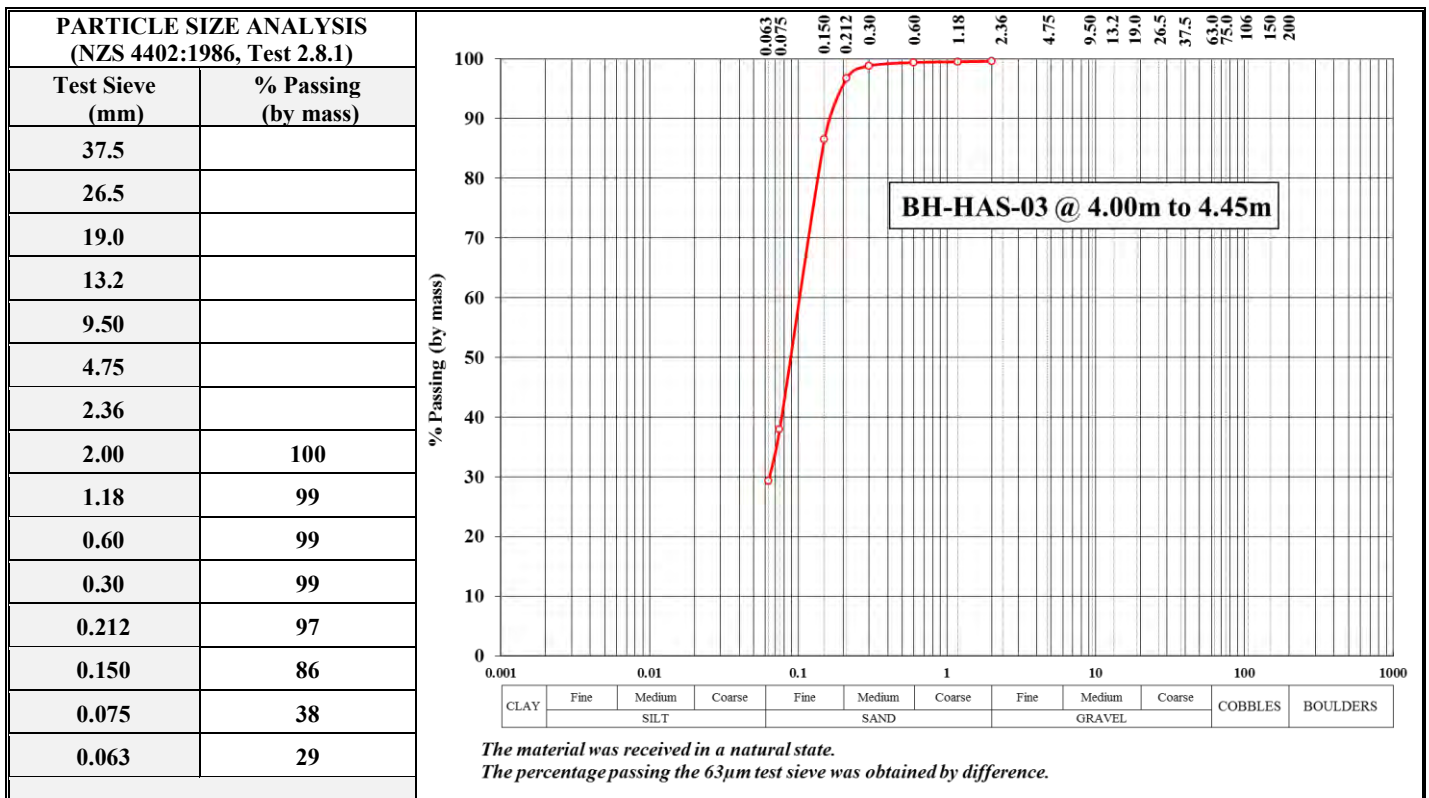
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accreditation





TEST REPORT – HALSWELL ROAD INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	M. Furniss
Job Description:	Halswell Rd / Halswell Junction Rd – J/N 1078102455-1660	Sample Source:	BH-HAS-03 @ 4.00m to 4.45m
Sample Description:	Silty SAND with trace of gravel	Sampled By:	M. Furniss
Date & Time Sampled:	30-Aug-12 (Trial 128)	Sample Method:	Borehole



WATER CONTENT RESULT - NZS 4402:1986, Test 2.1	
Water Content: (As Received)	25.3 %
Note: The sample received was in a natural state.	

Note:

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Tested By: P.R. Gibson

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TEST REPORT – HALSWELL ROAD INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	M. Furniss
Job Description:	Halswell Rd / Halswell Junction Rd – J/N 1078102455-1660	Sample Source:	BH-HAS-03 @ 5.50m to 5.95m
Sample Description:	SILT with minor clay	Sampled By:	M. Furniss
Date & Time Sampled:	30-Aug-12 (Trial 128)	Sample Method:	Borehole

WATER CONTENT & PLASTICITY INDEX RESULTS - NZS 4402:1986, Test 2.1, 2.2, 2.3 & 2.4	
Water Content: (As Received)	20.4 %
Liquid Limit: (LL)	26
Plastic Limit: (PL)	22
Plasticity Index: (PI)	4
<i>Note: The sample received was in a natural state. The plasticity index material tested was whole soil.</i>	

Note:

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Tested By: P.R. Gibson

Date: 13 to 19-Sep-12

Transcriptions Checked By:

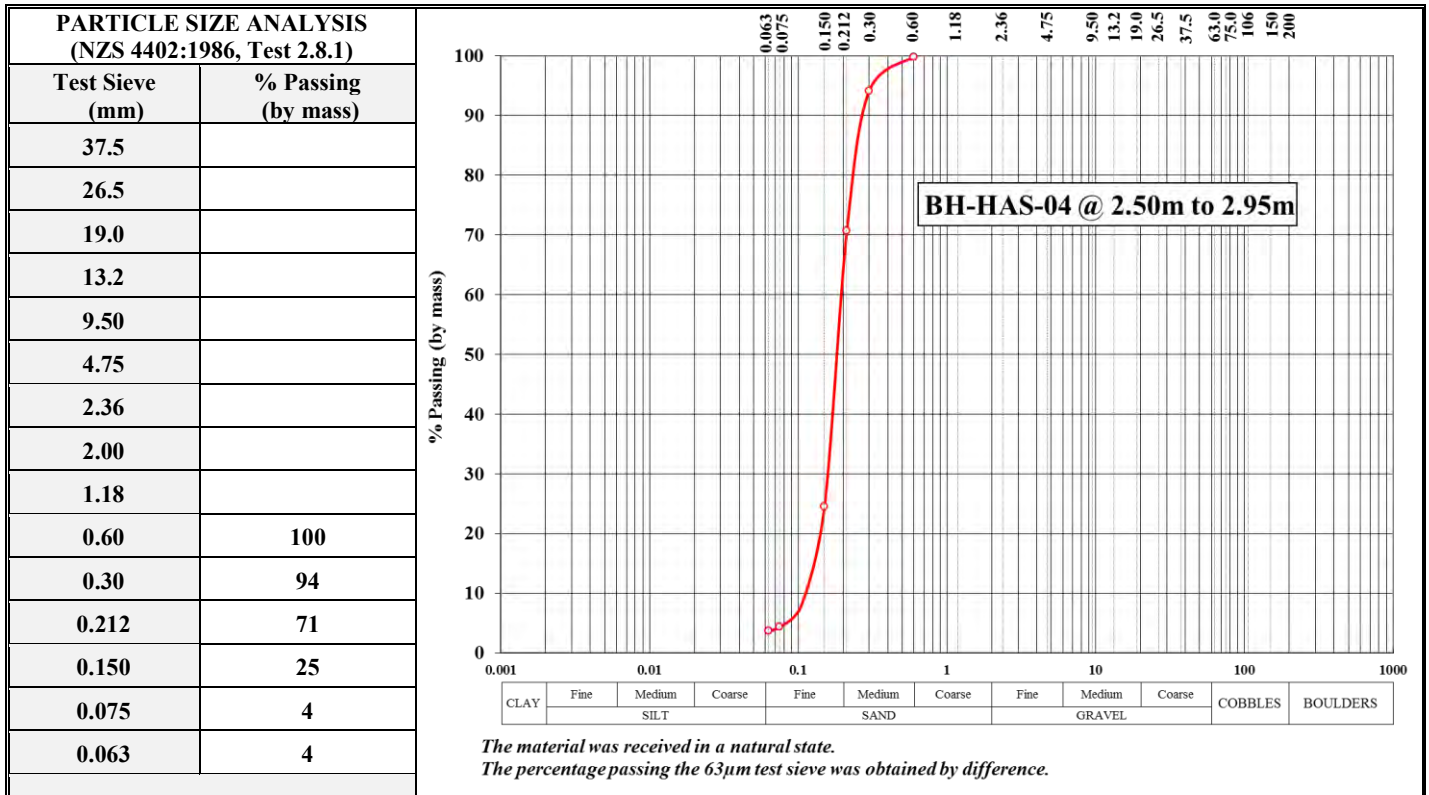
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TEST REPORT – HALSWELL ROAD INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	M. Furniss
Job Description:	Halswell Rd / Halswell Junction Rd – J/N 1078102455-1660	Sample Source:	BH-HAS-04 @ 2.50m to 2.95m
Sample Description:	SAND with trace of silt	Sampled By:	M. Furniss
Date & Time Sampled:	3-Sep-12 (Trial 142)	Sample Method:	Borehole



WATER CONTENT RESULT - NZS 4402:1986, Test 2.1	
Water Content: (As Received)	26.4 %
Note: The sample received was in a natural state.	

Note:

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Tested By: P.R. Gibson

Date: 13 to 19-Sep-12

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TEST REPORT – HALSWELL ROAD INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	M. Furniss
Job Description:	Halswell Rd / Halswell Junction Rd – J/N 1078102455-1660	Sample Source:	BH-HAS-04 @ 5.50m to 5.95m
Sample Description:	SILT with minor / some clay	Sampled By:	M. Furniss
Date & Time Sampled:	3-Sep-12 (Trial 142)	Sample Method:	Borehole

WATER CONTENT & PLASTICITY INDEX RESULTS - NZS 4402:1986, Test 2.1, 2.2, 2.3 & 2.4	
Water Content: (As Received)	35.2 %
Liquid Limit: (LL)	39
Plastic Limit: (PL)	30
Plasticity Index: (PI)	9
<i>Note: The sample received was in a natural state. The plasticity index material tested was whole soil.</i>	

Note:

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Tested By: P.R. Gibson

Date: 13 to 19-Sep-12

Transcriptions Checked By:

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TEST REPORT – HALSWELL ROAD INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	M. Furniss
Job Description:	Halswell Rd / Halswell Junction Rd – J/N 1078102455-1660	Sample Source:	BH-HAS-04 @ 6.50m to 6.95m
Sample Description:	SILT with minor clay	Sampled By:	M. Furniss
Date & Time Sampled:	3-Sep-12 (Trial 142)	Sample Method:	Borehole

WATER CONTENT & PLASTICITY INDEX RESULTS - NZS 4402:1986, Test 2.1, 2.2, 2.3 & 2.4	
Water Content: (As Received)	24.7 %
Liquid Limit: (LL)	26
Plastic Limit: (PL)	21
Plasticity Index: (PI)	5
<i>Note: The sample received was in a natural state. The plasticity index material tested was whole soil.</i>	

Note:

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Tested By: P.R. Gibson

Date: 13 to 19-Sep-12

Transcriptions Checked By:

Approved Signatory

A.P. Julius
Laboratory Manager

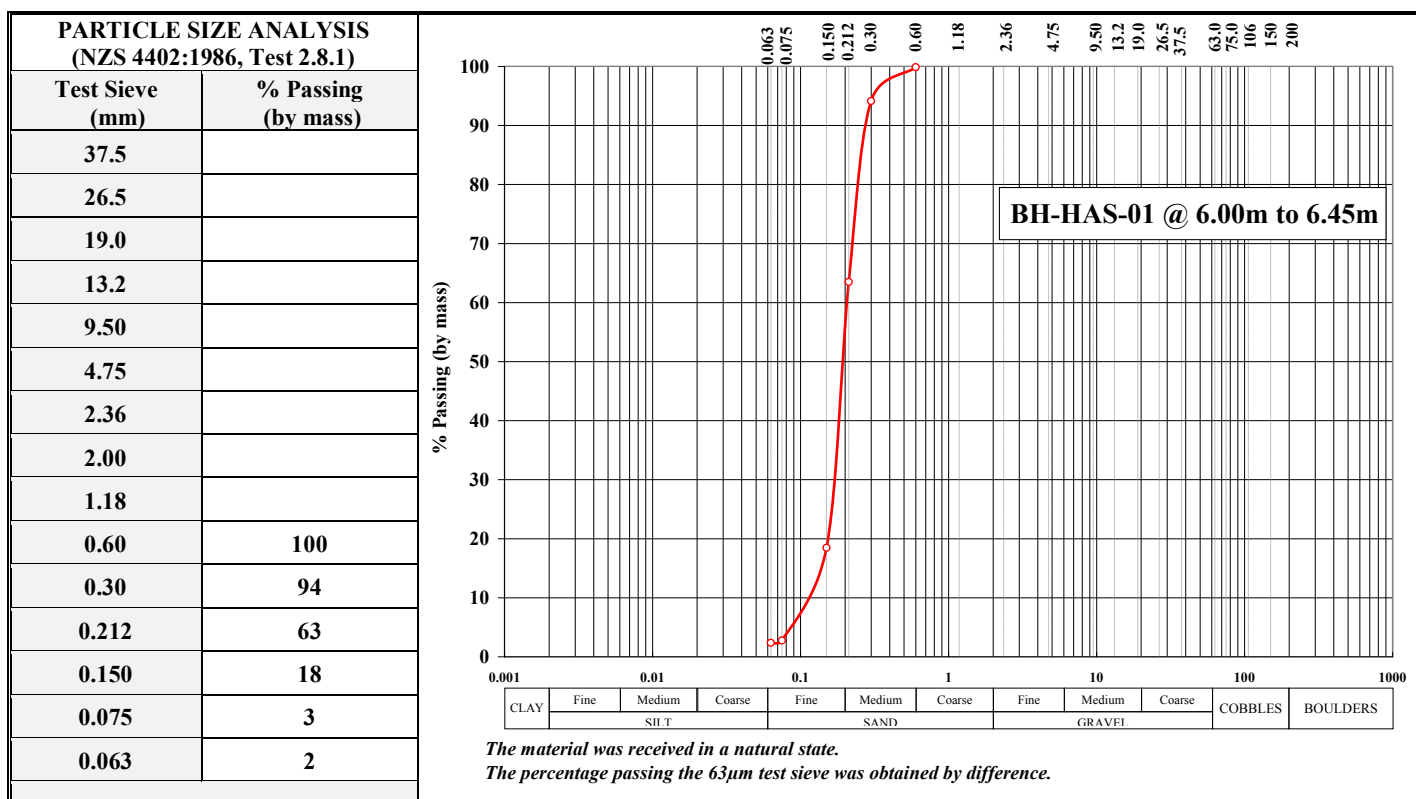
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TEST REPORT – HALSWELL INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	A. Baldwin
Job Description:	Halswell Group of Houses – J/N 1078102455-1660	Sample Source:	BH-HAS-01 @ 6.00m to 6.45m
Sample Description:	SAND with trace of silt	Sampled By:	Unknown
Date & Time Sampled:	Unknown	Sample Method:	Borehole



Note:

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Tested By: L.T. Smith

Date: 19 to 24-Sep-12

Transcriptions Checked By:

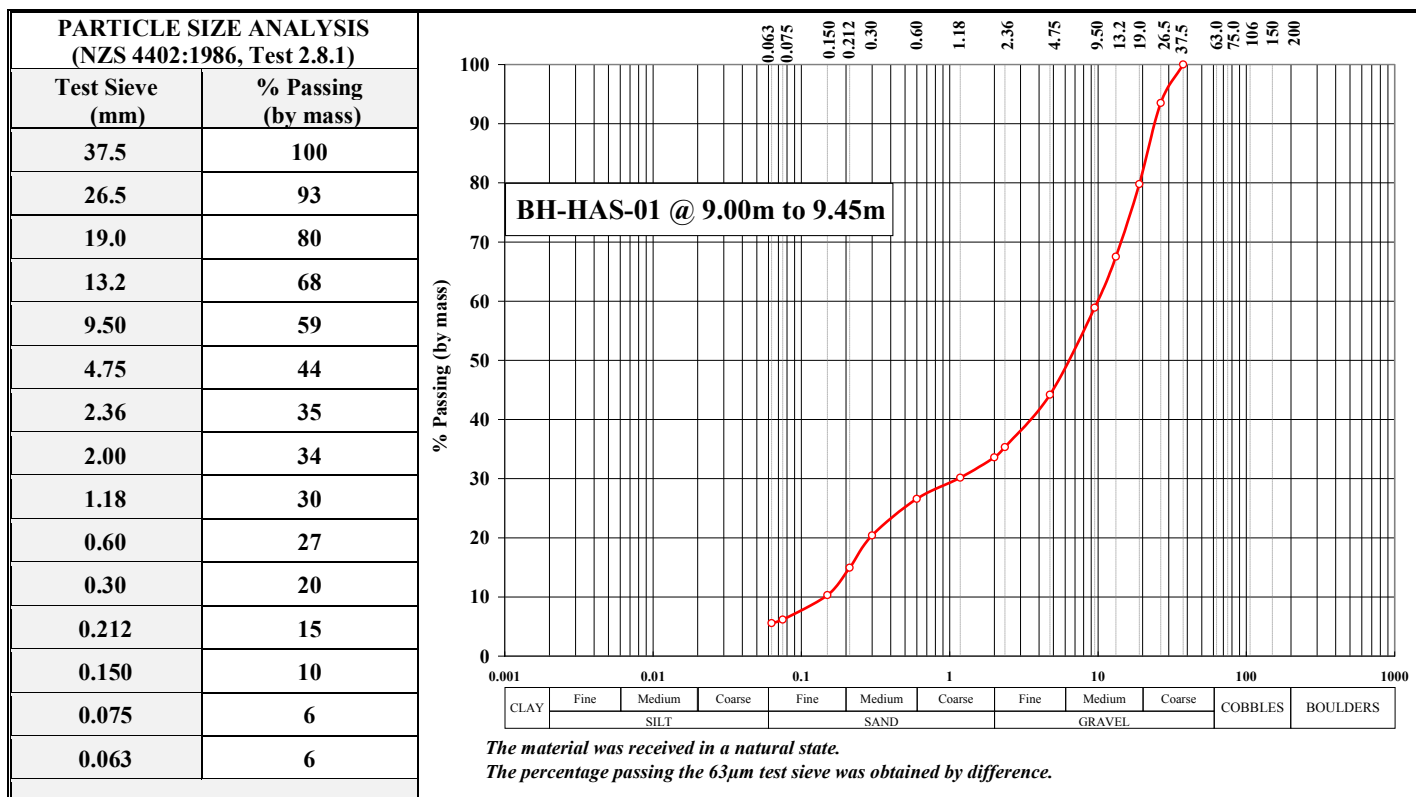
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TEST REPORT – HALSWELL INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	A. Baldwin
Job Description:	Halswell Group of Houses – J/N 1078102455-1660	Sample Source:	BH-HAS-01 @ 9.00m to 9.45m
Sample Description:	Sandy GRAVEL with minor silt	Sampled By:	Unknown
Date & Time Sampled:	Unknown	Sample Method:	Borehole



Note:

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Tested By: L.T. Smith

Date: 19 to 24-Sep-12

Transcriptions Checked By:

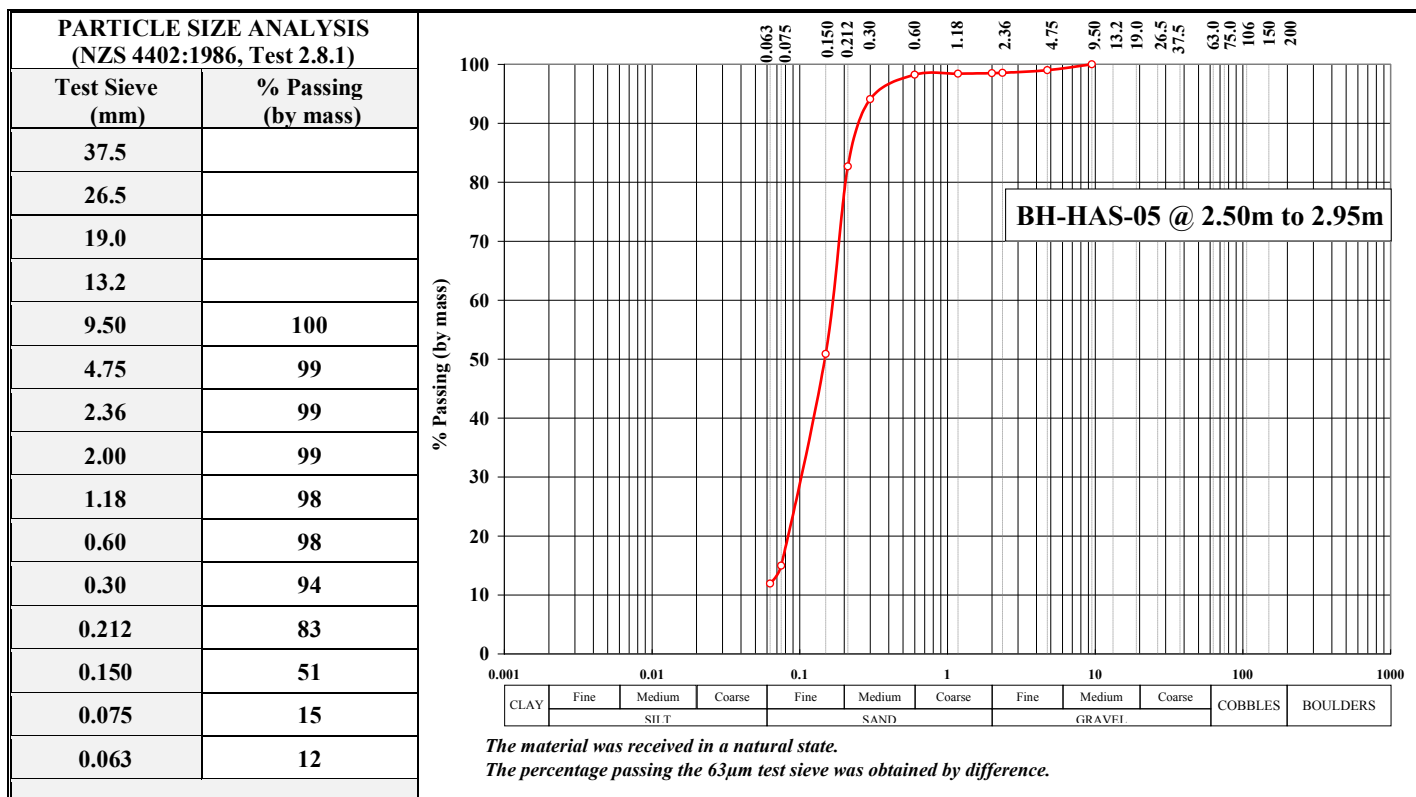
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TEST REPORT – HALSWELL INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	A. Baldwin
Job Description:	Halswell Group of Houses – J/N 1078102455-1660	Sample Source:	BH-HAS-05 @ 2.50m to 2.95m
Sample Description:	SAND with minor / some silt and trace of gravel	Sampled By:	Unknown
Date & Time Sampled:	Unknown	Sample Method:	Borehole



Note:

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Tested By: L.T. Smith

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TEST REPORT – HALSWELL INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	A. Baldwin
Job Description:	Halswell Group of Houses – J/N 1078102455-1660	Sample Source:	BH-HAS-05 @ 4.00m to 4.45m
Sample Description:	SILT & SAND with minor clay	Sampled By:	Unknown
Date & Time Sampled:	Unknown	Sample Method:	Borehole

WATER CONTENT & PLASTICITY INDEX RESULTS - NZS 4402:1986, Test 2.1, 2.2, 2.3 & 2.4	
Water Content: (As Received)	37.0 %
Liquid Limit: (LL)	30
Plastic Limit: (PL)	26
Plasticity Index: (PI)	4
<i>Note: The sample received was in a natural state. The plasticity index material tested was the -425µm fraction.</i>	

Note:

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Tested By: L.T. Smith

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TEST REPORT – HALSWELL INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	A. Baldwin
Job Description:	Halswell Group of Houses – J/N 1078102455-1660	Sample Source:	BH-HAS-06 @ 4.00m to 4.45m
Sample Description:	SAND with some silt	Sampled By:	Unknown
Date & Time Sampled:	Unknown	Sample Method:	Borehole

WATER CONTENT & PLASTICITY INDEX RESULTS - NZS 4402:1986, Test 2.1, 2.3, 2.4 & 2.5	
Water Content: (As Received)	23.9 %
Cone Penetration Limit: (CPL)	24
Plastic Limit: (PL)	Non Plastic (NP)
Plasticity Index: (PI)	Non Plastic (NP)
<i>Note: The sample received was in a natural state. The plasticity index material tested was the -425µm fraction.</i>	

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Tested By: L.T. Smith

Date: 19 to 24-Sep-12

Transcriptions Checked By:

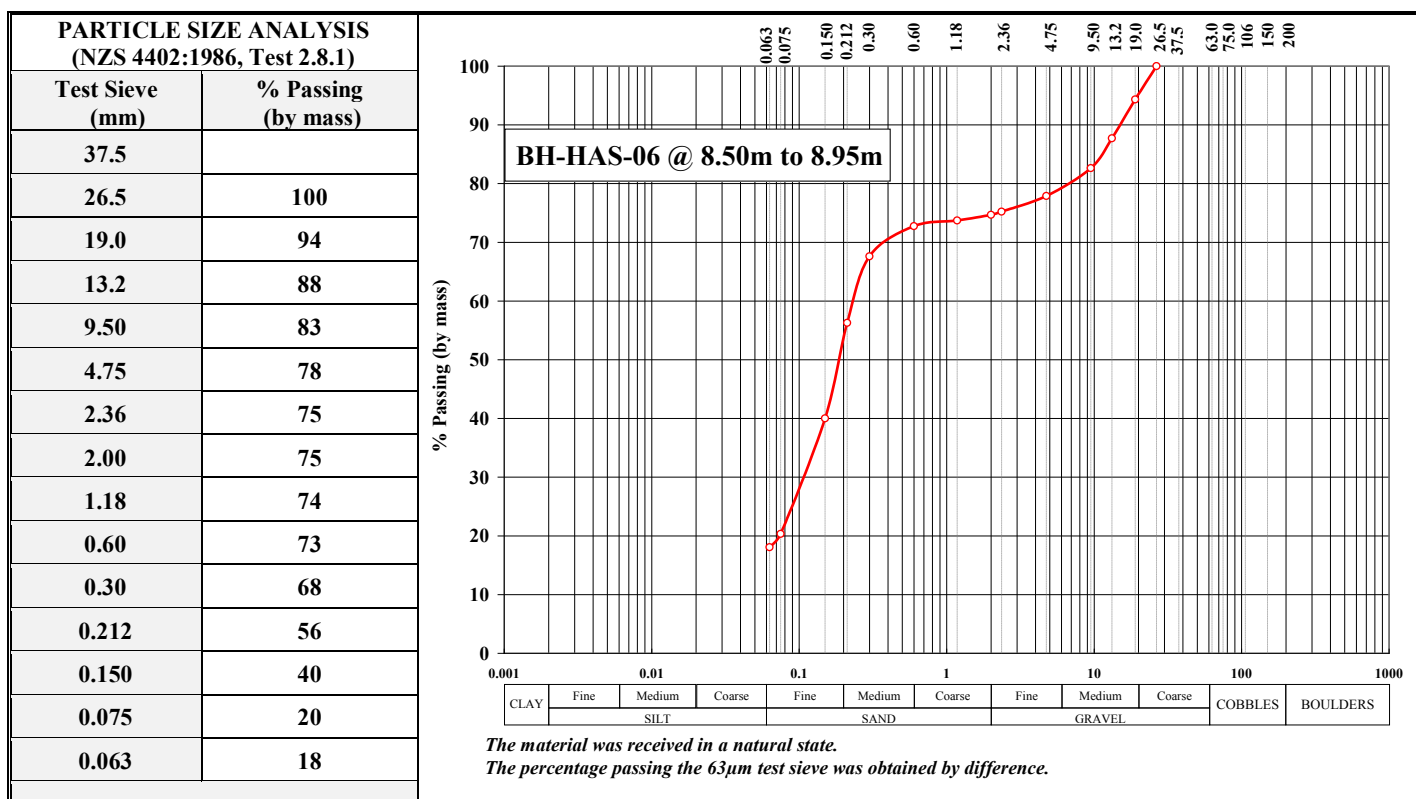
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TEST REPORT – HALSWELL INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	A. Baldwin
Job Description:	Halswell Group of Houses – J/N 1078102455-1660	Sample Source:	BH-HAS-06 @ 8.50m to 8.95m
Sample Description:	Gravelly SAND with some silt	Sampled By:	Unknown
Date & Time Sampled:	Unknown	Sample Method:	Borehole



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TEST REPORT – HALSWELL INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	A. Baldwin
Job Description:	Halswell Group of Houses – J/N 1078102455-1660	Sample Source:	BH-HAS-07 @ 4.00m to 4.45m
Sample Description:	SAND with some silt	Sampled By:	Unknown
Date & Time Sampled:	Unknown	Sample Method:	Borehole

WATER CONTENT & PLASTICITY INDEX RESULTS - NZS 4402:1986, Test 2.1, 2.3, 2.4 & 2.5	
Water Content: (As Received)	33.3 %
Cone Penetration Limit: (CPL)	27
Plastic Limit: (PL)	Non Plastic (NP)
Plasticity Index: (PI)	Non Plastic (NP)
<i>Note: The sample received was in a natural state. The plasticity index material tested was the -425µm fraction.</i>	

Note:

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- IANZ endorsement of this report does not apply to the sample description.
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Tested By: L.T. Smith

Date: 19 to 24-Sep-12

Transcriptions Checked By:

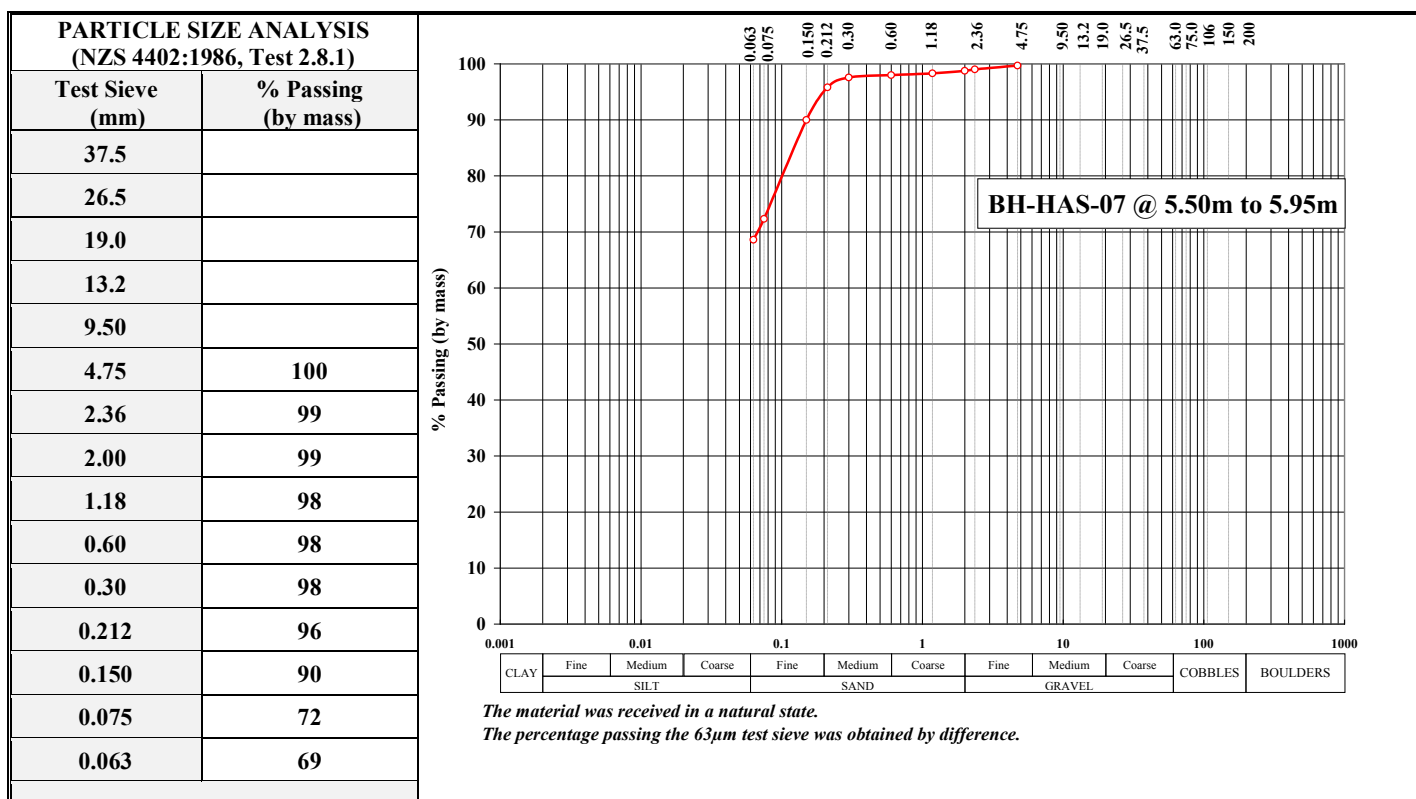
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TEST REPORT – HALSWELL INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	A. Baldwin
Job Description:	Halswell Group of Houses – J/N 1078102455-1660	Sample Source:	BH-HAS-07 @ 5.50m to 5.95m
Sample Description:	Sandy SILT with minor clay	Sampled By:	Unknown
Date & Time Sampled:	Unknown	Sample Method:	Borehole



WATER CONTENT & PLASTICITY INDEX RESULTS - NZS 4402:1986, Test 2.1, 2.2, 2.3 & 2.4	
Water Content: (As Received)	27.8 %
Liquid Limit: (LL)	23
Plastic Limit: (PL)	19
Plasticity Index: (PI)	4
Note: The sample received was in a natural state. The plasticity index material tested was the -425µm fraction.	

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Tested By: L.T. Smith

Date: 19 to 24-Sep-12

Transcriptions Checked By:

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TEST REPORT – HALSWELL INVESTIGATIONS

Client Details:	Golder Associates (NZ) Ltd, P.O. Box 2281, Christchurch	Attention:	A. Baldwin
Job Description:	Halswell Group of Houses – J/N 1078102455-1660	Sample Source:	BH-HAS-07 @ 7.00m to 7.45m
Sample Description:	Sandy SILT with some clay	Sampled By:	Unknown
Date & Time Sampled:	Unknown	Sample Method:	Borehole

WATER CONTENT & PLASTICITY INDEX RESULTS - NZS 4402:1986, Test 2.1, 2.2, 2.3 & 2.4	
Water Content: (As Received)	26.1 %
Liquid Limit: (LL)	35
Plastic Limit: (PL)	24
Plasticity Index: (PI)	11
<i>Note: The sample received was in a natural state. The plasticity index material tested was the -425µm fraction.</i>	

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Tested By: L.T. Smith

Date: 19 to 24-Sep-12

Transcriptions Checked By:

Approved Signatory

A.P. Julius
Laboratory Manager

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accreditation



At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.

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 Europe + 44 356 21 42 30 20
 North America + 1 800 275 3281
 South America + 55 21 3095 9500

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 Nelson 7040

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PO Box 2281
 Christchurch 8140

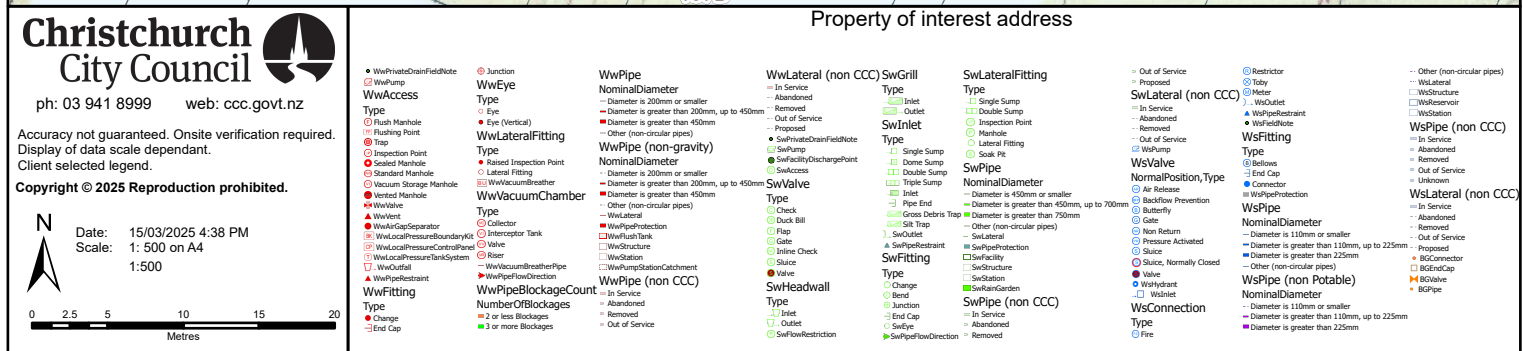
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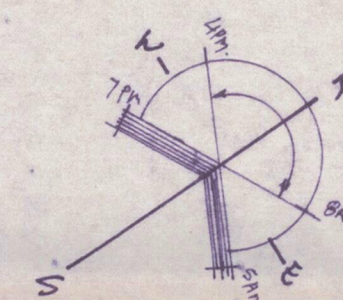
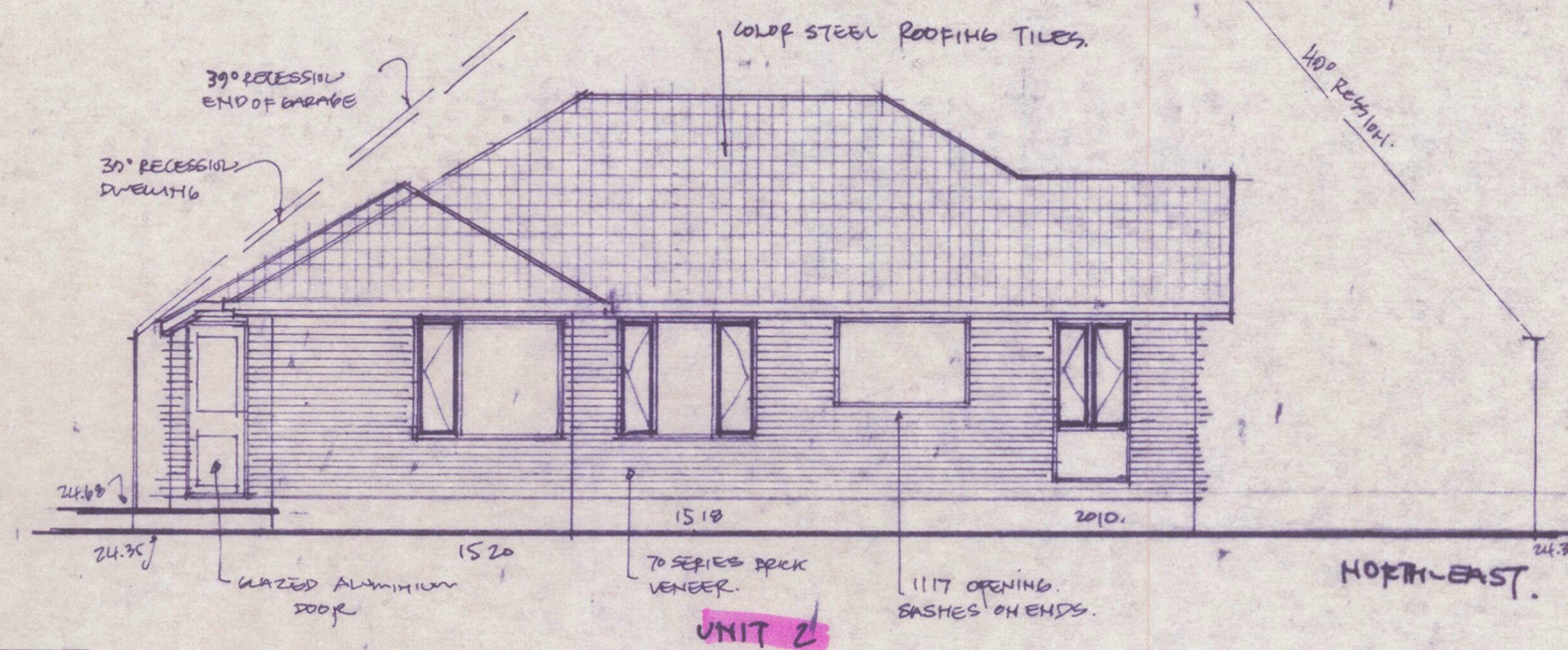
Tel +64 3 479 0390
 Fax +64 3 474 9642

Level 9A
 John Wickliffe House
 265 Princes Street
 Dunedin 9016

PO Box 1087
 Dunedin 9054







CHRISTCHURCH CITY COUNCIL
04 APR 1997
.....
CONSENT DOCUMENT

FILE COPY

Sheet	REF
2 of	95 18

Certificate of Acceptance

Section 99, Building Act 2004

Form 9 – Building (Forms) Regulations 2004

Project number	BAA37002026	Date issued	20 April 2020
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The building

Street address	1/126 Halswell Junction Road	Location within site/block number	N/A
Legal description	Flat 1 DP 75904 on Lot 5 DP 68654 having share in 651 m2		
Building name	N/A	Level/unit number	1

The owner

Name of owner	Rochelle Ainsworth & Hamish Flanagan	Phone numbers	
Contact person	Rochelle Ainsworth	Landline	N/A
Mailing address	57 Kennedys Bush Road, Halswell, Christchurch	Mobile	0274579666
		Daytime	N/A
Street address/ registered office	57 Kennedys Bush Road, Halswell, Christchurch	After hours	N/A
		Fax	N/A
Email	hrwholesale@xtra.co.nz	Website	N/A

First point of contact for communications with the council:

Name	Rochelle Ainsworth	Phone	N/A
Contact person	Rochelle Ainsworth	Mobile	0274579666
Mailing address	57 Kennedys Bush Road, Halswell, Christchurch	Fax	N/A
		Email	hrwholesale@xtra.co.nz

Acceptance of compliance

The Christchurch City Council is satisfied, to the best of its knowledge and belief and on reasonable grounds, that, insofar as it can ascertain, the building work described below complies with the building code.

The council was only able to inspect the following parts of the building work and this certificate is qualified as follows:

Description of Work:

- Install new ensuite shower room

The work comprises:

- Remove existing shower room fittings.
- Fit new wall between the ensuite and bathroom.
- Install new plumbing and drainage to ensuite fittings.
- Install new wall linings.

Civic Offices, 53 Hereford Street, Christchurch 8011
PO Box 73013, Christchurch 8154
Phone: 03 941 8999, Fax: 03 941-8792
www.ccc.govt.nz/goahead

- Form new door from the master bedroom.
- Install shower tray, acrylic wall linings and glazed door.
- Install new WC, cistern and vanity basin.
- Fit tiled splashback above vanity.
- Install wiring and electrical fittings, towel rail and extract fan.
- Install vinyl flooring.
- Miscellaneous works in connection with the above.

Building code clauses considered relevant to the work:

- **E3 - Internal Moisture**
- **F2 - Hazardous Building Materials**
- **G1 - Personal Hygiene**
- **G4 - Ventilation**
- **G9 - Electricity**
- **G12 - Water Supplies**
- **G13 - Foul Water**

The work is subject to the following exclusion(s):

- Elements that could not be sighted or otherwise verified for compliance with the Building Code are to be excluded from the Certificate of Acceptance.

This Certificate is qualified as follows:

Clause E3 - Internal Moisture

- From the photographs received with the application it can be verified that the wall to shower linings, the sanitary fittings to wall and floor linings have been sealed to reduce the risk of damage to the building elements. Floor and wall finishes are easily cleaned.
- The installation of the mechanical extract fan and heating (see Clause G4 and G9) will reduce the risk of damage to wall linings from the build-up of moisture laden air. Compliance can be accepted.

Clause F2 - Hazardous Building Materials

- The shower door is glazed. The applicant has confirmed that the door has been stamped with a mark to verify compliance with NZS 2208 – Safety glazing materials in buildings. Compliance can be accepted.

Clause G1 - Personal Hygiene

- The photographs and floor plans provided with the application verify that the ensuite shower room provides suitable facilities and spaces to carry out tasks relating to personal hygiene. Compliance can be accepted.

Clause G4 - Ventilation

- The plans and photographs provide verification that the bathroom has been provided with both natural ventilation and mechanical ventilation. Provided either or both are used, adequate air changes can be achieved. Compliance can be accepted.

Clause G9 - Electricity

- Alterations were undertaken to the existing electrical supply to the area to liven up the lighting, extract fan, towel rail and outlets within the ensuite.
- The alterations were undertaken by Bradley Pomare of Skilled Electrical and have been verified by the provision of an electrical certificate of compliance. Compliance can be accepted.

Clause G12 - Water Supplies

- Hot and cold water supplies are from the existing supplies.
- Alterations were undertaken to connect to the fittings to the existing water supplies by Certifying plumber Joshua Cottle of Cottle Plumbing Limited. Compliance can be accepted.

Clause G13 - Foul Water

- Additional connections have been made from the new sanitary fittings to the existing drainage outfalls.
- The alterations and additions were undertaken by Certifying plumber Joshua Cottle of Cottle Plumbing Limited. Compliance can be accepted.

NB Where compliance with stated building code clauses may not been verified, Council also has no evidence to indicate that the building may be dangerous or insanitary as a consequence.

This certificate is based on the following information:

- Certificate of Acceptance application form.
- Accompanying documents
- Inspection report, observations and photographs.

Nothing in this certificate limits the requirement that a person must not carry out building work except in accordance with a building consent, nor does it relieve any person from the requirement to obtain a building consent for building work.

Attachments

- Approval Letter
- Stamped approved documents.
- Inspection report.



Signature:

Position: Building Control Officer

On behalf of the Christchurch City Council:

Date: 20 April 2020

Reference/Certificate ID NO: **2116**

This form has been designed to be used by licensed electrical workers to certify that installations or Part installations under Part 1 or Part 2 of AS/NZS 3000 are safe to be connected to the specified system of electrical supply.

Location Details:

1/126 Halswell Junction RDContact Details:
(Name and address)**Tasman trust**

Description of Work: (including date/s of work and type of supply system)

Bathroom: wired and installed exhaust fan, vanity socket, vanity LT, towel rail
Ensuite: wired and installed exhaust fan, down Lts, vanity socket, towel rail
Kitchen: Relocated Hob Isolator to left side near Cabinet.

- ☐ Has been installed in accordance with the specified certified design¹
☐ Has an earthing system that is correctly rated (where applicable)
☒ Contains fittings that are safe to connect to a power supply
☐ Relies on a supplier Declaration of Conformity¹
☐ Relies on a manufacturer's instructions¹
☒ Has been satisfactorily tested in accordance with the Electricity (Safety) Regulations 2010

☒ Is safe to connect

Electronic/Other reference:

Certifier's signature:

Test Results

Polarity (Independent earth):	<input checked="" type="checkbox"/>
Insulation resistance:	<input checked="" type="checkbox"/>
Earth Continuity:	<input checked="" type="checkbox"/>
Bonding:	
Fault Loop impedance:	
Other (specify):	

Date:

6-11-19**CoC**

Type of work:

The prescribed electrical work is:

Reference Standards:

- ☒ Additions ☒ Alterations ☐ New work
☐ Low risk ☒ General ☐ High risk (Specify):
☐ Part 1 of AS/NZS 3000 ☒ Part 2 of AS/NZS 3000
☐ Additional Standards:

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

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

Electronic/Other reference:

Certifier's signature:

ESC

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

Certifier's name:

B. POMARE

Registration/Practising licence number:

E259898

Certifier's signature:

Certificate Issue Date:

6-11-19

Connection Date:

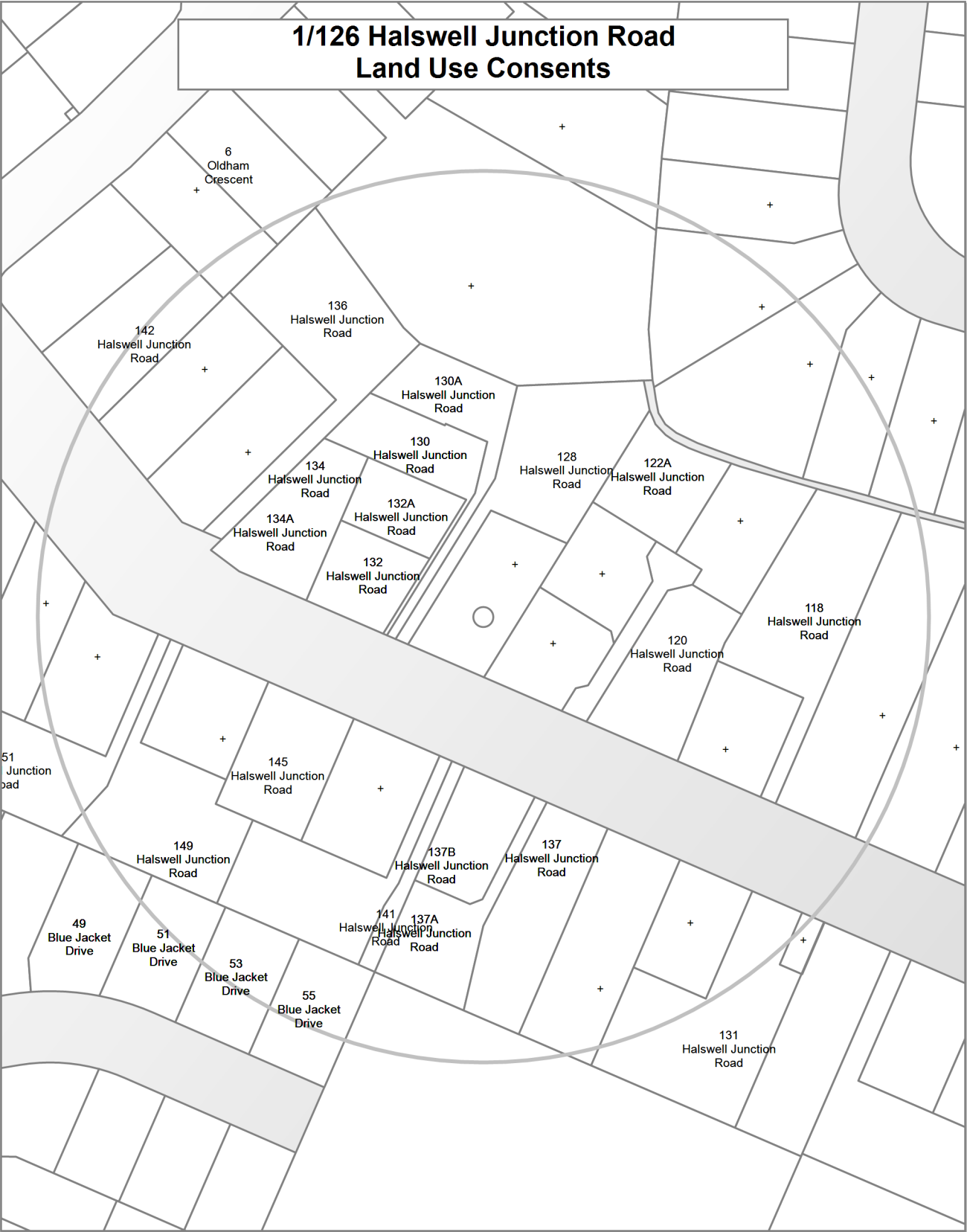
6-11-19

Date:

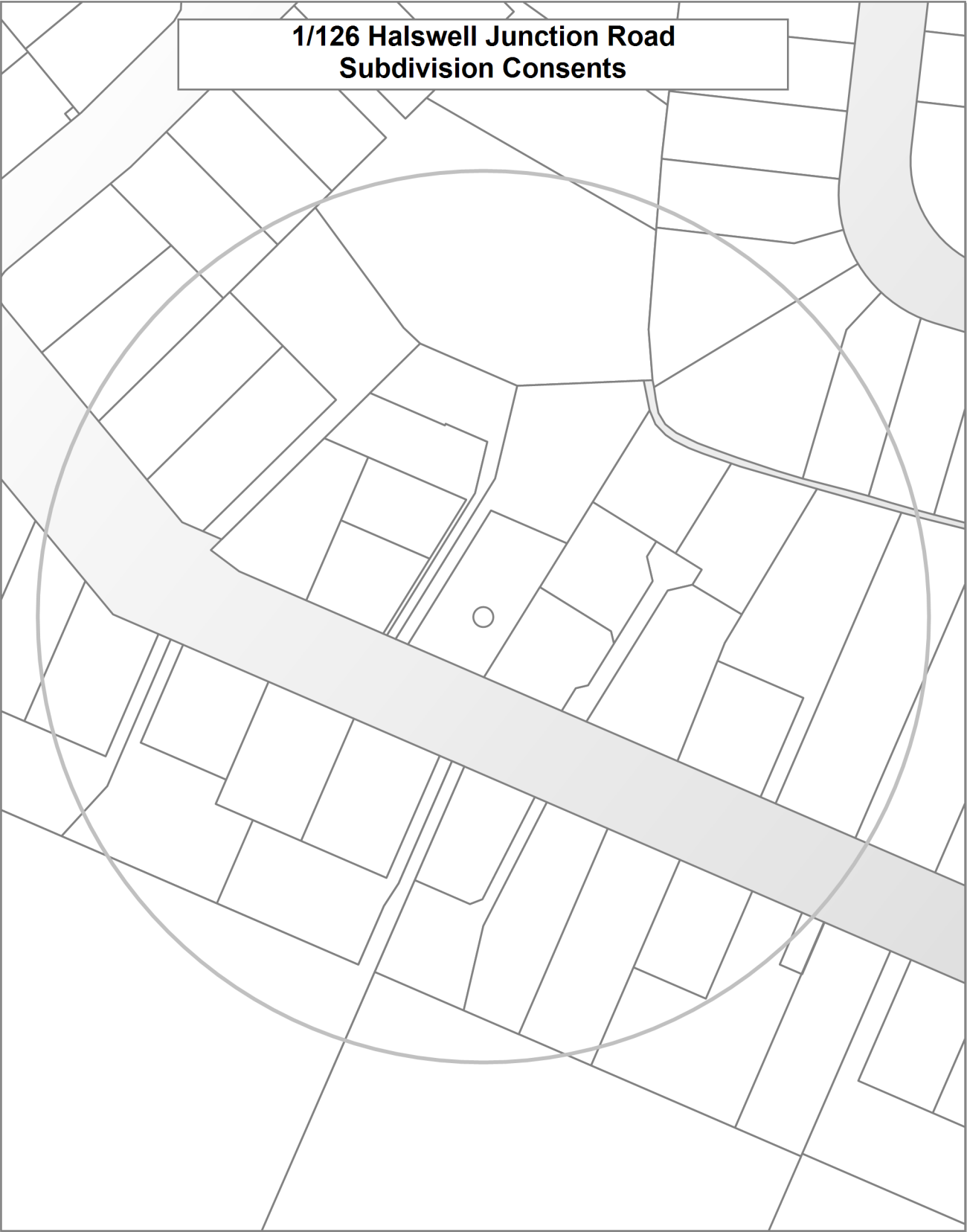
6-11-19**CUSTOMER COPY - THIS IS AN IMPORTANT DOCUMENT AND SHOULD BE RETAINED FOR A MINIMUM OF 7 YEARS**

This certificate also conforms that the electrical work complies with the building code for the purposes of Section 19(1)(e) of the Building Act 2004.

**1/126 Halswell Junction Road
Land Use Consents**



**1/126 Halswell Junction Road
Subdivision Consents**



Land Use Resource Consents within 100 metres of 1/126 Halswell Junction Road

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

118 Halswell Junction Road

RMA/1982/250

Consent to site garage 2.5m from boundary (rear) - Historical Reference RES9207214

Processing complete

Applied 17/05/1982

Decision issued 21/05/1982

Granted 21/05/1982

RMA/1985/407

Consent to site garage where it encroaches into minimum req'd setback of 2.8m from dwelling - Historical Reference RES9207215

Processing complete

Applied 17/09/1985

Decision issued 01/01/1999

Declined 01/01/1999

120 Halswell Junction Road

RMA/1999/4480

Application for an extension of time to the date on which Land Use Resource Consent RC971105 shall lapse. - Historical Reference RMA1283

Processing complete

Applied 15/11/1999

Decision issued 15/12/1999

Granted 10/12/1999

122A Halswell Junction Road

RMA/1997/1036

Application for a reduction in the setback from an Upstream River under the Proposed Plan, from 15m to 9m, for lots 3 and 4 Wigram/97/236, being part of a sub - Historical Reference RES971105

Processing complete

Applied 01/05/1997

Decision issued 14/08/1997

Granted 14/08/1997

RMA/1997/952

A 5 Lot subdivision where 2 lots do not comply with the Paparua Transitional Plan for site areas, and where the access width is less than the required - Historical Reference RES971008

Processing complete

Applied 15/04/1997

Decision issued 28/08/1997

Granted 28/08/1997

128 Halswell Junction Road

RMA/1997/317

Application to erect a dwelling that does not comply with the Proposed District Plan for the following: 15m building setback from the Nottingham Stream, a setback of 9.4m is proposed. 20m maximum length of wall without a step-in-Plan of 2.4m. - Historical Reference RES970249

Processing complete

Applied 31/01/1997

Decision issued 21/03/1997

Granted 21/03/1997

130 Halswell Junction Road

RMA/1997/2758

A two Lot subdivision which does not comply with Lot sizes, dimensions or access width requirements under the Paparua Transitional Plan. - Historical Reference RES973185

Processing complete

Applied 05/11/1997

Decision issued 06/11/1997

Granted 06/11/1997

RMA/2013/2828

Rebuild a new dwelling on the above application site - Historical Reference RMA92024564

Processing complete

Applied 20/12/2013

Decision issued 15/01/2014

Granted 14/01/2014

RMA/2013/857

Dwelling with attached garage - Historical Reference RMA92022487

Processing complete

Applied 14/05/2013

Decision issued 28/05/2013

Granted 28/05/2013

130A Halswell Junction Road

RMA/1997/2758

A two Lot subdivision which does not comply with Lot sizes, dimensions or access width requirements under the Paparua Transitional Plan. - Historical Reference RES973185

Processing complete

Applied 05/11/1997

Decision issued 06/11/1997

Granted 06/11/1997

RMA/2014/1042

Dwelling with Attached Garage - Historical Reference RMA92025682

Processing complete

Applied 02/05/2014

Decision issued 06/06/2014

Granted 05/06/2014

131 Halswell Junction Road

RMA/1997/232

Transitional Plan - Paparua - the net site area is required to be 500sq.m, it is 465sq.m. - Historical Reference RES970152

Processing complete

Applied 07/01/1997

Decision issued 24/01/1997

Granted 24/01/1997

132 Halswell Junction Road

RMA/1997/2294

Application to establish a two unit development with reduced Site Density; setback and exceeds site coverage. - Historical Reference RES972628

Processing complete

Applied 19/09/1997

Decision issued 22/10/1998

Granted 22/10/1998

RMA/1999/3741

A two Lot subdivision which does not comply with Lot size and Shape Factor under the Transitional Paparua Plan or with Lot size under the Pr - Historical Reference RES992842

Processing complete

Applied 05/10/1999

Decision issued 06/10/1999

Granted 06/10/1999

RMA/2014/1637

Dwelling with Attached Garage - Historical Reference RMA92026299

Processing complete

Applied 03/07/2014

Decision issued 22/07/2014

Granted 15/07/2014

132A Halswell Junction Road

RMA/1999/3741

A two Lot subdivision which does not comply with Lot size and Shape Factor under the Transitional Paparua Plan or with Lot size under the Pr - Historical Reference RES992842

Processing complete

Applied 05/10/1999

Decision issued 06/10/1999

Granted 06/10/1999

RMA/2013/2528

Replace EQ Dwelling - Historical Reference RMA92024251

Processing complete

Applied 26/11/2013

Decision issued 15/01/2014

Granted 14/01/2014

134 Halswell Junction Road

RMA/1997/897

Application for a single storey dwelling and attached garage with the southeast wall over 20m Long without a 2.4m step in Plan in terms of the Proposed District Plan. - Historical Reference RES970950

Processing complete

Applied 17/04/1997

Decision issued 19/05/1997

Granted 19/05/1997

RMA/2014/2120

To erect two Elderly Persons Housing Units on the site - Historical Reference RMA92026801

Processing complete

Applied 18/08/2014

Decision issued 26/09/2014

Granted 25/09/2014

134A Halswell Junction Road

RMA/1997/897

Application for a single storey dwelling and attached garage with the southeast wall over 20m Long without a 2.4m step in Plan in terms of the Proposed District Plan. - Historical Reference RES970950

Processing complete

Applied 17/04/1997

Decision issued 19/05/1997

Granted 19/05/1997

RMA/2014/2120

To erect two Elderly Persons Housing Units on the site - Historical Reference RMA92026801

Processing complete

Applied 18/08/2014

Decision issued 26/09/2014

Granted 25/09/2014

136 Halswell Junction Road

RMA/2013/1066

Global Consent for Transportable Cottages - Historical Reference RMA92022712

Processing complete

Applied 14/06/2013

Decision issued 25/06/2013

Granted 21/06/2013

137 Halswell Junction Road

RMA/2018/1023

Three lot subdivision & Fill & Earthworks.

Processing complete

Applied 30/04/2018

Conditions changed/cancelled - s127 14/04/2023

s223 Certificate issued 18/04/2023

s224 Certificate issued 09/05/2023

Decision issued 20/07/2018

Granted 20/07/2018

RMA/2018/1127

Wastewater Capacity Certificate

Processing complete

Applied 09/05/2018

Certificate issued 14/05/2018

137A Halswell Junction Road

RMA/2018/1023

Three lot subdivision & Fill & Earthworks.

Processing complete

Applied 30/04/2018

Conditions changed/cancelled - s127 14/04/2023

s223 Certificate issued 18/04/2023

s224 Certificate issued 09/05/2023

Decision issued 20/07/2018

Granted 20/07/2018

RMA/2018/1127

Wastewater Capacity Certificate

Processing complete

Applied 09/05/2018

Certificate issued 14/05/2018

137B Halswell Junction Road

RMA/2018/1023

Three lot subdivision & Fill & Earthworks.

Processing complete

Applied 30/04/2018

Conditions changed/cancelled - s127 14/04/2023

s223 Certificate issued 18/04/2023

s224 Certificate issued 09/05/2023

Decision issued 20/07/2018

Granted 20/07/2018

RMA/2018/1127

Wastewater Capacity Certificate

Processing complete

Applied 09/05/2018

Certificate issued 14/05/2018

141 Halswell Junction Road

RMA/2020/168

Earthworks consent for stockpile 10000m3 of clean material

Processing complete

Applied 30/01/2020

Decision issued 27/02/2020

Granted 27/02/2020

142 Halswell Junction Road

RMA/2015/1257

Global consent for soil disturbance associated with the rebuild and repair of earthquake-damaged residential structures on HAIL land - Historical Reference RMA92029513

Processing complete

Applied 11/05/2015

Decision issued 12/06/2015

Granted 12/06/2015

145 Halswell Junction Road

RMA/1989/289

Consent to protrude into min. req'd yard by 1.2m with a corner of proposed extensions - Historical Reference RES9207216

Processing complete

Applied 21/06/1989

Decision issued 21/06/1989

Granted 21/06/1989

149 Halswell Junction Road

RMA/1982/251

Consent to site garage 2.6m from r.o.w. - Historical Reference RES9207217

Processing complete

Applied 07/12/1982

Decision issued 01/01/1999

Declined 01/01/1999

RMA/1986/375

Consent to site conservatory 2.2m from garage - Historical Reference RES9207219

Processing complete

Applied 11/03/1986

Decision issued 01/01/1999

Granted 01/01/1999

151 Halswell Junction Road

RMA/1995/2153

Application to intrude recession plane on north west boundary and southern boundaries. - Historical Reference RES953013

Processing complete

Applied 27/07/1995

Decision issued 11/08/1995

Granted 11/08/1995

49 Blue Jacket Drive

RMA/2020/168

Earthworks consent for stockpile 10000m3 of clean material

Processing complete

Applied 30/01/2020

Decision issued 27/02/2020

Granted 27/02/2020

RMA/2021/1288

To undertake earthworks in relation to stormwater pipe.

Withdrawn

Applied 07/05/2021

RMA/2021/2098

Subdivision - Fee simple - 122 Lots with land use Linked to RMA/2021/2114 - Global land use consent for earthworks within 5m of a street tree. Also see Peter's time on RMA/2021/2114

Processing complete

Applied 06/07/2021

Conditions changed/cancelled - s127 10/01/2022

Conditions changed/cancelled - s127 13/04/2022

Conditions changed/cancelled - s127 24/11/2023

s223 Certificate issued stage 1 09/02/2023

s223 Certificate issued stage 2 14/09/2023

s224 Certificate issued stage 1 16/05/2023

s224 Certificate issued stage 2 11/12/2023

Decision issued 01/10/2021

Engineering plan stage 1 accepted 13/04/2023

Granted 29/09/2021

s223 Certificate reissued stage 1 23/02/2023

RMA/2021/2114

Earthworks - Global land use consent for earthworks within 5m of a street treeLinked to SUB RMA/2021/2098

Processing complete

Applied 07/07/2021

Decision issued 24/09/2021

Granted 24/09/2021

RMA/2022/3456

Minimum Floor Level Certificate - Floorlevel not required

Withdrawn

Applied 09/11/2022

51 Blue Jacket Drive

RMA/2020/168

Earthworks consent for stockpile 10000m3 of clean material

Processing complete

Applied 30/01/2020

Decision issued 27/02/2020

Granted 27/02/2020

RMA/2021/1288

To undertake earthworks in relation to stormwater pipe.

Withdrawn

Applied 07/05/2021

RMA/2021/2098

Subdivision - Fee simple - 122 Lots with land use Linked to RMA/2021/2114 - Global land use consent for earthworks within 5m of a street tree. Also see Peter's time on RMA/2021/2114

Processing complete

Applied 06/07/2021

Conditions changed/cancelled - s127 10/01/2022

Conditions changed/cancelled - s127 13/04/2022

Conditions changed/cancelled - s127 24/11/2023

s223 Certificate issued stage 1 09/02/2023

s223 Certificate issued stage 2 14/09/2023

s224 Certificate issued stage 1 16/05/2023

s224 Certificate issued stage 2 11/12/2023

Decision issued 01/10/2021

Engineering plan stage 1 accepted 13/04/2023

Granted 29/09/2021

s223 Certificate reissued stage 1 23/02/2023

RMA/2021/2114

Earthworks - Global land use consent for earthworks within 5m of a street treeLinked to SUB RMA/2021/2098

Processing complete

Applied 07/07/2021

Decision issued 24/09/2021

Granted 24/09/2021

RMA/2022/3456

Minimum Floor Level Certificate - Floorlevel not required

Withdrawn

Applied 09/11/2022

53 Blue Jacket Drive

RMA/2020/168

Earthworks consent for stockpile 10000m3 of clean material

Processing complete

Applied 30/01/2020

Decision issued 27/02/2020

Granted 27/02/2020

RMA/2021/1288

To undertake earthworks in relation to stormwater pipe.

Withdrawn

Applied 07/05/2021

RMA/2021/2098

Subdivision - Fee simple - 122 Lots with land use Linked to RMA/2021/2114 - Global land use consent for earthworks within 5m of a street tree. Also see Peter's time on RMA/2021/2114

Processing complete

Applied 06/07/2021

Conditions changed/cancelled - s127 10/01/2022

Conditions changed/cancelled - s127 13/04/2022

Conditions changed/cancelled - s127 24/11/2023

s223 Certificate issued stage 1 09/02/2023

s223 Certificate issued stage 2 14/09/2023

s224 Certificate issued stage 1 16/05/2023

s224 Certificate issued stage 2 11/12/2023

Decision issued 01/10/2021

Engineering plan stage 1 accepted 13/04/2023

Granted 29/09/2021

s223 Certificate reissued stage 1 23/02/2023

RMA/2021/2114

Earthworks - Global land use consent for earthworks within 5m of a street treeLinked to SUB RMA/2021/2098

Processing complete

Applied 07/07/2021

Decision issued 24/09/2021

Granted 24/09/2021

RMA/2022/3456

Minimum Floor Level Certificate - Floorlevel not required

Withdrawn

Applied 09/11/2022

55 Blue Jacket Drive

RMA/2020/168

Earthworks consent for stockpile 10000m3 of clean material

Processing complete

Applied 30/01/2020

Decision issued 27/02/2020

Granted 27/02/2020

RMA/2021/1288

To undertake earthworks in relation to stormwater pipe.

Withdrawn

Applied 07/05/2021

RMA/2021/2114

Earthworks - Global land use consent for earthworks within 5m of a street treeLinked to SUB RMA/2021/2098

Processing complete

Applied 07/07/2021

Decision issued 24/09/2021

Granted 24/09/2021

RMA/2022/3456

Minimum Floor Level Certificate - Floorlevel not required

Withdrawn

Applied 09/11/2022

RMA/2024/2865

Construct a new dwelling with attached garage

Processing complete

Applied 08/10/2024

Decision issued 22/10/2024

Granted 21/10/2024

6 Oldham Crescent

RMA/1999/892

Consent to double garage closer to dwelling than 3m being 2.3m - Historical Reference RES9215359

Processing complete

Applied 01/01/1999

Decision issued 28/02/1984

Granted 28/02/1984

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