EQC & information

Harcourts
Holmwood
my kind of people

holmwood.co.nz

EQC Full Assessment Report

Claim Number:	CLM/2011/102777	**Assessment Date:**	04/07/2011 17:30
Claimant:	JASON SAIL	**Assessor:**	Nicholls, Kerry
Property Address:	26 HEMINGWAY PLACE SPENCERVILLE CHRISTCHURCH 8083	**Estimator:**	Solomon, Jason
		Property Occupied By:	Owner Occupied

Claimant Setup

Type	Name	Home Number	Mobile Number	Work Number	Email Address
Owner	JASON, SAIL	[redacted]			
Owner	Rasmussen-Sail, Anne-Grete				

Insurance & Mortgage Details

Insurance Details - From Claim Centre

Insurer	Policy Type	Policy Number	Insurance Sighted	Insurance Valid
AA Insurance (AA/SIS/Sun Direct)	Dwelling	[redacted]	Yes	

Insurance Details - Added in COMET

Insurer	Policy Type	Policy Number	Insurance Sighted	Insurance Valid

Insurance Details - Comments

Mortgage Details - From Claim Centre

Bank

Mortgage Details - Added in COMET

Bank
NATIONAL BANK OF NEW ZEALAND

Mortgage Details - Comments

No money owing but still registered

Opt Out

For repairs costing between $10,000 and $100,000 the claimant wishes to manage their own repairs? No

Hazards

Hazards:	Two very friendly dogs on site
Property Sticker:	No Sticker

Building Configurations

Leaky Home Syndrome? No

Building Name	Number of floors	Building Finish	Age of house	Footprint	Area (m2)
Main Building	1	Standard	Post 1980	Rectangular	202.08

Full Assessment

Site

Element	Type	Material	Damages	Measure	Rate	Cost
Land	Exposed	Sand	Significant land crack > 100mm			
			Excavate top 500mm soil and 300mm either side of crack. Plate compact at 100mm layers	4.20 m3	904.00	3,796.80
Land	Under dwelling	Sand	No Earthquake Damage			

General Comments: Unable to ascertain damage under dwelling as concrete slab covers area - engineer's report will need to determine if any issues.

Services

Element	Type	Material	Damages	Measure	Rate	Cost
Sewerage	Town Connection	PVC Pipe				
Water Supply	Town Connection	Plastic	No Earthquake Damage			

General Comments:

Main Building

Exterior

Elevation (North)

Damage: Earthquake damage
Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Wall Cladding	Brick Veneer	Brick	Cracking			
			Grind out and repoint mortar	1.00 l/m	35.00	35.00
			Structural damage			
			Relay and re-bed loose bricks	1.00 m2	85.00	85.00
Wall framing	Timber Frame	Timber	No Earthquake Damage			

General Comments:

Elevation (South)

Damage: Earthquake damage
Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Wall Cladding	Brick Veneer	Brick	Structural damage			
			Relay and re-bed loose bricks	1.00 m2	85.00	85.00
Wall framing	Timber Frame	Timber	No Earthquake Damage			

General Comments:

Elevation (East)

Damage: No damage
Require Scaffolding? No
General Comments: 14*2.3 brick cladding

Elevation (West)

Damage: Earthquake damage
Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Wall Cladding	Brick Veneer	Brick	Cracking			
			Grind out and repoint mortar	5.00 l/m	35.00	175.00
Wall framing	Timber Frame	Timber	No Earthquake Damage			

General Comments:

Foundations

Damage: Earthquake damage
Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Slab foundation	Concrete Slab	Concrete	Slab has moved greater than 25mm over 6 metres			
			Refer engineer designed solution	308.00 m2	500.00	154,000.00

General Comments:

Roof

Damage: No damage
Require Scaffolding? No
General Comments: Trussed metal tile

Ground Floor - Internal Garage

Damage: Earthquake damage
Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Ceiling	Gib	Paint	Cosmetic Damage			
			Rake out, plaster and paint	36.00 m2	34.00	1,224.00
Door (External)	SG Single	Aluminium	No Earthquake Damage			
Door (Internal)	Single Hollow Core	Timber	No Earthquake Damage			
Floor	Concrete	Concrete	No Earthquake Damage			
Garage door	Sectional Metal	Aluminium	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Rake out, plaster and paint	57.60 m2	34.00	1,958.40
Window	Aluminium Awning	Pane double glazed	No Earthquake Damage			

General Comments:

Ground Floor - Bathroom

Damage: Earthquake damage
Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Bath	Acrylic	Standard specification	No Earthquake Damage			
Bathroom Sink	Vanity single	Standard specification	No Earthquake Damage			
Ceiling	Gib	Paint	No Earthquake Damage			
Door (Internal)	Single Hollow Core	Timber	No Earthquake Damage			
Floor	Concrete	Vinyl	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Rake out, plaster and paint	26.40 m2	34.00	897.60
Window	Aluminium Awning	Pane double glazed	No Earthquake Damage			

General Comments:

Ground Floor - Toilet

Damage: Earthquake damage
Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Ceiling	Gib	Paint	No Earthquake Damage			
Door (Internal)	Single Hollow Core	Timber	No Earthquake Damage			
Floor	Concrete	Concrete	No Earthquake Damage			
Toilet	Standard	Standard Spec	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Rake out, plaster and paint	14.40 m2	34.00	489.60
Window	Aluminium Awning	Pane double glazed	No Earthquake Damage			

General Comments:

Ground Floor - Entry

Damage: Earthquake damage
Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Ceiling	Gib	Paint	No Earthquake Damage			
Door (External)	DG Single	Aluminium	No Earthquake Damage			
Floor	Concrete	Vinyl	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Rake out, plaster and paint	32.16 m2	34.00	1,093.44

General Comments:

Ground Floor - Lounge

Damage: Earthquake damage
Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Ceiling	Gib	Paint	No Earthquake Damage			
Door (Internal)	Single Hollow Core	Timber	No Earthquake Damage			
Floor	Concrete	Carpet	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Rake out, plaster and paint	45.12 m2	34.00	1,534.08
Window	Aluminium Awning	Pane double glazed	No Earthquake Damage			

General Comments:

Ground Floor - Living

Damage: Earthquake damage
Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Ceiling	Gib	Paint	Cosmetic Damage			
			Rake out, plaster and paint	21.50 m2	34.00	731.00
Floor	Concrete	Carpet	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Rake out, plaster and paint	44.64 m2	34.00	1,517.76
Wall framing	Timber Frame	Timber	No Earthquake Damage			
Window	Aluminium Awning	Pane double glazed	No Earthquake Damage			

General Comments:

Ground Floor - Kitchen (Kitchen and dining combined)

Damage: Earthquake damage
Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Ceiling	Gib	Paint	Cosmetic Damage			
			Rake out, plaster and paint	21.76 m2	34.00	739.84
Door (External)	DG Sliding	Aluminium	Cosmetic damage			
			Realign	1.00 No of	90.00	90.00
Door (Internal)	Single Hollow Core	Timber	Cosmetic damage			
			Ease and repaint door	1.00 No of	130.00	130.00
Floor	Concrete	Vinyl	No Earthquake Damage			
Hob	Electric	Standard Spec	No Earthquake Damage			
Kitchen joinery	Medium Spec	MDF	Structural damage			
			Repair units	1.00 No of	200.00	200.00
Range (Free standing oven)	Electric	Standard Electric	No Earthquake Damage			
Range Hood	Over Head	Standard spec	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Paint wall	47.04 m2	24.00	1,128.96
			Structural damage			

Wall covering	Gib	Paint	Remove, dispose, replace Gib, stop and undercoat	47.04 m2	99.00	4,656.96
Window	Aluminium Awning	Pane double glazed	No Earthquake Damage			
Work top	Kitchen work top	Laminate	No Earthquake Damage			

General Comments:

Ground Floor - Bedroom (Bed 3)

Damage: No damage

Require Scaffolding? No

General Comments: Painted walls and doors, carpet on floor

Ground Floor - Bedroom (Bed 2)

Damage: Earthquake damage

Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Ceiling	Gib	Paint	No Earthquake Damage			
Door (Internal)	Single Hollow Core	Timber	Cosmetic damage			
			Ease and repaint door	1.00 No of	130.00	130.00
Floor	Concrete	Carpet	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Rake out, plaster and paint	34.56 m2	34.00	1,175.04
Window	Aluminium Awning	Pane double glazed	No Earthquake Damage			

General Comments:

Ground Floor - Office/Study

Damage: Earthquake damage

Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Ceiling	Gib	Paint	No Earthquake Damage			
Door (Internal)	Single Hollow Core	Timber	Cosmetic damage			
			Ease and repaint door	1.00 No of	130.00	130.00
Floor	Concrete	Carpet	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Rake out, plaster and paint	34.56 m2	34.00	1,175.04
Window	Aluminium Awning	Pane double glazed	No Earthquake Damage			

General Comments:

Ground Floor - Bedroom (Bed 1)

Damage: Earthquake damage

Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Ceiling	Gib	Paint	No Earthquake Damage			
Door (Internal)	Single Hollow Core	Timber	No Earthquake Damage			
Floor	Concrete	Carpet	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Paint wall	44.64 m2	24.00	1,071.36
			Structural damage			
			Remove, dispose, replace Gib, stop and undercoat	44.64 m2	99.00	4,419.36
Window	Aluminium Awning	Pane double glazed	No Earthquake Damage			

General Comments:

Ground Floor - En Suite

Damage: Earthquake damage

Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Bathroom Sink	Vanity single	Standard specification				
Ceiling	Gib	Paint	No Earthquake Damage			
Door (Internal)	Single Hollow Core	Timber	Cosmetic damage			
			Ease and repaint door	1.00 No of	130.00	130.00
Floor	Concrete	Vinyl	No Earthquake Damage			
Mirror (Fixed)	Standard Spec	Mirror	No Earthquake Damage			
Shower	Cubical shower unit	Acrylic shower	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Rake out, plaster and paint	23.04 m2	34.00	783.36
Window	Aluminium Awning	Pane double glazed	No Earthquake Damage			

General Comments:

Ground Floor - Walk In Wardrobe

Damage: Earthquake damage

Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Ceiling	Gib	Paint	No Earthquake Damage			
Floor	Concrete	Carpet	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Rake out, plaster and paint	16.32 m2	34.00	554.88

General Comments:

Ground Floor - Hallway

Damage: Earthquake damage

Require Scaffolding? No

Element	Type	Material	Damages	Measure	Rate	Cost
Ceiling	Gib	Paint	Cosmetic Damage			
			Rake out, plaster and paint	10.00 m2	34.00	340.00
Door (Internal)	Single Hollow Core	Timber	Cosmetic damage			
			Ease and repaint door	2.00 No of	130.00	260.00
Floor	Concrete	Carpet	No Earthquake Damage			
Wall covering	Gib	Paint	Cosmetic damage			
			Rake out, plaster and paint	52.80 m2	34.00	1,795.20

General Comments:

Fees

Fees

Name	Duration	Estimate
Engineers report	1.00	3,555.00
Contents movement fee	1.00	808.30

Overheads

Name	Estimate
Preliminary and general	14,922.61
Margin	20,581.86
GST	33,960.07

Scope Of Works Estimate

Property

Description	Estimate
Site	3,796.80
Services	0.00
	3,796.80

Main Building

Name	Description	Estimate
Exterior	Foundations	154,000.00
	Roof	0.00
	Elevation (East)	0.00
	Elevation (North)	120.00
	Elevation (South)	85.00
	Elevation (West)	175.00
		154,380.00

Floor	Description	Estimate
Ground Floor	Bathroom	897.60
	Bedroom (Bed 1)	5,490.72
	Bedroom (Bed 2)	1,305.04
	Bedroom (Bed 3)	0.00
	En Suite	913.36
	Entry	1,093.44
	Hallway	2,395.20
	Internal Garage	3,182.40
	Kitchen (Kitchen and dining combined)	6,945.76
	Living	2,248.76
	Lounge	1,534.08
	Office/Study	1,305.04
	Toilet	489.60
	Walk In Wardrobe	554.88
		28,355.88
		28,355.88

Fees

Description	Estimate
Engineers report	3,555.00
Contents movement fee	808.30
	4,363.30

Overheads

Description	Estimate
Preliminary and general	14,922.61
Margin	20,581.86
GST	33,960.07
	69,464.54
Total Estimate	260,360.52

Inspection Sign Off

Description	Answer	comments
Land Damage		
Is there land damage?	Yes	Major cracking noted in repair strategy. In orange zone.
Contents Damage		
Has the contents schedule been left with claimant?	Yes	
Have the contents been sighted?	No	
Was a full inspection done?		
In roof space	Yes	
On roof?	No	Weather conditions.
Under sub floor?	No	Concrete floor
Decline Claim		
Recommend Declining Claim	No	
Next Action:		

Previous Claim Numbers (recorded manually in field)

- 2010/024869

File Notes

Date Created: 05/07/2011 09:51
Created : Nicholls, Kerry
Subject: Overview
Note: This property is located in a quiet street, on a flat level section, having suffred minor cosmetic damage although the land suffered approx 10% liquefaction which has been removed by the owner. The damage estimate is September 80% February 20% and is habitable. The land has an easment for a council drain on the property.

Lot 30 DP 319911.

Next Action:

Date Created: 14/12/2012 06:50
Created : Administrator, Alchemy
Subject: Assessment Address Changed
Note: From:26 HEMINGWAY PLACE, BROOKLANDS, CHRISTCHURCH
To:26 HEMINGWAY PLACE, SPENCERVILLE, CHRISTCHURCH
Next Action:

Urgent Works Items

FRONTIER ENGINEERS
CIVIL, STRUCTURAL & REMEDIAL

22 February 2017 Our Ref: 170050

To: Lena Mercer
26 Hemingway Place
Brooklands, 8083
Christchurch

email: l.teamo@xtra.co.nz

RESIDENTIAL ENGINEERING EVALUATION REPORT AND REPAIR METHODOLOGY FOR 26 HEMINGWAY PLACE, BROOKLANDS

1. Introduction

Frontier Engineers was appointed by the Client to conduct a site inspection and provide an appropriate repair methodology for the Residential Building at 26 Hemingway Place, Brooklands.

2. Observations

2.1. General Layout

The Single Storey Residential Building and Attached Double Garage consists of a 240 wide x 400 deep Reinforced Concrete Perimeter Beam supporting an internal Unreinforced Concrete Floor Slab on compacted hardfill. The external cladding consists of 70 Series Brick Veneer and the internal cladding consists of 10 mm rated plasterboard. The Timber roof framing supports Colorsteel Colortiles.

The floor plan is an irregular shape with multiple projections. No heavy masses such as chimneys were identified.

2.2. Site Observations and Measurements

The Residential Building recorded floor levels are shown in Appendix 1. Appendix 2 contains a map of the recorded cracks in the Concrete Floor Slab and Site Photographs are shown in Appendix 3.

2.2.1 Floor Levels

Floor levels were recorded using a Nivcomp level machine at the surface of the Concrete floors as all floor coverings were removed. The maximum differential settlement recorded is 76 mm. The highest level occurs at the Southwestern corner in the en-suite bathroom and the lowest recorded level occurs at the Northeastern corner in the lounge.

The MBIE has guidance around floor levels which takes into consideration non-earthquake related settlement, construction tolerances and serviceability requirements. The guidance recommends that where total differential settlement over the floor plan is between 50 mm and 100 mm, re-levelling is required.

2.2.2 Concrete Foundation System

The Residential Building Concrete Floor Slab was inspected and no control joints were identified which is rare for an irregularly shaped floor slab.

Cracks were recorded during the site inspection, most cracks were between 0.4 mm and 0.8 mm wide and typically originate from re-entrant corners. The maximum crack width recorded is 1.9 mm at the master bedroom. A floor plan indicating the recorded cracks is shown in Appendix 2. Due to the absence of adequate control joints, the extent and width of the cracks observed, it is Frontier Engineers opinion that the cracks are predominantly due to drying shrinkage of the irregularly shaped floor slab. It is likely that the cracks may have been exacerbated by the Canterbury Earthquake Sequence, but the crack widths and lack of super-structure damage indicates that exacerbation and widening of the cracks was minimal.

The maximum cumulative crack width recorded in any direction is 5.10 mm which is below the threshold of 20 mm as indicated by the MBIE Guidance for lateral stretch of a Concrete Foundation. Furthermore, the lateral stretch criteria is typically applied to the Concrete Perimeter Foundation Beam which, when observed from the exterior around the perimeter of the Residential Building, did not contain any noticeable cracks.

The perimeter Concrete foundation beam and floor slab are not damaged to an extent that could limit re-levelling

2.2.3 Walls and Lining

The verticality of walls were recorded and found to be within construction tolerance except for one garage wall at the Northern elevation and the dining room wall at the western elevation. The recorded verticality of 8 mm/m and 7 mm/m is not a structural concern and does not indicate that the lateral bracing capacity of the Residential Building is compromised. No pattern of racking or creasing in the corners of joining walls and ceilings was noted that would indicate that the ability of the Residential Building to withstand a future seismic event is reduced.

2.2.4 Roof

The roof is in a good structural condition as no deflection of the ridgeline or variable slopes in the gutter and valleys was noted. The roof cladding was not loose and downpipes appeared in working order.

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CIVIL, STRUCTURAL & REMEDIAL

3. Repair Methodology

Considering the recorded floor levels and observed damage at the Concrete Floor Slab and Concrete Perimeter Foundation Beam, it is Frontier Engineers opinion that the Residential Building may be re-levelled in order to achieve acceptable floor slopes as required by the current New Zealand Building Code and the MBIE Guidance for Residential Buildings damaged by the Canterbury Earthquake Sequence.

With reference to the site specific Geotechnical Investigation Report which was completed for 26 Hemingways by Riley Consultants, 200 kPa is available at 0.45 m[1] below natural ground level. A bearing capacity of 200 kPa is adequate for re-levelling.

Specific Engineering Designed Concrete re-levelling pads may be constructed below the existing Concrete Foundation Beam by a specialist contractor. It is common for further cracking to occur as a result of re-levelling processes which may require additional repairs and needs to be completed prior to completion of works.

Stefan Pienaar

Senior Engineer, B Eng

Alan Pearson

Director, CPEng

[1] 26 Hemingways Place, Geotechnical Investigation Report, Riley Consultants, 4 July 2013 – page 4

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Appendix 1: Floor Level Survey

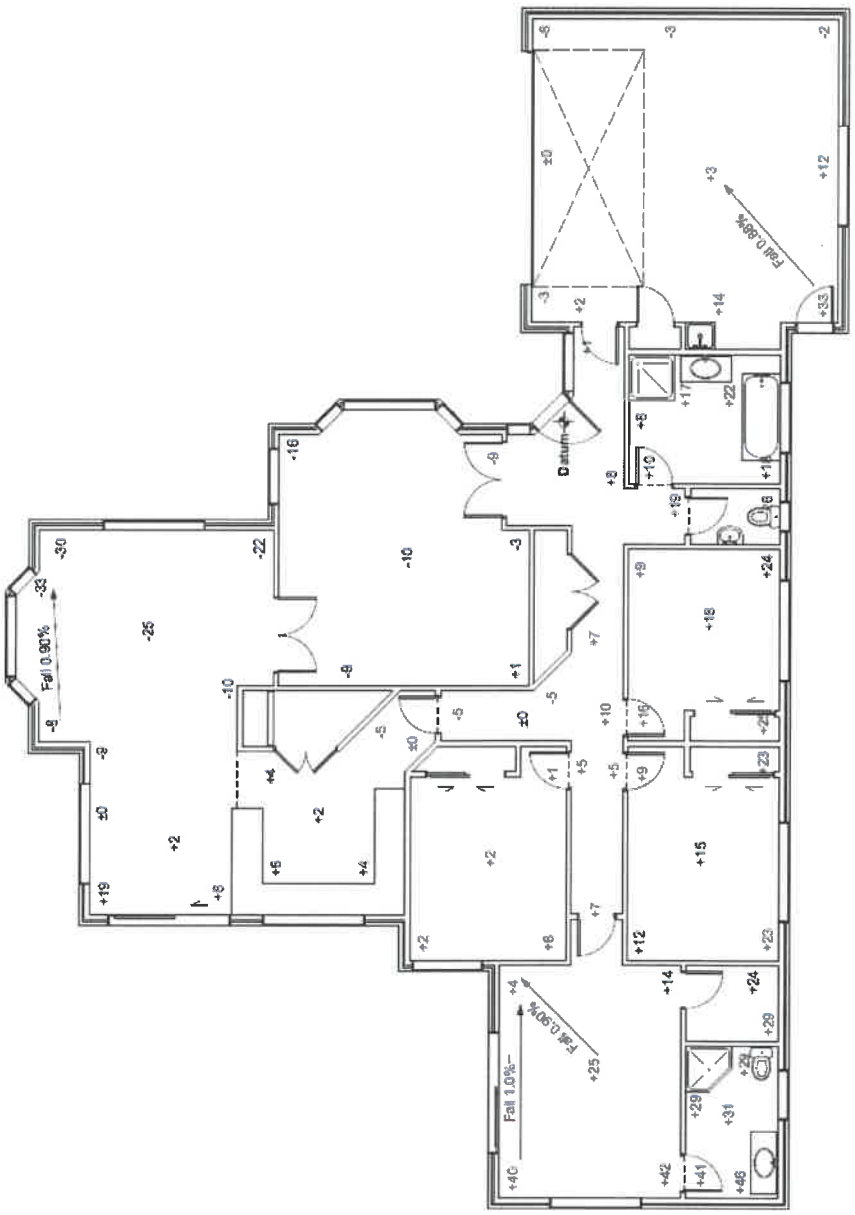


Figure 1: Floor Level Survey

Appendix 2: Crack Map

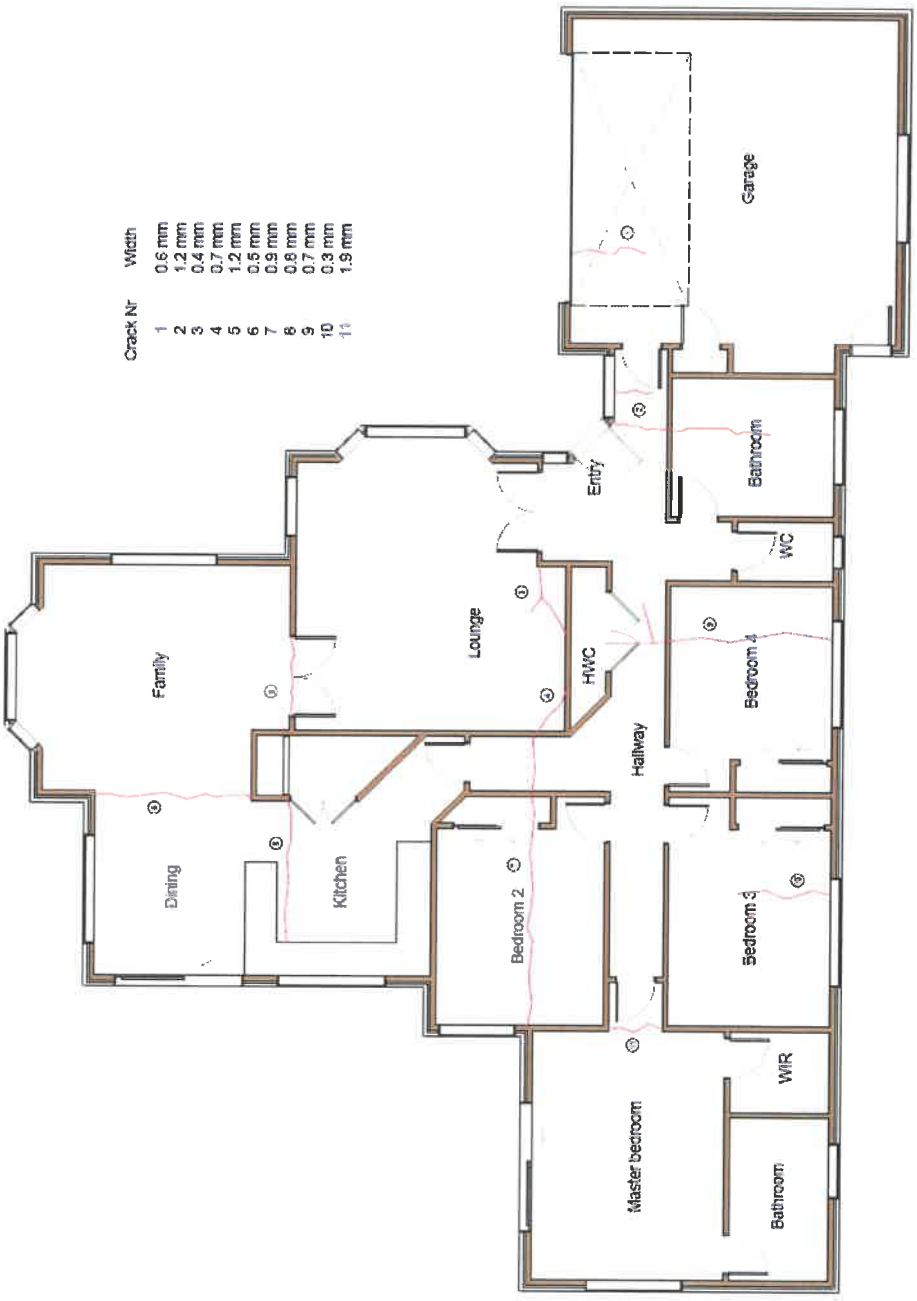


Figure 2: Crack Map

Appendix 3: Photographs

Photo 1: Typical Concrete Perimeter

Photo 2: Typical damage at internal lining damage

Photo 3: Typical crack originating at re-entrant corners

Photo 4: Roof in good condition

Christchurch City Council

14 March 2017

G W Mercer
2 Riverside Lane
Christchurch 8083

Dear Grant

Building Act exemption: BCN/2017/1413
26 Hemingway Place Spencerville
Re-level

Building Act exemption approved

We have considered your application, under Schedule 1, clause 2(a) of the Building Act 2004, for exemption from the requirement to obtain building consent.

We are satisfied that the completed work is likely to comply with the building code, provided it is carried out in accordance with your proposal. Therefore, your application has been approved.

You can download stamped copies of your proposal documents from onlineservices.ccc.govt.nz. Please forward copies to the building owner.

Advice

- All building work must comply with the Building Act, building code, and all other applicable laws.
- This letter does not provide any approval that may be required, other than that stated.
- This approval is valid if the work is completed within two years of **14 March 2017.**

As the Council does not inspect the work, it is recommended that completion verification documents be supplied to the Council on completion of the work. These will be placed on the file for the property, and may prove beneficial for future enquiries (for example, land information memoranda (LIMs) or property file requests).

Yours sincerely

Gray Packer
Building Consent Officer
Building Certification & Exemption Team
Consenting & Compliance Group

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

Construction Monitoring No.#1 R00

PROJECT NUMBER: 170050	PROJECT NAME: 26 Hemingway Place
ARCHITECT:	BUILDER: Heritage House Relevellers
TOPIC/ITEM: Scala Penetrometer Test	
ISSUE TO: Lena Mercer	
DATE ATTENDED: 15 March 20110	
TIME ATTENDED: 9:00	
FOREMAN ONSITE: Yes	

	Blows						
Test Pit Number	0	2	4	6	8	10	Average Penetration Per Blow
1	1723	1681	1633	1608	1575	1544	18
2	1624	1576	1534	1501	1469	1435	19
3	1700	1677	1647	1616	1583	1553	15
4	1612	1586	1544	1517	1493	1464	15
5							
6							
7							
8							
9							
10							

Construction Monitoring No.#1 R00

ISSUE	Y	N	COMMENTS
AVERAGE PENETRATION PER BLOW	Y		Average penetration per blow does not exceed 20 mm for all pits
300 KPa ACHIEVED		N	
200 KPa ACHIEVED	Y		
150 KPA ACHIEVED	Y		
ISSUE WITH TEST PITS		N	PROBLIMATIC TEST PIT NUMBERS: none KPa ACHIEVED:
BEARING CAPACITY SATISFACTORY	Y		
REMEDIAL WORK REQUIRED	Y		No remedial work required
FURTHER COMMENTS		N	

Construction Monitoring No.#1 R00

CHECK OFF			
ISSUE	**Y**	**N**	**COMMENT**
CONSTRUCTION SATISFACTORY	Y		
MORE INFORMATION REQUIRED		N	
SITE PHOTOGRAPHS REQUIRED (TO BE PROVIDED BY BUILDER)		N	
ADDITIONAL SITE VISIT REQUIRED		N	
INSPECTION PASSED	Y		
FURTHER COMMENTS: The dugouts were excavated to a minimum of 0.5 m bgl. The dimensions of the dugout exceeded or mated the 600 mm square pads that Frontier Engineers specified. The contractor may now pour the underpinning pads. Water must be pumped out of all pits prior to pouring concrete.			

FRONTIER ENGINEERS LTD

Signed:

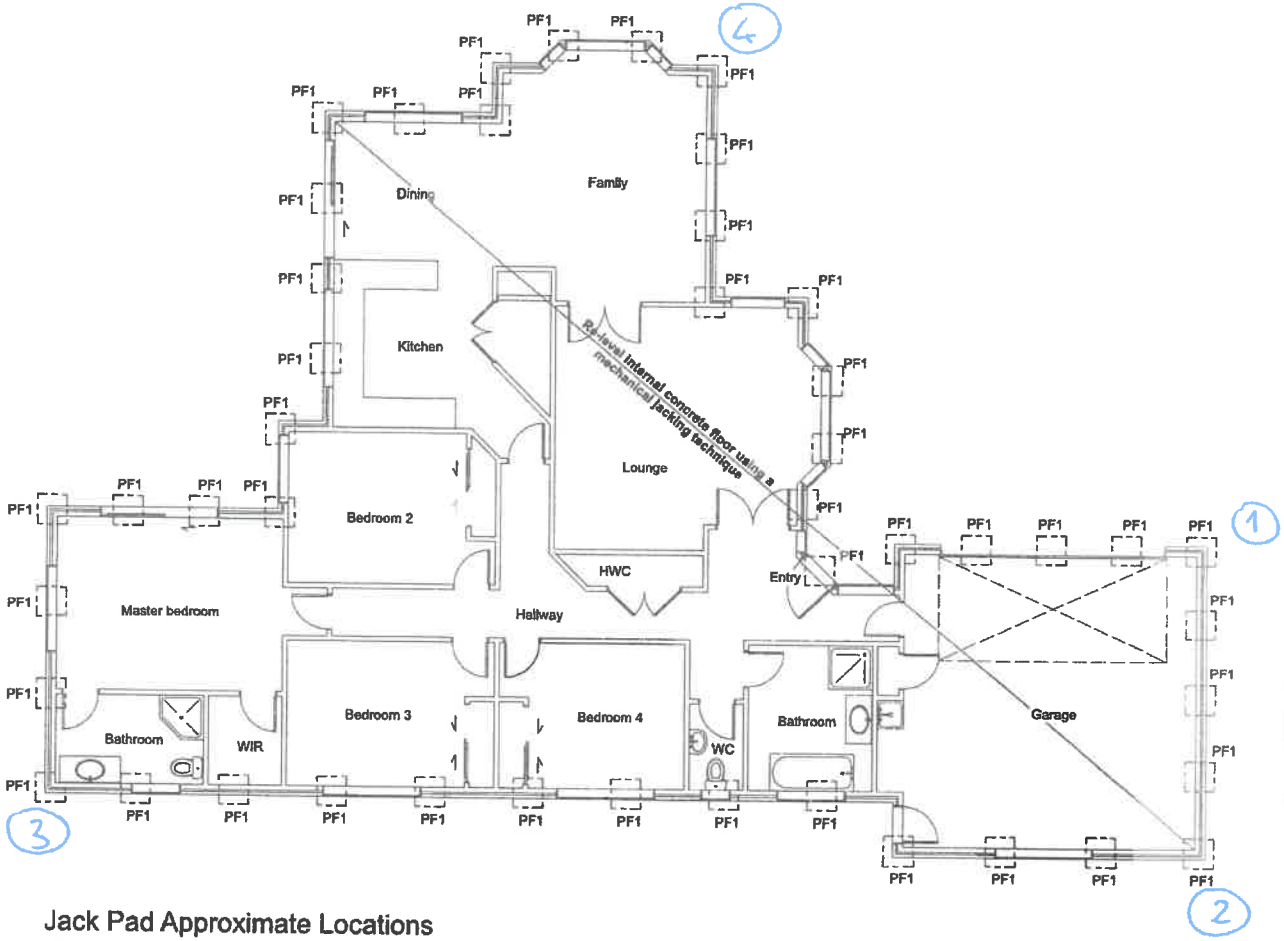
Engineer: Alexander Zamshin

Date Issued: 15 March 2017

Construction Monitoring No.#1 R00

PHOTOS

① - Test pits



Jack Pad Approximate Locations

SCALE 1:100

Schedule	
PF1	600x600sq. concrete pad footing at max. 2.0m crs*

Notes:

1. Contractor is to confirm all dimensions on site before commencing work
2. Contractor is to confirm floor levels at each pile or bearer support location to be packed.
3. Pad target depth is 0.5m min. below ground level.
4. Disconnect and reconnect services as required.
5. Ensure guttering falls to downpipes after relevelling.
6. Ensure all doors open and close properly.
7. All work to be carried out in accordance with NZS3604-2011.
8. Contractor to make all walls plumb.
9. Cracks in all concrete structures are to be repaired using proprietary product crack bond 'LR321G' supplied by adhesives technology corporation or approved equivalent.
   Cracks to be repaired up to a maximum of 5mm and any cracks of more than 5mm are to be repaired by using Helibar or any approved equivalent.
   Product to be installed strictly in accordance with manufacturers instructions

* Please note, positions of concrete pads are an approximate location setting

FRONTIER ENGINEERS
CIVIL, STRUCTURAL & REMEDIAL

PO Box 79183 Avonhead
Christchurch 8446

Unit 1, 35 Sheffield Crescent, Burnside 8053

Phone: 03 359 9192
Free Call: 0508 FRONTIER (0508 376 684)

Email: admin@frontierengineers.co.nz

Rev ID	Description	Date
00	Issued for Consent	6/03/2017

Scale at A3	1:100
Date	6/03/2017
Design by	AZ
Drawn by	DC
Approved	
Date	
Project	Earthquake Repairs
Address	26 Hemingway Place, Spencerville
Client	Grant & Lena Mercer
Drawing Title	Ground Floor Jack Pad Approximate Locations
Project Number	170050
Sheet	S03
Rev ID	00
Project Status	Consent Issue

Construction Monitoring No.#2 R00

PROJECT NUMBER: 170050	PROJECT NAME: 26 Hemingway Place, Spencerville
ARCHITECT: N/A	CONTRACTOR: Heritage House Relevellers Ltd.
TOPIC/ITEM: Post Level Floor Check	PAGES: 1 + Attachment
ISSUE TO: Lena Mercer l.teamo@xtra.co.nz, Lindsay Smith: hhr@hotmail.co.nz	
DATE ATTENDED: 13 April 2017	
TIME ATTENDED: 2.30pm	

REPORT: Frontier Engineers conducted a site inspection located at 26 Hemingway Place as requested by Heritage House Relevellers.

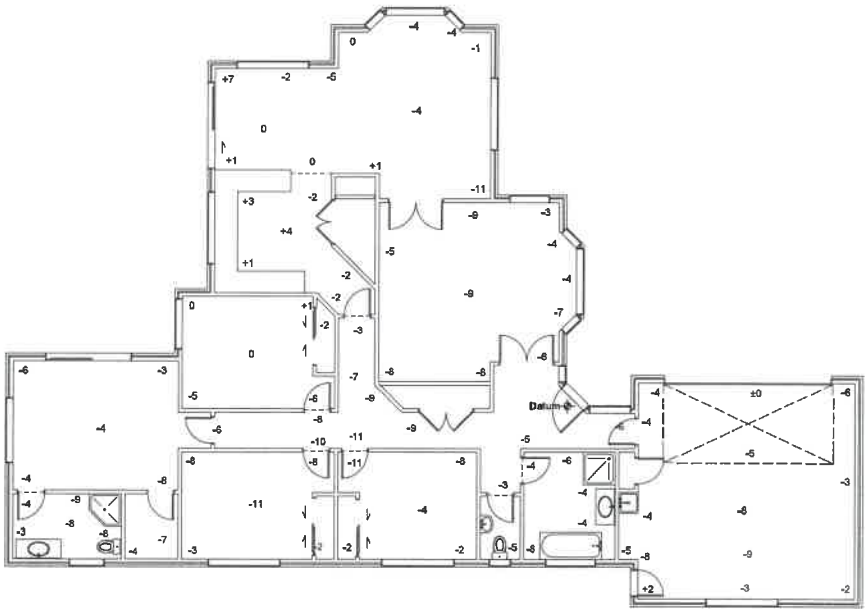
Post Level Re-inspection:

Contractor was instructed onsite to apply 6 mm of floor levelling compound to the floor at the bay window in Family Room. After it was done, the result of the post level survey has met the requirements of MBIE guidance of maximum acceptable slope of 0.5% in between any two points more than 2 meters apart in the dwelling.

FRONTIER ENGINEERS LTD

Signed:

Engineer: Alexander Zamshin
Date Issued: 8 May 2017



Ground Floor Pre-Level Survey

SCALE 1:100

Legend:

- x.x% → Indicates floor slope
- ±X Indicates floor level above or below datum
- ------- Indicates change in floor type

Notes:

1. Following relevelling the floor at each unit shall have
   i. maximum differential height of 50mm overall
   ii. 10mm within any room.
   iii. have a maximum slope of 1:200 (0.5%) between any to points more than 2m apart.
2. All levels shown on this plan are relative to the indicated datum.
3. All floor levels locations and slopes approximate

FRONTIER ENGINEERS
CIVIL, STRUCTURAL & REMEDIAL

PO Box 79183 Avonhead
Christchurch 8446

Unit 1, 35 Sheffield Crescent, Burnside 8053

Phone: 03 359 9192
Free Call: 0508 FRONTIER (0508 376 884)

Email: admin@frontierengineers.co.nz

Rev ID	Description	Date
00	Issued for Consent	21/02/2017

Scale at A3	1:100
Date	21/02/2017
Design by	AZ
Drawn by	DC
Approved Date	

Project	Earthquake Repairs
Address	26 Hemingway Place, Brooklands
Client	Grant & Lena Mercer
Drawing Title	Ground Floor Pre-Level Floor
Project Number	170050
Sheet	S02
Rev ID	00
Project Status	Consent Issue

Building Code Clause(s)...B1.....

PRODUCER STATEMENT – PS4 – CONSTRUCTION REVIEW

(Guidance notes on the use of this form are printed on page 2)

ISSUED BY: Frontier Engineers Ltd..... .....
(Construction Review Firm)

TO: Grant & Lena Mercer.....
(Owner/Developer)

TO BE SUPPLIED TO: Christchurch City Council I
(Building Consent Authority)

IN RESPECT OF: Re-level of existing dwelling only
(Description of Building Work)

AT: ...26 Hemingway Place, Spencerville, Christchurch 8083.....

..... **LOT**.....30 ..... **DP** .....319911..... **SO** .....

Frontier Engineers Ltd ..has been engaged by Liam Brewer.....
(Construction Review Firm)
To provide☐CM1☐CM2☐CM3☐CM4☐CM5*(Engineering Categories)* or ☒ observation as per agreement with owner/developer

or ☐other ...Structural Design of specific building elements and Supervision.....services
(Extent of Engagement)
in respect of clause(s) .....B1/VM1 .....of the Building Code for the building work described in

documents relating to Building Consent No. BCN/2017/1413..... and those relating to

Building Consent Amendment(s) Nos. ....issued during the

course of the works. We have sighted these Building Consents and the conditions of attached to them.

Authorised instructions / variations(s) No. ...Record of Inspections letter attached.... (copies attached)

or by the attached Schedule ☐ have been issued during the course of the works.

On by the basis of ☐this ☒these review(s) and information supplied by the contractor during the course of the works and **on behalf of the firm** undertaking this Construction Review, **I believe on reasonable grounds** that ☒All ☐Part only of the building works have been completed in accordance with the relevant requirements of the Building Consent and Building Consent Amendments identified above, with respect to Clause(s) ...B1....of the Building Code.
I also believe on reasonable grounds that the persons who have undertaken this construction review have the necessary competency to do so.

I, Alan Pearson.....am: ☒CPEng No. ...1024104.....
(Name of Construction Review Professional)

☐Reg Arch No. .....

I am a Member of : ☒IPENZ ☐NZIA and hold the following qualifications: .....B.Eng.....

The Construction Review Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.
The Construction Review Firm is a member of ACENZ : ☐

SIGNED BY Alan Pearson..... **ON BEHALF OF** Frontier Engineers Ltd.....

Date:...8 May 2017..... ..... Signature:.....

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form is to accompany **Forms 6 or 8 of the Building (Form) Regulations 2004** for the issue of a Code Compliance Certificate.

Construction Monitoring No.#2 R00

PROJECT NUMBER: 170050	PROJECT NAME: 26 Hemingway Place, Spencerville
ARCHITECT: N/A	CONTRACTOR: Heritage House Relevellers Ltd.
TOPIC/ITEM: Post Level Floor Check	PAGES: 1 + Attachment
ISSUE TO: Lena Mercer l.teamo@xtra.co.nz, Lindsay Smith: hhr@hotmail.co.nz	
DATE ATTENDED: 13 April 2017	
TIME ATTENDED: 2.30pm	

REPORT: Frontier Engineers conducted a site inspection located at 26 Hemingway Place as requested by Heritage House Relevellers.

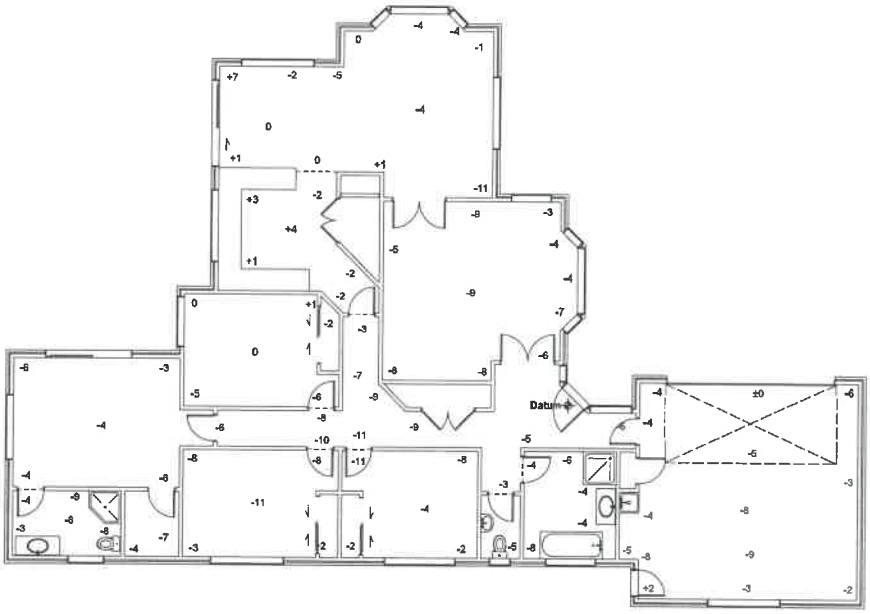
Post Level Re-inspection:

Contractor was instructed onsite to apply 6 mm of floor levelling compound to the floor at the bay window in Family Room. After it was done, the result of the post level survey has met the requirements of MBIE guidance of maximum acceptable slope of 0.5% in between any two points more than 2 meters apart in the dwelling.

FRONTIER ENGINEERS LTD

Signed:

Engineer: Alexander Zamshin
Date Issued: 8 May 2017



Ground Floor Pre-Level Survey

SCALE 1:100

Legend:

x.x% → Indicates floor slope

±X Indicates floor level above or below datum

------ Indicates change in floor type

Notes:

1. Following relevelling the floor at each unit shall have
   i. maximum differential height of 50mm overall
   ii. 10mm within any room.
   iii. have a maximum slope of 1:200 (0.5%) between any to points more than 2m apart.
2. All levels shown on this plan are relative to the indicated datum.
3. All floor levels locations and slopes approximate

FRONTIER ENGINEERS
CIVIL, STRUCTURAL & REMEDIAL

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Christchurch 8448

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Phone: 03 359 6162
Free Call: 0508 FRONTIER (0508 376 684)

Email: admin@frontierengineers.co.nz

Rev ID	Description	Date
00	Issued for Consent	21/02/2017

Scale at A3	1:100
Date	21/02/2017
Design by	AZ
Drawn by	DC
Approved	
Date	

Project	Earthquake Repairs
Address	26 Hemingway Place, Brooklands
Client	Grant & Lena Mercer
Drawing Title	Ground Floor Pre-Level Floor
Project Number	170050
Sheet	S02
Rev ID	00
Project Status	Consent Issue

PRODUCER STATEMENT – PS1 – DESIGN

(Guidance notes on the use of this form are printed on page 2)

ISSUED BY: Frontier Engineers Ltd.....
(Design Firm)

TO: Grant & Lena Mercer
(Owner/Developer)

TO BE SUPPLIED TO: Christchurch City Council.....
(Building Consent Authority)

IN RESPECT OF: Re-level of existing dwelling only.
(Description of Building Work)

AT: 26 Hemingway Place, Spencerville, Christchurch 8083
(Address)

..... **LOT** 30..... **DP** 319911 **SO** .....

We have been engaged by the owner/developer referred to above to provide ...Structural Design of specific building elements and Supervision..... services in respect of the requirements of
(Extent of Engagement)
Clause(s) B1/VM1 ..of the Building Code for
All ☐ or Part only ☒ (as specified in the attachment to this statement), of the proposed building work.

The design carried out by us has been prepared in accordance with:

☒ Compliance Documents issued by the Ministry of Business, Innovation & Employment...B1/VM1 ... .or
(verification method / acceptable solution)

☐ Alternative solution as per the attached schedule ... ...

The proposed building work covered by this producer statement is described on the drawings titled .....

...Earthquake Repairs, 26 Hemingway Place, Spencerville and numbered 170050 S00-S06.....;
together with the specification, and other documents set out in the schedule attached to this statement.
On behalf of the Design Firm, and subject to:
(i) Site verification of the following design assumptions ground as per Geotechnical report by Riley Consultants, dated 4 July 2013, ref.13801/83-A and • Penetrometer test report by Fulton Hogan Canterbury Laboratory, dated 6 August 2002, ref.200/1517/30...
(ii) All proprietary products meeting their performance specification requirements;

I **believe on reasonable grounds** that a) the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code and that b), the persons who have undertaken the design have the necessary competency to do so. I also recommend the following level of construction monitoring/observation:
☐CM1 ☐CM2 ☐CM3 ☐CM4 ☐CM5 (Engineering Categories) or ☒ as per agreement with owner/developer (Architectural)

I, Alan Pearson ... am: ☒CPEng 1024104#
(Name of Design Professional)

☐Reg Arch ..... .#

I am a Member of : ☒ IPENZ ☐NZIA and hold the following qualifications B. Eng
The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.
The Design Firm is a member of ACENZ: ☐

SIGNED BY ...Alan Pearson..... ON BEHALF OF Frontier Engineers
(Design Firm)

Date 06/03/2017 ..... (signature).....

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

Form 2A

Memorandum from licensed building practitioner: Certificate of design work

Section 45 and Section 30C, Building Act 2004

Please fill in the form as fully and correctly as possible.

If there is insufficient room on the form for requested details, please continue on another sheet and attach the additional sheet(s) to this form.

THE BUILDING

Street address: 26 Hemingway Place	
Suburb: Spencerville	
Town/City: Christchurch	Postcode: 8083

THE OWNER

Name(s): Grant & Lena Mercer	
Mailing address: 2 Riverside Lane	
Suburb: Halswell	PO Box/Private Bag:
Town/City: Tai Tapu	Postcode: 7672
Phone number:	Email address: L.Teamo@xtra.co.nz

BASIS FOR PROVIDING THIS MEMORANDUM

I am providing this memorandum in my role as the: Please tick the option that applies (✓)	
( )	**sole** designer of all of the RBW design outlined in this memorandum – I carried out all of the RBW design myself – no other person will be providing any additional memoranda for the project
( )	**lead** designer who carried out some of the RBW design myself but also supervised other designers – this memorandum covers their RBW design work as well as mine, and no other person will be providing any additional memoranda for the project
( )	**lead** designer for all but specific elements of RBW – this memorandum only covers the RBW design work that I carried out or supervised and the other designers will provide their own memoranda relating to their specific RBW design
(✓)	**specialist** designer who carried out specific elements of RBW design work as outlined in this memorandum – other designers will be providing a memorandum covering the remaining RBW design work

IDENTIFICATION OF DESIGN WORK THAT IS RESTRICTED BUILDING WORK (RBW)

I, Alan Pearson, carried out / supervised the following design work that is restricted building work

PRIMARY STRUCTURE: B1

Design work that is restricted building work	Description	Carried out/ supervised	Reference to plans and specifications
Tick(√)if included *Cross (X) if excluded*	*[If appropriate, provide details of the restricted building work]*	*[Specify whether you carried out this design work or supervised someone else carrying out this design work]*	*[If appropriate, specify references]*

PRIMARY STRUCTURE: B1

All RBW Design work relating to B1 (x)		( ) Carried out ( ) Supervised	
Foundations and subfloor framing (✓)	*Re-level of existing foundation only*	(x) Carried out (✓) Supervised	Refer drawing set from Frontier Engineers 170050
Walls (x)		( ) Carried out ( ) Supervised	
Roof (x)		( ) Carried out ( ) Supervised	
Columns and beams (x)		( ) Carried out ( ) Supervised	
Columns and beams (x)		( ) Carried out ( ) Supervised	
Other (x)		( ) Carried out ( ) Supervised	

EXTERNAL MOISTURE MANAGEMENT SYSTEMS: E2

All RBW design work relating to E2 (x)		( ) Carried out ( ) Supervised	
Damp proofing (x)		( ) Carried out ( ) Supervised	
Roof cladding or roof cladding system (x)		( ) Carried out ( ) Supervised	
Ventilation system (for example, subfloor or cavity) (x)		( ) Carried out ( ) Supervised	
Wall cladding or wall cladding system (x)		( ) Carried out ( ) Supervised	

Waterproofing	(x)		( ) Carried out ( ) Supervised	
Other	(x)		( ) Carried out ( ) Supervised	

FIRE SAFETY SYSTEMS: C1 – C6

Emergency warning systems, evacuation and fire service operation systems, suppression or control systems, or other	(x)		( ) Carried out ( ) Supervised	

Note: The design of fire safety systems is only restricted building work when it involves small-to-medium apartment buildings as defined by the Building (Definition of Restricted Building Work) Order 2011.

Note: continue on another page if necessary.

WAIVERS AND MODIFICATIONS

Waivers or modifications of the building code are required	(x) Yes	(✓) No

If Yes, provide details of the waivers or modifications below:

Clause	**Waiver/modification required**
[List relevant clause numbers of building code]	*[Specify nature of waiver or modification of building code]*

Note: continue on another page if necessary.

ISSUED BY

Name: Alan Pearson	LBP or Registration number: 1024104
The practitioner is a: (x) Design LBP (x) Registered architect (✓) Chartered professional engineer	
Design Entity or Company (optional): Frontier Engineers Ltd	
Mailing address (if different from below): PO Box 79183, Avonhead, Christchurch, 8446	
Street address / Registered office: 1/35 Sheffield Crescent	
Suburb: Burnside	Town/City: Christchurch
PO Box/Private Bag:	Postcode: 8053
Phone number:	Mobile: 027 923 7888
After Hours:	Fax:
Email address: admin@frontierengineers.co.nz	Website: www.frontierengineers.co.nz

DECLARATION

I, Alan Pearson , CP Eng 1024104,

state that I have applied the skill and care reasonably required of a competent design professional in carrying out or supervising the Restricted Building Work (RBW) described in this form, and that based on this, I also state that the RBW:

- Complies with the building code; or
- Complies with the building code subject to any waiver or modification of the building code recorded on this form.

Signature: Alan Pearson

Date: 6/03/2017

CONSTRUCTION MONITORING SCHEDULE
JOB LOCATION: 26 HEMINGWAY PLACE, SPENCERVILLE, CHRISTCHURCH 8083
FILE NUMBER: 170050

Construction monitoring site visits relating to compliance with the building consent documentation and for verification of design assumptions are required as follows:

	TIME	NUMBER OF VISITS
1	Base of excavation pads	1-2
2	Post floor level survey	1

A site inspection report will be sent within 24hrs after inspection to the Client. A Producer Statement 4, Construction Review, could be issued once the above monitoring site visits have been completed. It is the Clients responsibility to notify the Engineer to enable the above site visits to be completed.

Alexander Zamshin
Frontier Engineers Ltd

FRONTIER ENGINEERS
CIVIL STRUCTURAL & REMEDIAL

Design Feature Report

Re-level of Existing Residential Building

Location 26 Hemingway Place, Spencerville, Christchurch 8083
Client Grant & Lena Mercer

Job No: 170050
Issue Date: 06-March-17
Revision: 00

Document Quality Assurance Record

Document prepared by:

FRONTIER ENGINEERS LTD
1/35 Sheffield Crescent
Burnside
Christchurch 8053

PO Box 79183
Avonhead
Christchurch 8446
New Zealand

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E| admin@frontierengineers.co.nz
W| frontierengineers.co.nz

Document Transmittal

Rev	Date	Revision Details/Status	Author	Reviewer
00	06 March 2017	Issued to Client	Alexander Zamshin	Stefan Pienaar

Author Signature:		**Reviewer Signature:**		**Approver Signature:**	
Name:	Alexander Zamshin	**Name:**	Stefan Pienaar	**Name:**	Alan Pearson
Title	Engineer	**Title**	Eng. Manager	**Title**	CPEng

FRONTIER ENGINEERS
CIVIL, STRUCTURAL & REMEDIAL

Introduction:

The existing Residential Building was damaged in the Canterbury Earthquake Sequence (CES) including differential settlement. The structural integrity of the dwelling is satisfactory; however, re-levelling is required to amend differential settlement of more than 50 mm and floor slopes that exceed 1:200.

Scope of work:

Frontier Engineers has been engaged by Grant & Lena Mercer to prepare technical documentation and certification for the re-level of the existing Residential only:

- Technical drawings of the proposed repairs
- Producer Statement 1
- Memorandum of Works
- Construction Monitoring Schedule
- Site inspection reports
- Producer Statement 4

Exclusions:

- All repair works other than re-levelling or direct repairs to the foundation system
- Strengthening of the Residential Building in anyway
- Future proofing of the Residential Building in anyway
- Any work above foundation level
- The works are assumed to be carried out under a Consent Exemption, and on this basis we refer to the Guidance for Building Work that Does Not Require a Building Consent (Building Act 2004) issued by the MBIE regarding section 42A of the Building Act,

  (a) the building work complies with the building code to the extent required by this Act:
  (b) after the building work is completed, the building:
  (i) if it complied with the building code immediately before the building work began, continues to comply with the building code; or
  (ii) if it did not comply with the building code immediately before the building work began, continues to comply at least to the same extent as it did then comply.

I.e. where specific parts of the building are modified our intention is to ensure that the building will function structurally to at least the same extent as it did prior to repairs, but may not necessarily be brought up to the current building code requirements.

Reference:

- Updated Geotechnical Report by Riley Consultants, dated 3 March 2017, ref.13801/83-B
- Residential Engineering Evaluation Report by Frontier Engineers, dated 22 February 2017, ref.170050
- NZS3101 Concrete Structures
- MBIE Guidance

Building Summary:

Foundation Type:	Perimeter reinforced concrete foundation and unreinforced concrete slab
Structural Framing:	Timber framing
No. of Storeys:	1
Wall Cladding Weight:	Heavy – clay brick veneer
Roof Cladding Weight:	Light – pressed steel
Technical Category:	TC3, TC2 according to site specific investigation by Riley Consultants
200kPa Bearing:	@ 0.45mbgl
Target Pad Depth:	0.5mbgl
Minimum Pad Size:	600mm x 600mm
Typical Pad Spacing:	2.0m
Max Pad Spacing:	2.0m

Design Philosophy:

Re-levelling

Mechanical jacking of the concrete structures using portable jacks and excavations at the lifting locations. The lifting locations are considered temporary until the dwelling is reinstated to its pre-earthquake condition. Any additional material or concrete works that remain on site are not considered to decrease any future performance, nor is it to be relied on as betterment or considered to increase performance during future earthquake events.

It is common for further cracking to occur as a result of re-levelling processes, which may require additional repairs, and needs to be completed prior to completion of works.

The concrete foundations have been assessed based on minimum steel design, but an additional design check has been made to consider the consequences of no reinforcement, and the concrete required to span using the flexure tensile capacity only.

As part of this assessment we have not considered the permanent lateral stretch of the building, or any other complications that may arise from re-levelling the building. Additionally, we do not know the condition of the dwelling prior to re-levelling, or the differential settlement of the foundations prior to the earthquake events. For this reason it may not be practical to re-level the foundations where historical or long term settlement has previously occurred.

As the loading on the re-levelling pads is temporary, we have considered a safety factor of 2 for the ultimate bearing capacity.

APPENDIX – Design calculations

- Foundation Loading
- Re-levelling pads
- Concrete beam span
- Concrete slab span

STANDARD CALCULATION TEMPLATE

JOB NAME: 26 Hemingway Place
JOB NO.: 170050
ENGINEER: A Zamshin
DATE: 17/02/2017

JOB DESCRIPTION:

Re-levelling of existing building

- Perimeter reinforced concrete foundation
- Unreinforced concrete floor slab
- Single storey building
- Heavy clay brick veneer cladding
- Light steel sheet roof cladding

STANDARD NOTATION AND DEFINITIONS

ACRONYMS

Foundations		Floor	
SF1	Strip Footing	FB1	Floor Bearer
PF1	Pad Footing	FJ1	Floor Joist
EB1	Edge Beam	SP1	Stringer Plate
IB1	Internal Beam	FP1	Pile
IR1	Internal Rib	VCJ	Vertical Control Joint
WP	Weld Plate		
SCJ	Saw Cut Joint		
CJ1	Control Joint		
CKJ	Connolly Key Joint		

Wall		Roof	
EW1	External Wall	R1	Rafter
IW1	Internal Wall	P1	Purlins
FW1	Fire Wall	VB	Veranda Beam
L1	Lintel	RB1	Roof Bracing
C1	Column	B1	Beam (steel or timber)
		B1	Ridge Beam

Other

TC#	Technical Category according to CERA for liquefaction risk
NZS	New Zealand Standard
MBIE	Ministry of Building, Innovation and Employment

DEFINITIONS

Along	Along the ridge line (Longitudinal)
Across	Across the ridge line (Transverse)

NZS 1170.0 - DESIGN ACTIONS - PART 0: GENERAL PRINCIPALS

REF		
3.3	**IMPORTANCE LEVEL**	
T 3.1	Structure designed for importance level	**2**
T3.1	Consequence of failure	ORDINARY
T3.1	Description: Medium consequence for loss of human life, or considerable economic, social or environmental consequences	
T3.1	Comment: Normal structures and structures not falling into other levels	
T3.2	Importance level desciption: Normal structures and structures not in other importance levels	
3.4	**ANNUAL PROBABLITY OF EXCEEDENCE**	
T3.3	Design working life	**< 6 months**

Design annual probability of exceedence

Wind	ULS	1/100
Snow	ULS	1/50
Earthquake	ULS	1/100
SLS1	Service	1/25
SLS2	Service	-

3.4.2 *SLS1 — the structure and the non-structural components do not require repair after the*
3.4.2 *SLS1 earthquake, snow or wind event*

SLS2—the structure maintains operational continuity after the SLS2 earthquake (Importance L4 only)

NZS 1170.1 - PART 1: PERMANENT, IMPOSED AND OTHER LOADS

REF

4.2 COMBINATION FACTORS

G	Dead Loads (Permanent)
Q	Live Loads (Imposed)
ψ	load factor

4.2.2 Design Combinations for Strength

1.35G	Dominate Permernate Action
1.2G + 1.5Q	Permanent and Imposed Action
$1.2G + W_u$ (Down) + $\psi_c Q$	Permanent , Wind and Imposed Action
$0.9G + W_u$ (Up)	Permanent , Wind Reversal
$1.2G + S_u + \psi_c Q$	Permanent, Snow and Imposed
$1.0G + E_u + \psi_c Q$	Earthquake ULS

T4.1

ψ_c =	0.4 for roofs
	0.6 storage
S_u =	0.9kPa Minimum for Christchurch

4.3 Design Combinations for Servicabiltiy

$G + \psi_c Q$	Permanent and Imposed Action
E_s	Earthuquake SLS1

S5 METHOD OF ANALYSIS

STATIC
ELASTIC

NZS 1170.1 - PART 1: PERMANENT, IMPOSED AND OTHER LOADS
NZS 3604 - TIMBER FRAMED BUILDINGS - DESIGN LOADING

REF

3604 **Live Loading (Q)**

T1.2	Dwelling Floor Live Load	1.5	kPa	A1
	Dwelling Balconies/Decks	2.0	kPa	A1
	Dwelling Bathrooms	2.0	kPa	A2
	Communal Kitchens	3.0	kPa	A2
	Offices and Work Areas	3.0	kPa	B
	Dwelling Roof Load	0.25	kPa	

Dead Loading (G) - including timber framing

Branz	Light Roof	0.40	kPa		
3604	Heavy Roof	0.85	kPa		
	Light Wall	1.20	kN/m	H=	2.4
	Medium Wall	2.80	kN/m	H=	2.4
	Heavy Wall	6.40	kN/m	H=	2.4
	190 Block Wall	8.40	kN/m	H=	2.4
	190 Block Wall	11.40	kN/m	H=	2.4
	Timber Subfloor	0.40	kPa		
	Suspended Timber Floor	0.40	kPa		

Material Densities

$\mu_{Concrete}$	25.0	kN/m^3
μ_{Timber}	6.0	kN/m^3
μ_{Steel}	72.5	kN/m^3

NZS 3604 - TIMBER FRAMED BUILDINGS - DURABILITY

REF

3604 **Exposure Zone for Chrisrchurch** C

F4.2

NOTE – Zone D includes all offshore islands the area within 500 m of the coastline of New Zealand, and those areas shown in white. The map shall be read in conjunction with 4.2.2.

T4.1

ZONES B AND C	Treated timber pile connections more than 600 mm from the ground and all subfloor connections	Subfloors vented 7000 mm² or less	SHELTERED[4]	Hot-dipped galvanized steel[3]
		Subfloors vented more than 7000 mm²	EXPOSED	Type 304 stainless steel[5]
	Treated timber pile connections within 600 mm of the ground	SHELTERED[4] AND EXPOSED		Type 304 stainless steel[5]
	All other structural fixings, except fabricated brackets[6]	SHELTERED[4]		Hot-dipped galvanized steel[3]
		EXPOSED		Type 304 stainless steel[5]
ZONE D	All structural fixings	SHELTERED[4] AND EXPOSED		Type 304 stainless steel[5]

NAME: 26 Hemingway Place **SHEET No.** 6
DATE: 17/02/2017 **REF: 170050**

SPECIFIC ENGINEERING DESIGN - RE-LEVELLING PAD

MBIE - Mechanical Re-levelling of Concrete Perimeter Beam

For Single Storey Area

Roof Load width	**8.0**	m	(Worst Case)
First Floor Load Width	**0.0**	m	
Ground Floor Load With	**1.0**	m	

Dead Loads		**Mass**	**Load**
Roof	**Light**	0.40	3.20
First Floor Wall	**Nil**	0.00	0.00
First Floor	**Nil**	0.00	0.00
Ground Floor Wall	**Heavy**	2.20	5.28
Ground Floor	**Heavy**	2.50	2.50
Foundation	**Heavy**	-	4.50
		Total	**15.48**
Live Load			
Roof	**Ped Traffic**	0.25	2.00
First Floor	**Nil**	0.00	0.00
Ground Floor	**Residential**	1.50	1.50
		Total	**3.50**
Load Case	G + 0.3Q		**16.53**

Max Spacing of Jack Points	2.00	m	
Design Lift Load	33.06	kN	
Min Pad Size	**0.6 x 0.6**	m	
Min Pad Area	0.36	m^2	
Max Bearing Load	91.83	kPa	
Min Soil UBC	**200**	kPa	
Design Soil SBC	100	kPa	L.o.S = 2
Capacity Ratio	**1.1**		

NAME: 26 Hemingway Place **SHEET No. 7**

DATE: 17/02/2017 **REF: 170050**

SPECIFIC ENGINEERING DESIGN - RE-LEVELLING PAD

Check temporary span of concrete perimeter beam between relevelling pads

Beam Type	**Perimeter Beam**		
Assumed Size	400Dx240W		
Assumed No. Reo Bars	**1**		
Assumed Size of Reo Bars	**D16**	201.1	mm^2
Assumed grade of Reo	**270**		
Assumed concrete strength	**20**		

For conservative design assumed simply supported conditions

Design Load	16.53	kN/m	
Design Span	2.00	m	
Design Moment	8.27	kN.m	$wL^2/8$
Design Shear	16.5	kN	$wL/2$
Beam Check 1 - Moment	14.30	kN.m	$\phi Mb = \phi\ As\ fy\ (d-a/2)$
Capacity Ratio	**1.7**		
Beam Check 2 - Shear	29.2	kN	$0.08\sqrt{f'_c}$.
Capacity Ratio	**1.8**		NZS 3101 EQ 9-5

NAME: 26 Hemingway Place **SHEET No. 8**

DATE: 17/02/2017 **REF: 170050**

FRONTIER

Check slab (temporary span 1 m)

$d = 100$ mm , $b = 1000$ mm

$f'_c = 20$ MPa

Direct tensile strength: $0.36\sqrt{f'_c} = 1.6$ MPa

$Z = (0.5d)^2 \times 1000 / 6 = 416.7 \times 10^3$ mm^3

$\phi = 0.85$ - cl. 2 3.2.2 NZS 3101.1

$\phi M_n = 0.85 \times 416.7 \times 1.6 = 0.57$ kNm

$L = 1.0$ m

Load : $1.0\text{m} \times 0.1\text{m} \times 24\text{kN} = 2.4$ kN/m (self-weight only)

$M^* = 2.4\text{kN/m} \times 1.0^2\text{m} / 8 = 0.3$ kNm

OK

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Avonhead
Christchurch 8446
P. (03) 359 9192 or (0508) 376 684
E. admin@frontierengineers.co.nz
W. www.frontierengineers.co.nz

Project

Address 26 Hemingway Pl

Title

Designed AZ | Scale @ A4

Date 17/02/2017

Job No

Sheet No 9

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RILEY CONSULTANTS

Ms Lena Mercer
26 Hemingway Place
Brooklands
Christchurch 8083

3 March 2017

Our Ref: 13801/83-B

Dear Ms Mercer

UPDATED GEOTECHNICAL INVESTIGATION REPORT 26 HEMINGWAY PLACE, BROOKLANDS

1.0 Introduction

This report, prepared by Riley Consultants Ltd (RILEY), is an update of the original Geotechnical Investigation Report (RILEY Ref: 13801/83-A, dated 4 July 2013), and presents the findings of the geotechnical investigation undertaken at 26 Hemingway Place, Brooklands, following damage sustained to the property from the 2010/2011 Canterbury earthquake events.

At the time of writing the original report, RILEY understood the dwelling had been assessed as a foundation rebuild. However, a residential engineering evaluation report and repair methodology for 26 Hemmingway Place was prepared for the homeowner by Frontier Engineers in February 2017, which indicates that a foundation repair is suitable for the dwelling. This updated report includes comments on foundation repair options for the dwelling, as well as foundation rebuild options, and supersedes our previous report (RILEY Ref: 13801/83-A).

The area in which the property is located is designated by the Ministry of Building, Innovation, and Employment (MBIE) as Technical Category 3 (TC3) based, in part, on the potential for future liquefaction causing moderate to significant land deformations.

2.0 Scope of Work

The original scope of geotechnical work undertaken by RILEY, and agreed with AA Insurance Ltd, was to provide a geotechnical report covering:

- An assessment of shaking versus land attributed damage.
- An assessment of the liquefaction susceptibility of the site based on regional data from the Canterbury Geotechnical Database (CGDb), with confirmation of subsurface profile provided by two dynamic probe-heavy (DPH) tests to a target depth of 15m, and hand auger (HA) and Scala penetrometer (Scala) testing to a target depth of 3m.
- A review of the CGDb to assess what ground conditions are likely to be present at greater depths based on available local data.
- A review of the likely peak ground accelerations (PGAs) during the September 2010, February, June and December 2011 earthquakes in Canterbury.
- Confirmation (or otherwise) that superficial soils meet MBIE Guidelines and NZS3604 for standard shallow foundations.

- Provide advice on potential foundation rebuild options consistent with the MBIE Guidance Document for Repairing and Rebuilding Houses affected by the Canterbury Earthquakes (Version 3, dated December 2012).

RILEY was subsequently requested by the homeowner, via email and short form agreement, dated 21 February 2017, to provide:

- Geotechnical advice to assist assessment of suitable repair options.

Development of a construction methodology and design of any remedial measures is beyond the scope of this report.

3.0 Regional Geology

The published geological map of the area (Qmap Greater Christchurch, Institute of Geological and Nuclear Sciences, 1:250,000 Geological Map 16, 2008) indicates that the property is underlain by sand of dunes and beaches.

A review of the New Zealand Geotechnical Database (NZGDb)(which supersedes the CGDb) indicates there are 11 cone penetrometer tests (CPTs) within 30m of the property boundary (to final depths of up to 20m), and one machine borehole located 40m north-west of the property boundary (drilled to 11m depth). A review of the ECan wells database also indicated data was available from three wells (south of the property) within 300m of the property.

A review of the borehole log available from the machine borehole and CPT tests (detailed above) indicates that the anticipated geological profile in this area comprises sand of the Christchurch Formation to 20+m depth. Based on the ECan deep well logs, the sand is expected to be present to approximately 28m depth, underlain by a thin layer of peat and gravel to approximately 34+m depth.

Groundwater was recorded at 1.5m depth in the machine borehole. The NZGDb map of median water table elevation indicates groundwater is between 1m and 2m depth.

4.0 Visual Inspection and Observed Foundation Damage

A visual inspection of the property was undertaken prior to the field investigations on 3 June 2013. The dwelling is a single-storey, timber-framed house with brick veneer cladding and a metal tiled roof. The dwelling is founded on a Type C foundation (concrete slab-on-grade) as described in the MBIE Guidelines. The property is located on generally level ground with no obvious significant waterways within 200m.

Damage to the dwelling as a result of the Canterbury earthquake sequence, as reported by others via the Building Inspection Report (BIR), includes differential settlement (tilt) and cracking of the concrete floor. The floor level survey in the BIR document is dated 18 February 2011, prior to the main February 2011 earthquake event. The greatest differential settlement recorded on this floor level survey is 70mm over approximately 17m (with a floor slope 0.42%). The concrete floor slab is reported to be tilting towards the north-eastern corner of the dwelling. The BIR indicates that the foundation had three cracks however, the size of the cracks was not recorded in the BIR. The floor slab was not inspected at the site of the original survey due to floor coverings.

Since the issue of our original report, an additional floor level survey has been undertaken by Frontier Engineers in February 2017. This survey shows that the maximum floor level difference recorded across the dwelling is 79mm, sloping towards the north-eastern corner of the dwelling. Cracks have been mapped in the floor slab; these range between hairline in width to a maximum crack width of 1.9mm.

A walkover of the grounds surrounding the dwelling (undertaken in June 2013) did not indicate any obvious evidence of ejected sand on the site due to liquefaction. A review of aerial photographs following the Canterbury earthquake events indicated moderate amounts of ejecta present in the area surrounding the property following the September 2010 and February 2011 events. The EQC aerial photographs indicate moderate to severe liquefaction was observed on-site, and in the surrounding area, following the September 2010 earthquake. Minor observed liquefaction was recorded following the February 2011 earthquake.

No obvious evidence of lateral stretching was observed during the walkover inspection. At the time of preparation of the 2013 report, no ground cracking was reported on the database. However, the map of observed ground crack locations now indicates that there are three ground cracks mapped on-site; two of the cracks are indicated to be <50mm wide and occurred prior to the February 2011 event. The third crack was mapped after the February 2011 event and is indicated to be <10mm wide.

5.0 Ground Conditions

5.1 Cone Penetrometer Test Investigation

A review of NZGDb indicates CPT 14658 is the closest CPT to the site boundary, located 7m to the north-west of the property boundary. Inferred soil conditions from the CPT test indicated topsoil underlain by sand to 10m depth; the full extent of the test.

5.2 Dynamic Probe Tests

Due to access constraints to the rear of the property the DPH test was utilised to investigate the soil strength profile at depth, assess consistency of material strength across the site and assist liquefaction assessment. The two DPH tests were completed on 3 June 2013. The probes were undertaken at the northern and southern end of the property, as shown on the attached plan. In summary, the subsurface soils across the two testing locations indicated generally similar soil strengths.

Data from both DPH1 and DPH2 indicate that predominantly loose ($N_{1(60)}$ between 4 to 10) soil is present to 1.5m depth, grading to predominantly medium dense ($N_{1(60)}$ between 10 to 30) soil to 7.5m depth. Between 7.5m and 9.5m depth, dense ($N_{1(60)}$ between 30 to 50) soil was encountered before grading to very dense ($N_{1(60)}$ >50) soil until 12.5m and 12.0m depth in DPH1 and DPH2, respectively (final depth).

A comparison of the DPH and the CPTs indicates a generally similar soil strength profile suggesting consistency of soil conditions across the site.

5.3 Hand Auger Boreholes

In addition to the deep investigations, two HA boreholes were drilled at the site to assess the near surface materials and their strength. Scala testing was carried out in each HA borehole as they were progressed. HA1 was located adjacent to DPH1 at the northern end of the property while HA2 was located adjacent to DPH2 at the southern end of the property. All HA boreholes were completed by RILEY on 3 June 2013 and logged in general accordance with the NZGS guidelines (December 2005).

The materials encountered in HA1 and HA2 comprised topsoil to 0.25m depth underlain by fill material to 0.45m depth (in HA1 only). Beneath the topsoil and fill material, fine to coarse sand was encountered to 1.4m and 1.75m depth in HA1 and HA2, respectively (final depths). Both HA boreholes were terminated prematurely due to collapse of saturated sand.

Groundwater was encountered in both HA boreholes between 1.2m and 1.3m depth.

The Scala tests carried out in HA1 and HA2 were terminated at 3.2m and 3.0m depth, respectively. Scala testing indicated that a geotechnical ultimate bearing capacity of 200kPa is not available above 0.45m depth, with 300kPa geotechnical ultimate bearing capacity consistently available below 1.4m depth.

6.0 Geotechnical Considerations

6.1 Seismic Design Parameters

The preliminary design PGA for the site, based on the latest MBIE Guidelines (Issue 7), are summarised in Table 1. Since the time of preparation of the original Geotechnical Investigation Report for 26 Hemingway Place, a new Serviceability Limit State (SLS) condition has been proposed. The values in Table 1 are based on Class D soil type (deep or soft soils), which is considered appropriate for the site, and a design life of 50-years for the structure.

Table 1: MBIE Recommended PGA Values for Geotechnical Design in Canterbury

Importance Level [1] = 2	SLS_1[2]	SLS_2[2]	ULS[3]
Moment Magnitude (M_w)	7.5	6.0	7.5
Annual Probability of Exceedance	1/25	1/25	1/500
Peak Ground Acceleration	0.13g	0.19g	0.35g

Notes:
1) Structure has been designated in terms of AS/NZS 1170 as Importance Level 2 structures. These include normal structures, and structures not included in other importance levels.
2) As of latest guidance; two SLS cases must be considered.
3) ULS – Ultimate Limit State.

Prior to the Darfield earthquake (September 2010), the design PGA for residential buildings in Christchurch was approximately 0.25g for ULS, deep soil sites with a 50-year design life. The design SLS level was 0.11g.

Review of the conditional PGA contours from the NZGDb indicates that during the Canterbury earthquake sequence, the site may have been subject to levels of shaking in excess of the prior ULS. PGA levels for the other earthquake events suggest shaking levels were in excess of current SLS design levels.

6.2 *Liquefaction Risk and Assessment*

The property at 26 Hemingway Place has been zoned as TC3, which is assessed as having a moderate to significant risk of land damage in future significant earthquakes.

Liquefaction typically occurs in recent (i.e. less than 10,000 years old), normally consolidated silt and sand beneath groundwater and is dependent on material density, grain size and soil composition.

Liquefaction analysis has been undertaken on two CPTs, both located within 20m of the property boundary. The assessment was undertaken in accordance with the MBIE Guidelines at the time of writing the original report, using the Zhang, Robertson and Brachman 2002 method, with a 7.5M_w earthquake. A groundwater level of 1m depth was assumed for the assessment. The results of the analysis undertaken for our previous report are shown in Table 2

Table 2: Estimated Liquefaction Induced Settlement

Test	Event	PGA	Settlement (Total)[1]	Differential Settlement [2]	Index Settlement [3]
CPT 14658-CGDb	SLS	0.13g	5mm	2-3mm	5mm
	ULS	0.35g	55mm	25-35mm	55mm
CPT 9479-CGDb	SLS	0.13g	15mm	7-10mm	5mm
	ULS	0.35g	200mm	100-133mm	90mm

Notes:
1) Settlements obtained through a liquefaction analysis using data obtained from the CPT.
2) Differential settlement is calculated as 1/2 to 2/3 of the total settlement values.
3) Index settlement is the estimated vertical settlement in the top 10m of soil under SLS and ULS loadings.

Results of the liquefaction analysis indicate index settlements representative of TC2 type land. Liquefaction analysis was also undertaken using equivalent SPT N data obtained from the DPH testing. This analysis produced settlement values generally consistent with the figures presented in Table 2 above.

6.3 *Lateral Spread*

Lateral spreading occurs where differences in ground level or soil consistency allow liquefied soils to flow laterally. Lateral movement is also possible in an earthquake event due to a lack of lateral support. Site observations do not indicate a significant lateral spreading hazard at this site and the property is located on generally level ground with no obvious significant waterways nearby. However, the map of observed ground crack locations indicates that there are three ground cracks mapped on-site; two of the cracks are indicated to be <50mm wide and occurred prior to the February 2011 event. The third crack was mapped after the February 2011 event and is indicated to be <10mm wide.

The BIR document makes reference to cracks being present in the foundation. The floor slab was not inspected at the time of the inspection due to floor coverings. The Frontier Engineers investigation indicates that there are cracks in the floor slab ranging from hairline to 1.9mm in width.

On the basis of the above information, lateral stretch potential of the ground across the building footprint is considered to be less than 200mm, indicating the threat of lateral stretch is in the minor to moderate category (Table 12.4, MBIE Guidelines).

6.4 Damage Mechanism

Based on the floor level surveys indicating very little change in the floor level differential settlements between the September 2010 and the subsequent earthquake events, it is considered that the damage to the dwelling is mainly attributable to shaking induced damage to the structure. Some of the damage observed may be a result of shaking induced consolidation of the shallow soil about the water table, and liquefaction induced settlement.

It should be noted that due to ground conditions at the site comprising sand, and the PGAs that have been experienced at the site, it is considered that the shaking will have densified the shallow soils at the site.

7.0 Foundation Recommendations

As a result of the Canterbury earthquake sequence, the dwelling at 26 Hemingway Place has suffered differential settlement of 79mm across the foundation slab. Cracks ranging from hairline to 1.9mm in width were observed by Frontier Engineers during their recent site visit. Based on the damage observed, it is considered that the foundation can be repaired. Foundation repair and rebuild options are presented below.

7.1 Foundation Repair

Table 2.3 of the MBIE Guidelines indicates that the floor level difference recorded in the dwelling is within the MBIE Guidelines criteria for a foundation re-level. The MBIE Guidelines state that a geotechnical ultimate bearing capacity of greater than 300kPa is required to undertake re-levelling without specific design. Investigations at the site have not identified soils providing a 300kPa geotechnical ultimate bearing capacity within the shallow soils, therefore, specific engineered design will be required for the re-levelling work to be undertaken. A geotechnical ultimate bearing capacity of 200kPa was consistently recorded at 0.45m across the site.

Reference to Table 3 should be made for foundation repair options at the property.

Table 3: Foundation Repair Options

Foundation Type	Repair Options	MBIE Guidelines Reference
Concrete slab-on-grade	Foundation re-level.	Appendix A1.1.3
	Foundation crack repair (based on aperture).	Appendix A4.4
	Fill voids below concrete slab foundation.	The filling of voids or cavities below the concrete slabs can be carried out with a flowable grout or concrete.

Input from a geotechnical engineer is recommended in the development of a re-levelling strategy. Bearing capacities should be confirmed by a geotechnical engineer once the details of the proposed repair methodology are known.

It should be noted that re-levelling the property will not prevent liquefaction induced settlement of the dwelling in a future earthquake event.

7.2 Foundation Rebuild

Should the foundation be considered a rebuild, it is considered that the replacement foundation will comprise a concrete floor.

Option A: Deep Pile Foundation

The results from the liquefaction analysis and the strength profiles obtained from both DPH and CPTs indicate that a suitable piling layer may be present at approximately 10m depth. Notwithstanding this, due to the considerable depth and availability of more suitable economic foundation options (see below), this option was not considered further.

Option B: Enhanced Concrete Slab with Hardfill Raft

The preferred foundation type is to utilise a "hybrid TC2/TC3 foundation" as outlined in the MBIE Guidance document (Section 15.4.6, page 15.44). The SLS settlements less than 50mm indicate that amenity requirements at SLS would be satisfied by the installation of a TC2 foundation, but the level of foundation damage might be unacceptable during an ULS earthquake. A foundation more robust than a TC2 foundation alone is considered more appropriate. The hybrid TC2/TC3 foundation recommended in the MBIE Guidance document consists of a minimum 800mm thick geogrid reinforced gravel raft (i.e. TC2 Option 1), in combination with an overlying 300 to 400mm thick enhanced concrete slab (TC2 Option 2), or waffle-type slab (i.e. TC2 Option 4).

A geotechnical ultimate bearing capacity of 200kPa is available below 0.45m of soil (below the fill), for the gravel raft to be founded on, a requirement as outlined by the MBIE Guidelines.

Option C: Re-levellable Concrete Surface Structure

Another foundation system that could be applicable to this site is a re-levellable concrete surface structure similar to concepts from Section 15.4.8, Part C of the MBIE Guidelines. This type of foundation system is suitable where less than 100mm SLS settlement is expected.

If this option is pursued, it is recommended to implement an excavate and replace geogrid reinforced raft extending to approximately 0.5m depth to where a geotechnical ultimate bearing capacity of 200kPa is available.

A comparison of the relative costs of the foundation systems described above would be recommended in conjunction with the associated future risks for each option in order to aid in the decision of the final foundation design.

Consideration should also be given to the provision of lightweight materials, particularly for roof and wall cladding. These lightweight materials will reduce inertial loading on foundations and can reduce settlement in future seismic events.

It is recommended that the composition and strength of the materials is confirmed at the time of the foundation replacement. The strength of the materials located across the site or directly beneath the existing dwelling may vary from those indicated in the HA boreholes and probe tests.

8.0 Limitation

This report has been prepared solely for the benefit of Ms Lena Mercer as our client with respect to the brief. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

Recommendations and opinions in this report are based on data from limited test positions. The nature and continuity of subsoil conditions away from the test positions are inferred, and it must be appreciated that actual conditions could vary considerably from the assumed model.

During excavation and construction, the site should be examined by an engineer or engineering geologist competent to judge whether the exposed subsoils are compatible with the inferred conditions on which the report has been based. It is possible that the nature of the exposed subsoils may require further investigation and the modification of the design based upon this report.

Riley Consultants Ltd would be pleased to provide this service to Ms Lena Mercer and believes the project would benefit from such continuity. In any event, it is essential Riley Consultants Ltd is contacted if there is any variation in subsoil conditions from those described in the report as it may affect the design parameters recommended in the report.

Yours faithfully
RILEY CONSULTANTS LTD

Prepared by:	Reviewed by:	Approved for issue by:
Jen Kelly **Senior Engineering Geologist**	Leah King **Senior Engineering Geologist**	Scott Vaughan **Managing Director, CPEng**

Enc: Hand Auger Logs, including Scala Penetrometer Results
Dynamic Probe-Heavy Logs
Liquefaction Analysis Plots
Site Plan (RILEY Dwg: 13801/83-1)

GEOTECHNICAL AND GEOLOGICAL INFORMATION

SOIL TYPES AND SYMBOLS


FILL


TOPSOIL


SILT


SAND


GRAVEL


CLAY


PEAT


GROUNDWATER LEVEL

10,11,10
SCALA PENETROMETER
LAST 3 NUMBER OF BLOWS PER 50mm INCREMENT

ROCK TYPES AND SYMBOLS


SANDSTONE


SILTSTONE


MUDSTONE


LIMESTONE


BASALT


TUFF


IGNIMBRITE


GREYWACKE

SOIL STRENGTH CLASSIFICATION

FINE GRAINED COHESIVE SOILS

TERM	FIELD IDENTIFICATION	UNDRAINED SHEAR STRENGTH (KPa)
Very Soft (Vs)	Exudes between fingers when squeezed	<12
Soft (S)	Easily indented by fingers.	12 – 25
Firm (F)	Indented only by strong finger pressure.	25 – 50
Stiff (St)	Indented by thumb pressure	50 – 100
Very Stiff (VSt)	Indented by thumbnail	100 – 200
Hard (H)	Difficult to indent by thumbnail.	200+

SPT & SCALA PENETROMETER RESULTS

TERM	SPT VALUE No. of BLOWS/300mm	SCALA PENETROMETER No. of BLOWS/100mm
very dense	>50	17+
dense	30 – 50	7 – 17
medium dense	10 – 30	3 – 7
loose	4 – 10	1 – 3
very loose	0 – 4	0 – 2

ROCK STRENGTH CLASSIFICATION

TERM		FIELD IDENTIFICATION	UNCONFINED UNIAXIAL COMPRESSIVE STRENGTH (MPa)
Extremely weak	(EW)	Indented by thumbnail.	< 1
Very weak	(VW)	Crumbles under firm blows with point of geological hammer. Can be peeled with pocket knife	1 – 5
Weak	(W)	Difficult to peel with pocket knife.	5 – 20
Moderately strong	(MS)	Cannot be scraped or peeled with pocket knife.	20 – 50
Strong	(S)	More than one blow of geological hammer to fracture.	50 – 100
Very strong	(VS)	Many blows of geological hammer to break.	100 – 250
Extremely strong	(ES)	Can only be chipped with geological hammer.	250+

MOISTURE CONDITION

Dry (D)	Looks and feels dry; powdery and friable.
Moist (M)	Feels cool; darkened in colour; no free water when remoulded
Wet (W)	Feels cool; darkened in colour; free water forms on hands
Saturated (S)	Free water is present on sample.

SAMPLE TYPES


UNDISTURBED


MACHINE AUGER DISTURBED

D
HAND AUGER DISTURBED


STANDARD PENETRATION TEST (solid cone)


STANDARD PENETRATION TEST (hollow cone)

DRILLING METHOD

OB	OPEN BARREL
TT	TRIPLE TUBE
WB	WASH BORE
SH	UNDISTURBED SHELBY TUBE
RC	ROCK CORE
SPT	STANDARD PENETRATION TEST

FIELD TESTS

V	SHEAR VANE (corrected to BS:1377)
R	REMOULDED STRENGTH
P	POCKET PENETROMETER
CH	CLEGG HAMMER

INFORMATION BASED ON THE NZ GEOTECHNICAL SOCIETY INC GUIDELINES FOR THE CLASSIFICATION AND DESCRIPTION OF SOIL AND ROCK FOR ENGINEERING PURPOSES

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GEOLOGICALINFO-chch.DWG REV 1 June 2010

RILEY CONSULTANTS
Engineers and Geologists
Riley Consultants Limited
385 Madras St
Christchurch 8013
Tel: 03 3794402
Fax 03 3794403

HAND AUGER LOG

Project:	Location:	Hole position:	No.:
26 Hemingway Place	Brooklands, Christchurch	Refer to site plan	HA1

Job No.:	Start Date: 03-06-13 Finish Date: 03-06-13	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
13801/83		1.00	E 1,575,604.0 N 5,191,451.0

Client:	Hole Depth:	Sheet:
MWH Recovery	1.40 m	1 of 1

Elevation (m LINZ)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend
+1.00				
+0.85	0.15		Slightly organic sandy SILT with trace rootlets; dark brown. Soft; moist; non-plastic; sand, fine. (TOPSOIL)	
			SILT with some sand and minor gravel; dark brown. Firm; moist; non-plastic; sand, fine; gravel, fine, subrounded, greywacke (NON-ENGINEERED FILL?)	
+0.55	0.45		Fine to coarse SAND with trace silt; light brownish grey Medium dense; moist. (CHRISTCHURCH FORMATION)	
			0.55m - 0.75m Grades to a dense layer	
			0.80m Grades to grey	
	1			
			1.20m Grades to saturated	
-0.40	1.40		EOH @ 1.40 m	
	2			
	3			

Soil Shear Strength (kPa): 50 100 150 200

Scala Penetrometer (blows / 50 mm): 3 6 9 12 15

1.0m

2.0m

3.2m

Groundwater

Soil Moisture

Samples

Tests

No. 1
1, 0, 1,
0, 1, 1,
2, 2, 4,
3, 3, 4,
5, 4, 4,
3, 3, 3,
3, 2

No. 2
2, 2, 1,
3, 2, 2,
3, 2, 2,
3, 3, 3,
4, 3, 3,
4, 4, 4,
3, 3

No. 3
4, 4, 4,
3, 4, 3,
4, 4, 4,
4, 3, 3,
4, 4, 5,
5, 5, 5,
5, 4, 3,
4, 4, 5

Instrument/ Backfill

Explanations:

Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered

Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) and Rise Time (minutes)

GROUNDWATER

- [ ] None
- [X] Slow Seep (depth 1.2 m)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[ ] Target depth [ ] Refusal [X] Collapse

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.
2. Scala test terminated due to collapse of saturated sand.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Hand Auger 70 mm	Logged by: FB	Checked by: AvD

RILEY AGS 3_1 NZ LIB 13.GLB Log RILEY HA CHCH (NO MAP) 13801-83 26 HEMINGWAY PL.GPJ [DWG91#42.GDW 27/06/2013 17:11 Produced by gINT Professional

RILEY CONSULTANTS
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395 Madras St
Christchurch 8013
Tel: 03 3794402
Fax: 03 3794403

HAND AUGER LOG

Project:	Location:	Hole position:	No.:
26 Hemingway Place	Brooklands, Christchurch	Refer to site plan	HA2

Job No.:	Start Date: 03-06-13 Finish Date: 03-06-13	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
13801/83		1.00	E 1,575,606.0 N 5,191,424.0

Client:	Hole Depth:	Sheet:
MWH Recovery	1.75 m	1 of 1

Elevation (m LINZ)	Depth (m)	Geological Unit	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend
+1.00				
			Slightly organic sandy SILT with trace rootlets; dark brown. Soft; moist; non-plastic; sand, fine (TOPSOIL)	
+0.75	0.25			
			Fine to coarse SAND with trace silt; light brown. Medium dense; dry (CHRISTCHURCH FORMATION)	
			0.45m Grades to dense	
			0.90m Grades to dark greyish brown. Wet	
	1		1.00m Grades to medium dense	
			1.30m Grades to saturated	
-0.75	1.75			
			EOH @ 1.75 m	
	2			
	3			

Soil Shear Strength (kPa): 50, 100, 150, 200

Scala Penetrometer (blows / 50 mm): 3, 6, 9, 12, 15

Groundwater: 1.0m; 2.0m; 3.0m

Soil Moisture

Samples

Tests

No. 1
1, 1, 1,
1, 2, 2,
2, 3, 4,
5, 4, 5,
4, 4, 5,
5, 4, 4,
4, 4

No. 2
2, 2, 2,
3, 3, 2,
3, 3, 2,
3, 3, 2,
3, 3, 3,
3, 3, 4,
4, 5

No. 3
4, 5, 5,
5, 4, 4,
3, 4, 4,
3, 4, 5,
6, 6, 6,
6, 5, 7,
7, 7

Instrument/ Backfill

Explanations:

Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered

Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Scala Penetrometer - blows/50mm
- Permeability Test
- Schmidt Hammer
- Insitu Vane Shear Strength (kPa) V=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd) and Rise Time (minutes)

GROUNDWATER

- [ ] None
- [X] Slow Seep (depth 1.3 m)
- [ ] Rapid Inflow (depth)

HOLE TERMINATED DUE TO:
[ ] Target depth [ ] Refusal [X] Collapse

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation
2. Scala test terminated due to collapse of saturated sand

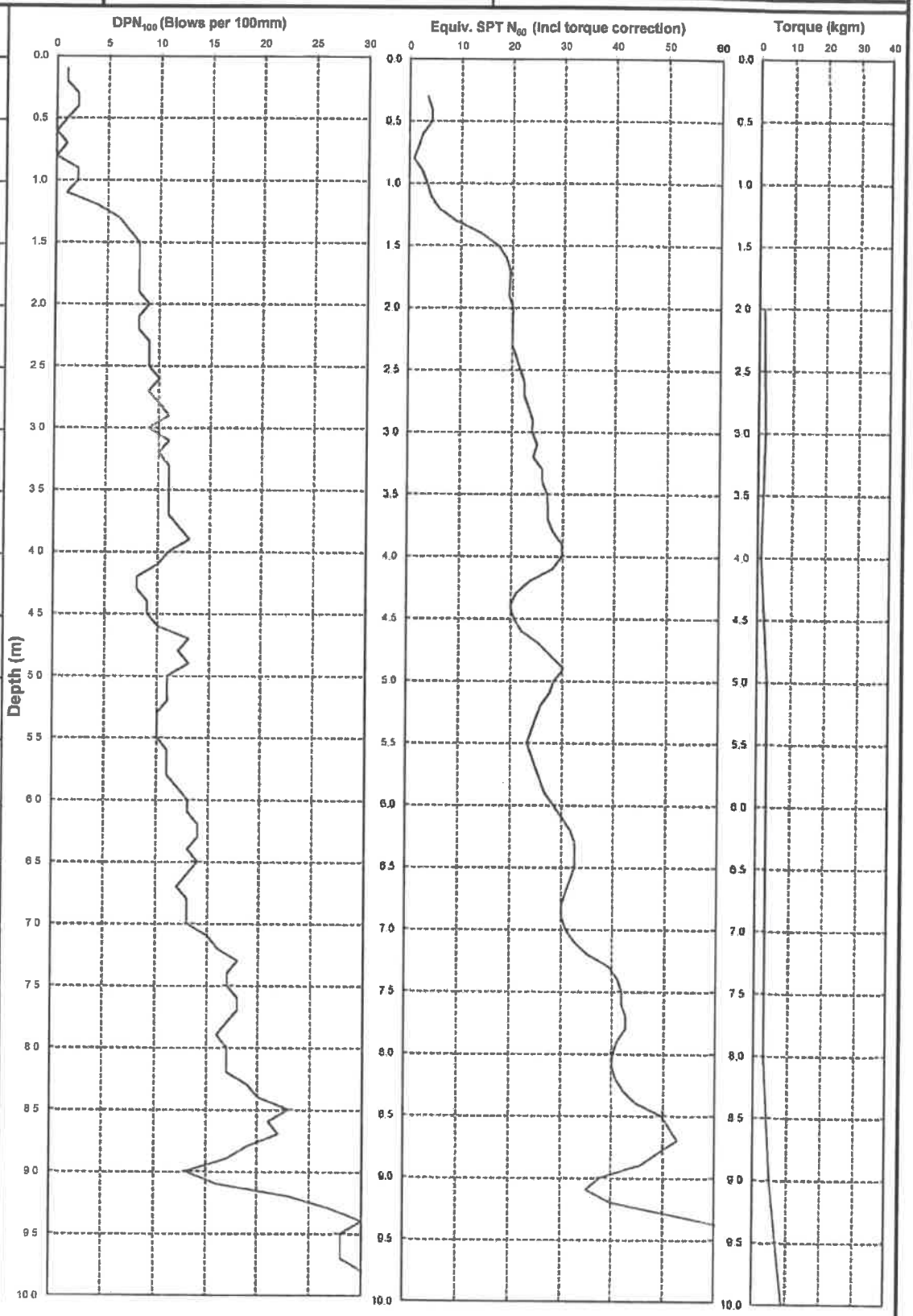
All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Hand Auger 70 mm	Logged by: CJO	Checked by: AvD

RILEY AGS 3_1 NZ LIB 13 GLB Log: RILEY HA CHCH (RD NMP) 13801-83 26 HEMINGWAY PL.GPJ DWG 91842.GDW 27/06/2013 17:11 Produced by gINT Professional

DYNAMIC PROBE TEST — DPH1

Project Number	13801/83	Hammer Weight	50 kg
Project:	26 Hemingway Place	Hammer Drop	500 mm
		Tip Diameter	43.7 mm
Location:	Brooklands, Christchurch	Hammer Efficiency	91%

Depth (m)	DPN_{100}	Equiv. SPT N	Torque
0.1	1		
0.2	1		
0.3	2	3.4	
0.4	2	4.2	
0.5	1	4.2	
0.6	0	2.5	
0.7	1	1.7	
0.8	0	0.8	
0.9	2	2.5	
1.0	2	3.4	
1.1	1	4.1	
1.2	4	5.7	
1.3	6	9.0	
1.4	7	14.0	
1.5	8	17.3	
1.6	8	18.9	
1.7	8	19.6	
1.8	8	19.5	
1.9	8	19.4	
2.0	9	20.1	1.5
2.1	8	20.1	
2.2	8	20.0	
2.3	8	20.0	
2.4	8	20.8	
2.5	9	21.6	
2.6	10	22.4	
2.7	9	22.4	
2.8	10	23.2	
2.9	11	24.0	
3.0	9	24.0	2
3.1	11	24.9	
3.2	10	24.1	
3.3	11	25.9	
3.4	11	26.0	
3.5	11	26.9	
3.6	11	27.0	
3.7	11	27.1	
3.8	12	28.0	
3.9	13	28.8	
4.0	11	29.8	1
4.1	10	28.0	
4.2	8	23.6	
4.3	8	20.9	
4.4	9	19.9	
4.5	9	20.6	
4.6	10	22.1	
4.7	13	25.4	
4.8	12	27.8	
4.9	13	30.2	
5.0	11	28.4	3
5.1	11	27.5	
5.2	11	25.8	
5.3	10	25.0	
5.4	10	24.1	
5.5	10	23.3	
5.6	11	24.1	
5.7	11	25.0	
5.8	11	25.8	
5.9	12	26.7	
6.0	13	28.4	3
6.1	13	30.0	
6.2	14	31.7	
6.3	14	32.6	
6.4	13	32.6	
6.5	14	32.6	
6.6	13	31.7	
6.7	12	30.9	
6.8	13	30.0	
6.9	13	30.0	
7.0	13	30.9	3
7.1	15	32.8	
7.2	16	35.1	
7.3	18	39.4	
7.4	17	41.1	
7.5	17	41.9	
7.6	18	41.9	
7.7	18	42.8	
7.8	17	42.8	
7.9	16	41.1	
8.0	17	40.2	3
8.1	17	40.1	
8.2	17	40.8	
8.3	19	42.3	
8.4	20	44.7	
8.5	23	49.7	
8.6	21	51.2	
8.7	22	52.8	
8.8	19	49.2	
8.9	17	45.7	
9.0	13	37.9	5
9.1	16	35.1	
9.2	23	39.9	
9.3	27	51.5	
9.4	30	63.1	
9.5	28	67.0	
9.6	28	67.6	
9.7	28	65.6	
9.8	30	67.0	
9.9	34	71.8	
10.0	30	73.2	9



Date Logged	3/06/2013
Logged By	FB/CO
Testing Based on	BS 1377

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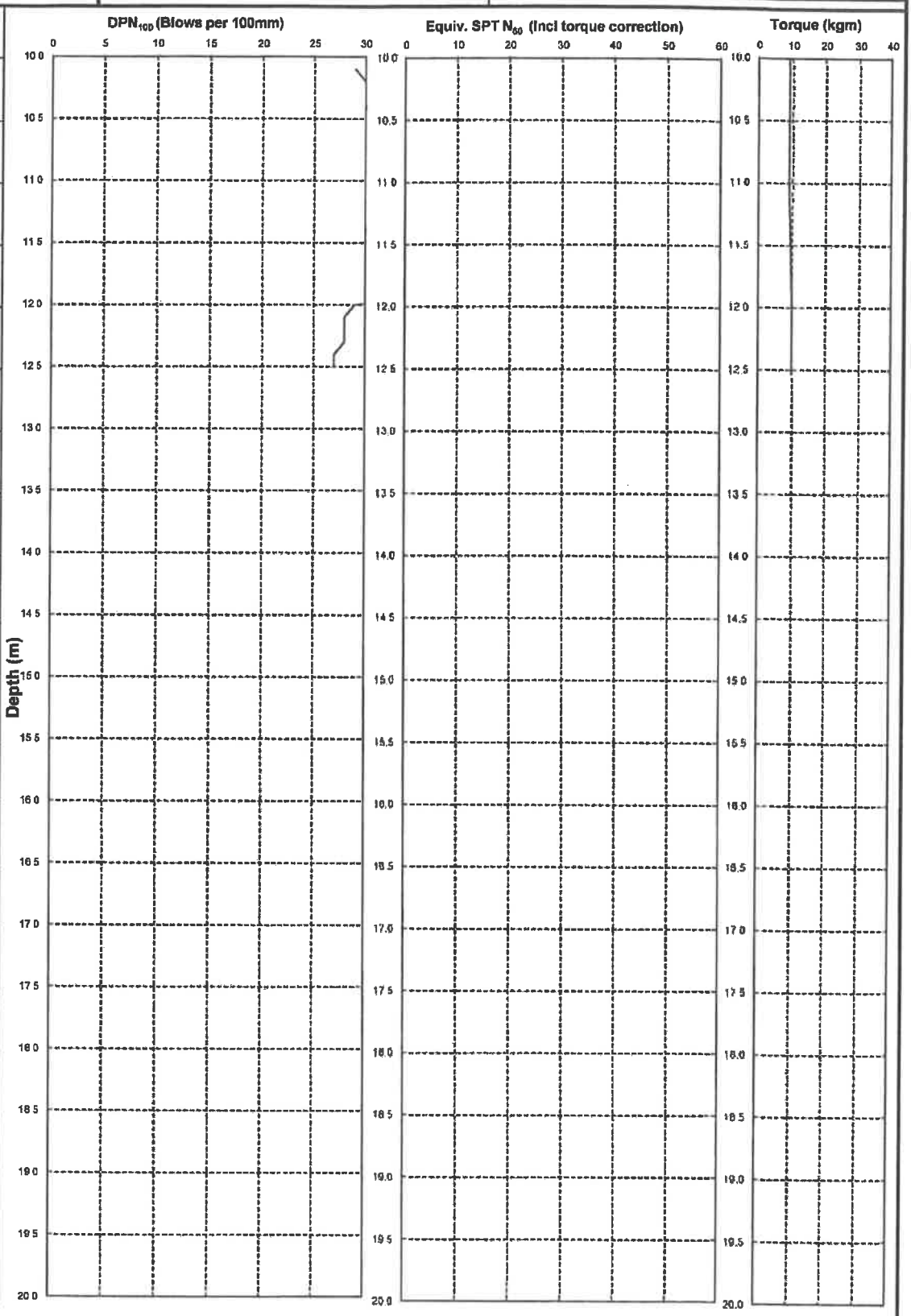
DYNAMIC PROBE TEST — DPH1

Project Number	13801/83	Hammer Weight	50 kg
Project:	26 Hemingway Pla	Hammer Drop	500 mm
		Tip Diameter	43.7 mm
Location:	Brooklands, Christ	Hammer Efficiency	91%

Depth (m)	DPN_{100}	Equiv. SPT N	Torque
10.1	29	72.3	
10.2	30	68.9	
10.3	30	68.9	
10.4	30	69.8	
10.5	32	71.5	
10.6	35	75.7	
10.7	36	80.8	
10.8	35	83.4	
10.9	35	83.4	
11.0	36	83.4	9
11.1	34	82.4	
11.2	32	79.8	
11.3	32	76.3	
11.4	30	72.9	
11.5	30	71.1	
11.6	32	71.0	
11.7	33	73.5	
11.8	34	76.8	
11.9	36	80.1	
12.0	29	76.7	10
12.1	28	71.6	
12.2	28	64.8	
12.3	28	63.9	
12.4	27	63.1	
12.5	27	62.2	10
12.6			
12.7			
12.8			
12.9			
13.0			
13.1			
13.2			
13.3			
13.4			
13.5			
13.6			
13.7			
13.8			
13.9			
14.0			
14.1			
14.2			
14.3			
14.4			
14.5			
14.6			
14.7			
14.8			
14.9			
15.0			
15.1			
15.2			
15.3			
15.4			
15.5			
15.6			
15.7			
15.8			
15.9			
16.0			
16.1			
16.2			
16.3			
16.4			
16.5			
16.6			
16.7			
16.8			
16.9			
17.0			
17.1			
17.2			
17.3			
17.4			
17.5			
17.6			
17.7			
17.8			
17.9			
18.0			
18.1			
18.2			
18.3			
18.4			
18.5			
18.6			
18.7			
18.8			
18.9			
19.0			
19.1			
19.2			
19.3			
19.4			
19.5			
19.6			
19.7			
19.8			
19.9			
20.0			



Date Logged	3/06/2013
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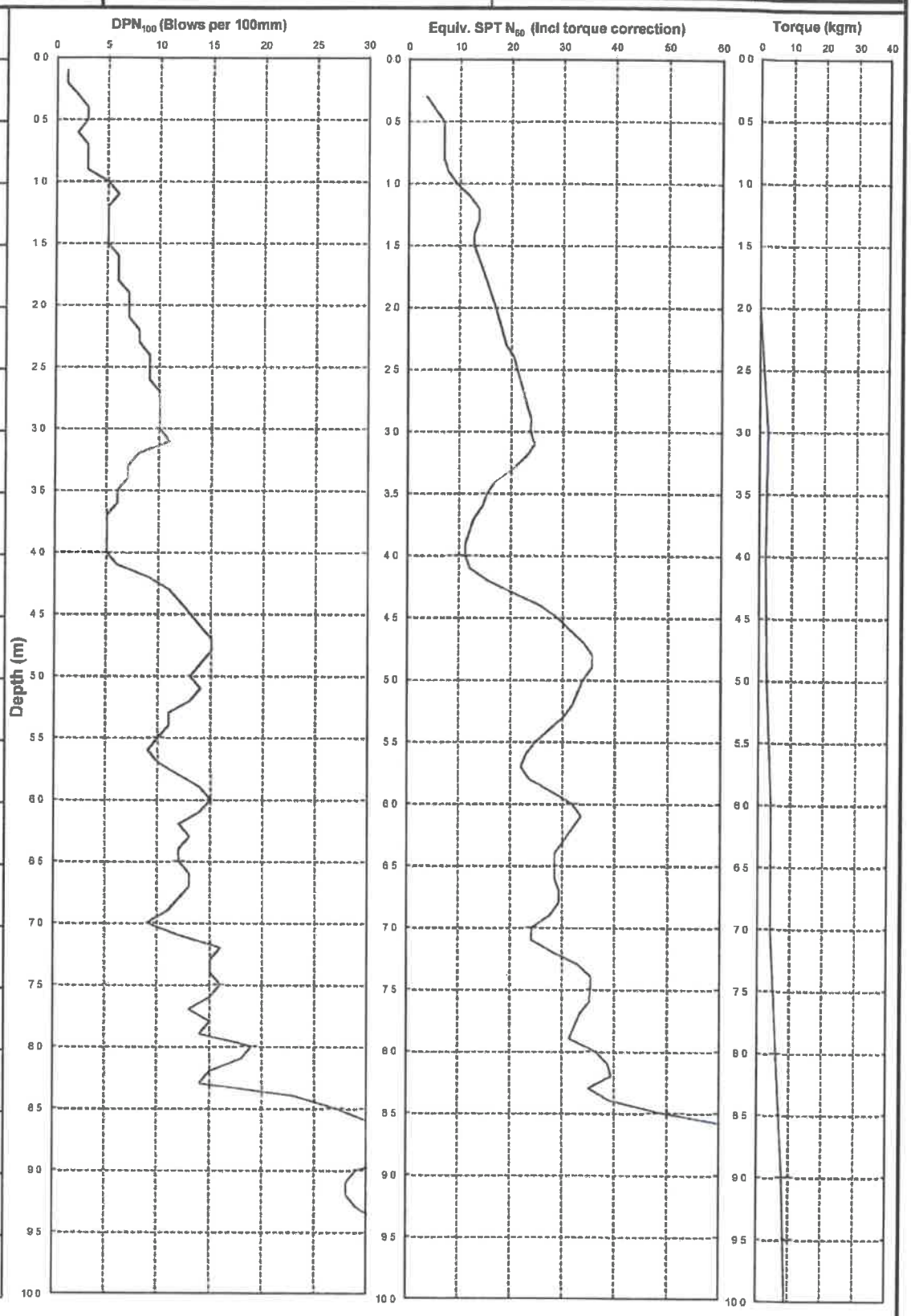
DYNAMIC PROBE TEST — DPH2

Project Number	13801/83	Hammer Weight	50 kg
Project:	26 Hemingway Place	Hammer Drop	500 mm
		Tip Diameter	43.7 mm
Location:	Brooklands, Christchurch	Hammer Efficiency	91%

Depth (m)	DPN_{100}	Equiv. SPT N	Torque
01	1		
02	1		
03	2	34	
04	3	51	
05	3	68	
06	2	68	
07	3	68	
08	3	68	
09	3	76	
10	5	93	
11	6	119	
12	5	136	
13	5	136	
14	5	127	
15	5	127	
16	6	136	
17	6	144	
18	6	153	
19	7	161	
20	7	170	0
21	7	177	
22	8	183	
23	8	190	
24	9	205	
25	9	212	
26	9	218	
27	10	225	
28	10	231	
29	10	238	
30	10	236	25
31	11	245	
32	8	229	
33	7	203	
34	7	170	
35	6	153	
36	6	145	
37	5	128	
38	5	120	
39	5	112	
40	5	113	2
41	6	121	
42	9	154	
43	11	205	
44	12	255	
45	13	289	
46	14	314	
47	15	339	
48	15	358	
49	14	356	
50	13	338	25
51	14	329	
52	13	318	
53	11	301	
54	11	274	
55	10	248	
56	9	230	
57	10	220	
58	12	238	
59	14	277	
60	16	319	4
61	14	336	
62	12	319	
63	13	302	
64	12	285	
65	12	285	
66	13	285	
67	13	293	
68	12	293	
69	11	276	
70	9	242	4
71	12	241	
72	16	282	
73	15	331	
74	15	355	
75	16	354	
76	16	352	
77	13	334	
78	15	324	
79	14	314	
80	19	363	6
81	16	387	
82	15	394	
83	14	350	
84	23	391	
85	27	492	
86	30	626	
87	30	684	
88	30	708	
89	34	741	
90	29	731	8
91	28	713	
92	28	681	
93	28	660	
94	31	685	
95	32	716	
96	32	743	
97	32	751	
98	31	742	
99	32	741	
100	30	725	9



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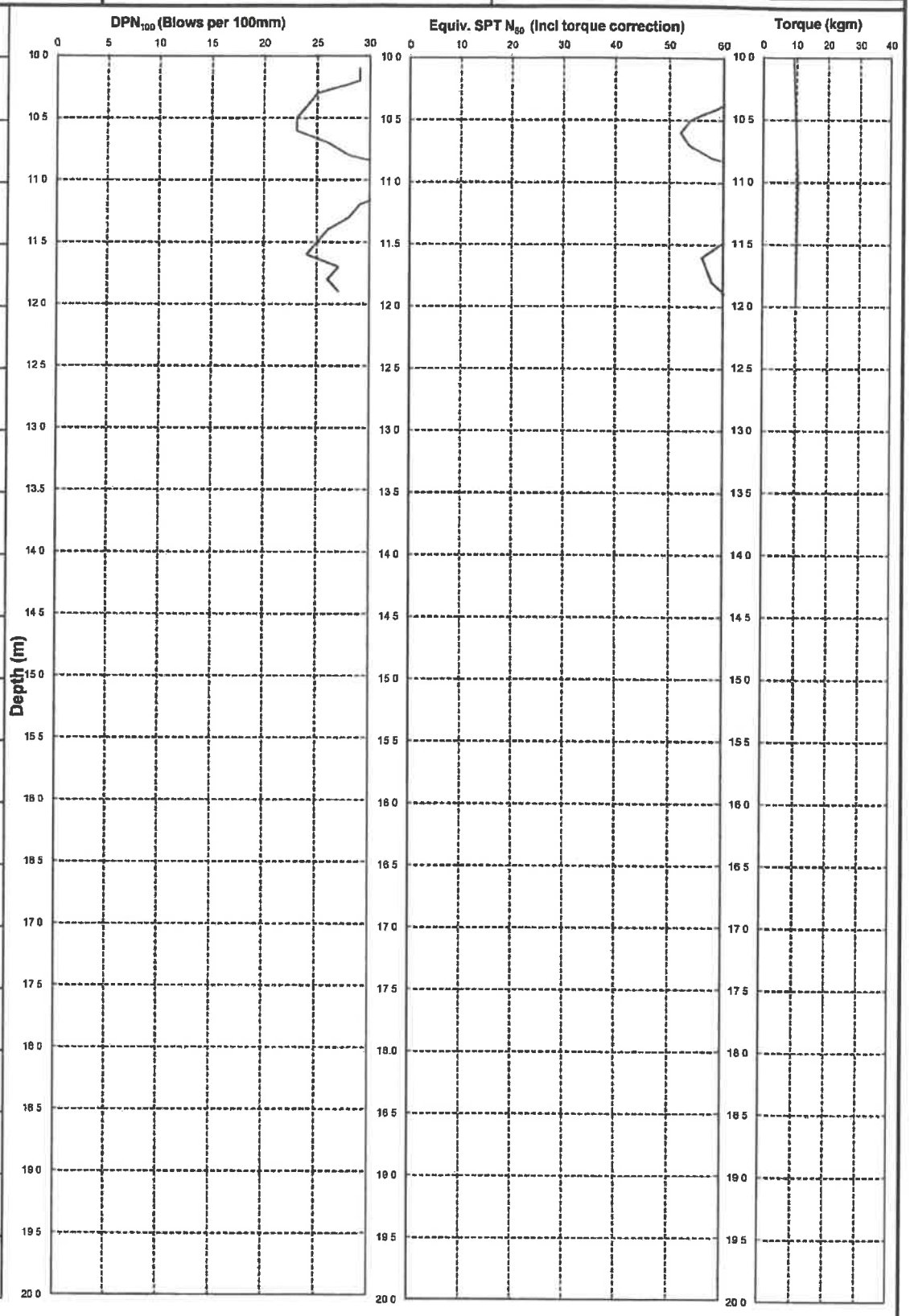
DYNAMIC PROBE TEST — DPH2

Project Number	13801/83	Hammer Weight	50 kg
Project:	26 Hemingway Pla	Hammer Drop	500 mm
		Tip Diameter	43.7 mm
Location:	Brooklands, Christ	Hammer Efficiency	91%

Depth (m)	DPN_{100}	Equiv. SPT N	Torque
10.1	29	705	
10.2	29	678	
10.3	25	636	
10.4	24	591	
10.5	23	539	
10.6	23	521	
10.7	26	537	
10.8	28	578	
10.9	33	662	
11.0	32	712	10.5
11.1	32	748	
11.2	29	713	
11.3	28	679	
11.4	26	629	
11.5	25	595	
11.6	24	561	
11.7	27	570	
11.8	26	579	
11.9	27	605	
12.0			10



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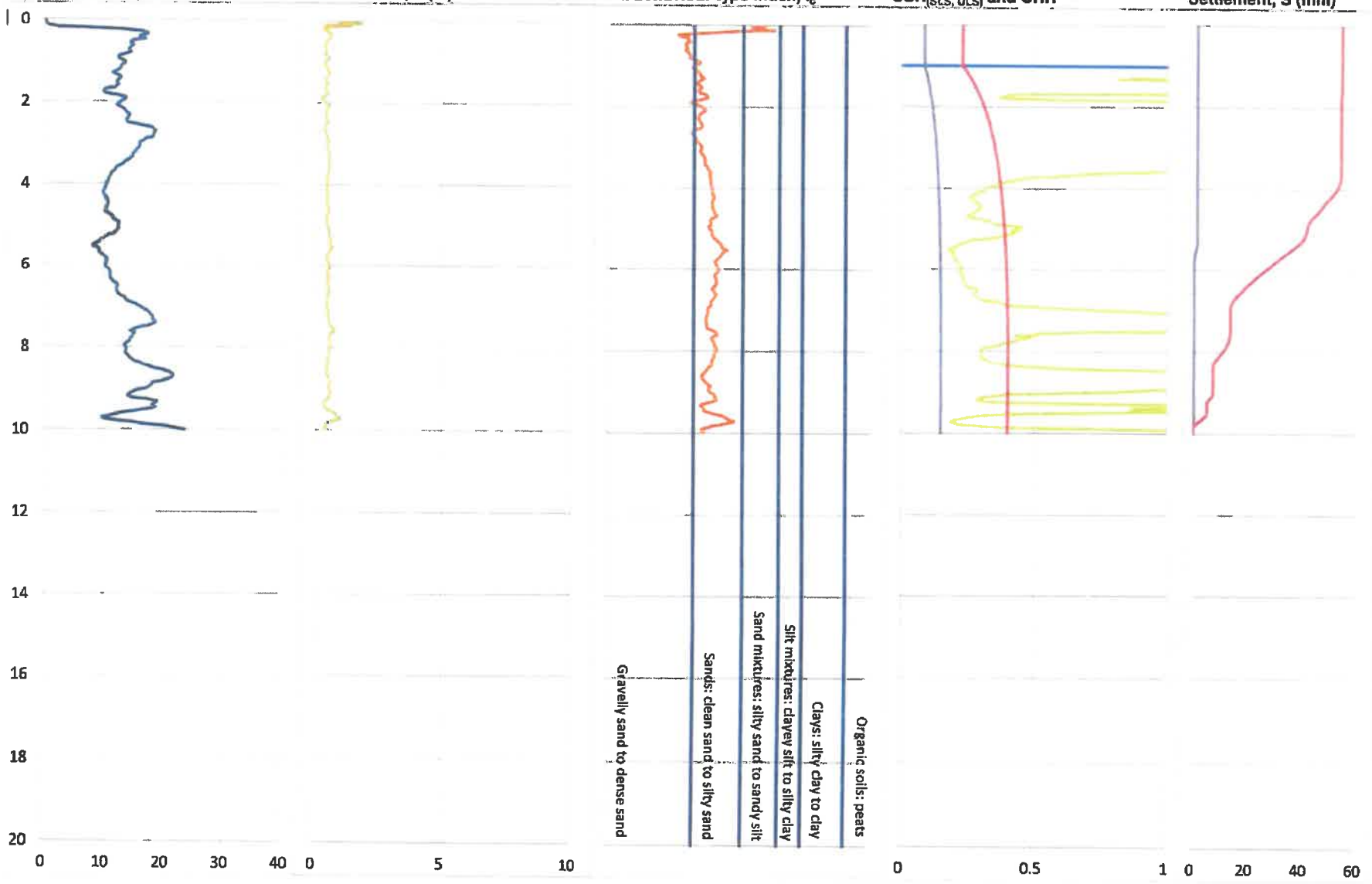
Test: *CPT 14658-CGDb* File: 13801/63-A
Project: 26 Hemingway Place

Water table depth 1 m
Magnitude 7.5 (Mw)

SLS	PGA	0.13	g	Settlement	2	mm	LSN 0
ULS	PGA	0.35	g	Settlement	55	mm	LSN 9



2/07/2013

Calculation Sheet Rev 8

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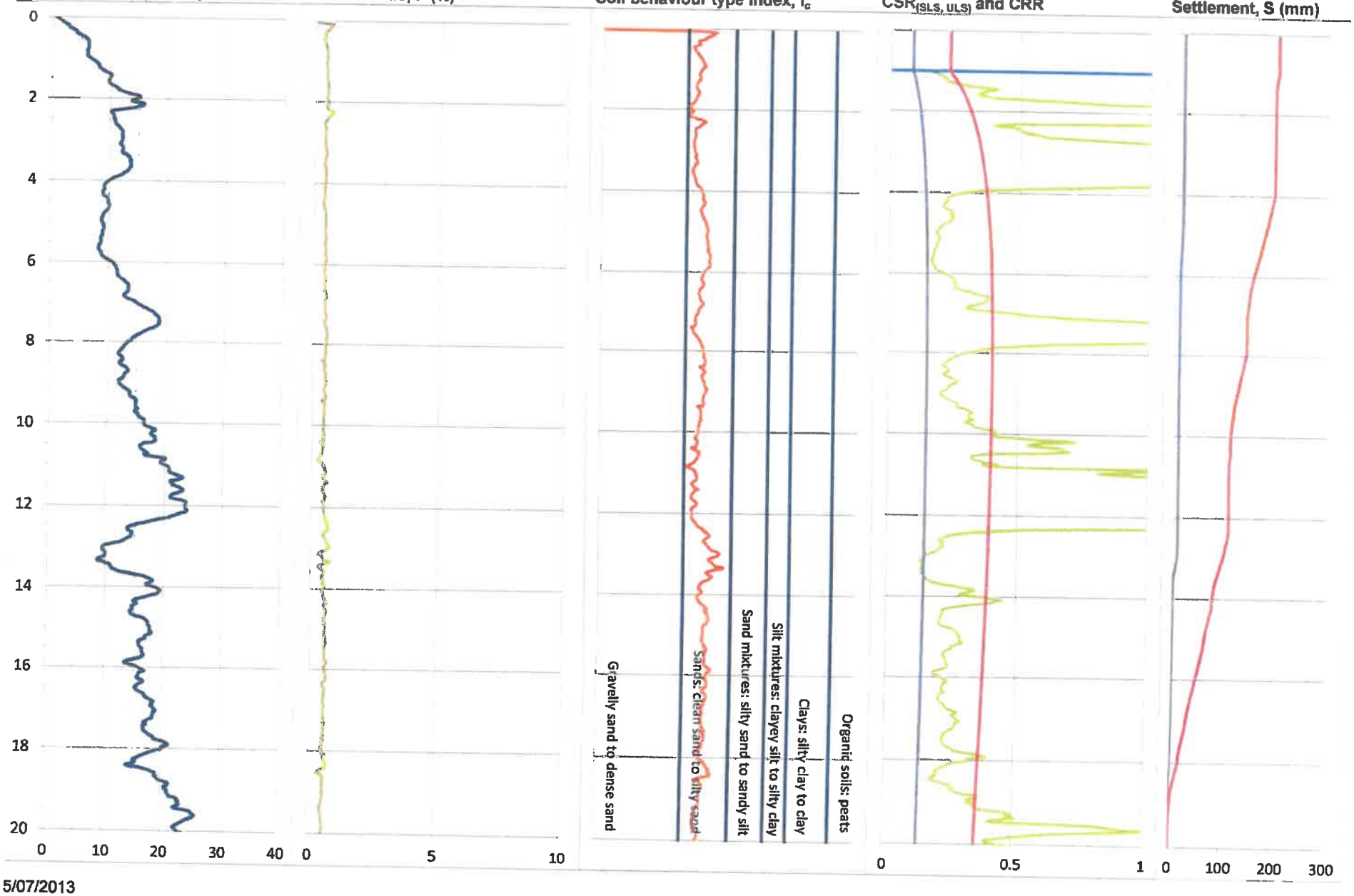
Test: *CPT 9479-CGDb* File: 13801/63-A
Project: 26 Hemingway Place

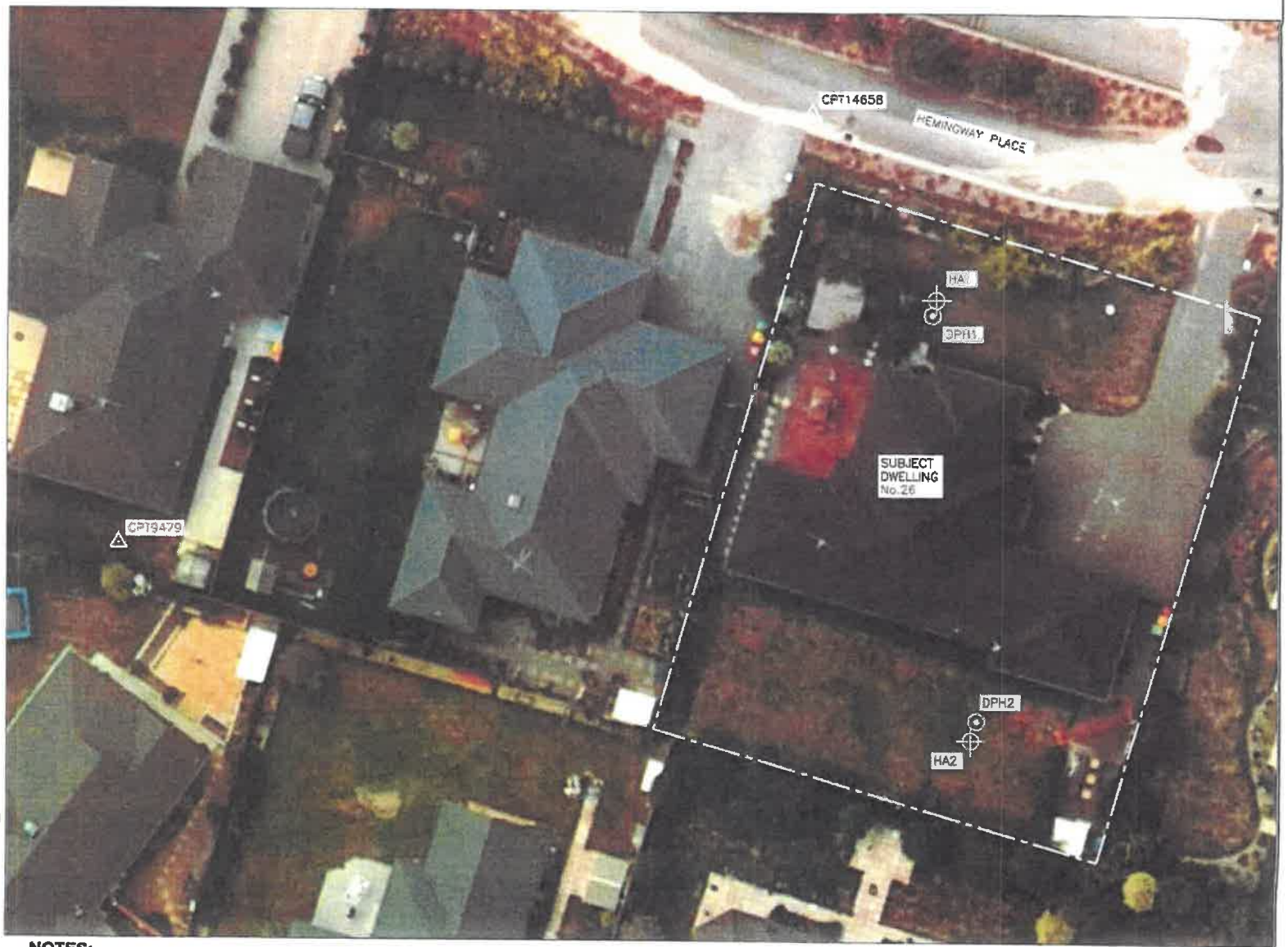
Water table depth 1 m
Magnitude 7.5 (Mw)

SLS PGA 0.13 g Settlement 16 mm LSN 2
ULS PGA 0.35 g Settlement 199 mm LSN 25



5/07/2013

Calculation Sheet Rev 8



LEGEND

- HA1 — HAND AUGER HOLE LOCATION
- DPH1 — DYNAMIC PROBE (HEAVY) TEST LOCATION
- CPT — CONE PENETRATION TEST LOCATION (SOURCED FROM CANTERBURY GEOTECHNICAL DATABASE)
- PROPERTY BOUNDARY

SCALE 1:250 (A3)

0 2.5 5 7.5 10 15 (m)

NOTES:-

1. PHOTO SOURCED FROM CHRISTCHURCH POST EARTHQUAKE AERIAL PHOTOS (24TH FEB 2011), LINZ
2. ORIGINAL SCALE A3
3. PARCELS SOURCED FROM QUICKMAP CANTERBURY (OCT 2012)
4. HOLE/TEST LOCATIONS ACCURATE TO ± 1m

REV	DESCRIPTION	BY	DATE
2	ICPT ADDED	HN	3.7.13
1	NOTE 4 ADDED	HN	1.7.13
0	FIRST ISSUE		

DESIGN CHECKED: PB
DRAWN: HN
CHECKED:
DATE DRAWN: 12 JUNE 2013
APPROVED FOR ISSUE:
DATE: 4/7/2013

RILEY CONSULTANTS
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TITLE

MWH RECOVERY

26 HEMINGWAY PLACE, BROOKLANDS

GEOTECHNICAL INVESTIGATION SITE LOCATION PLAN

JOB FILE: 13801_63-01
SCALE: AS SHOWN
DRAWING No: 13801/63-01
REV: 2