

25 Tuckers Road, Redwood

CONDITION ASSESSMENT AND STRUCTURAL DESIGN REPORT



Structural Design Report – Rev B

Project No: 25123
Date: 4 April 2025
Project Name: House Re-level Design
Project Address: 25 Tuckers Road, Redwood

Revision A – Original Document

Revision B – Added Condition Assessment

1.0 INTRODUCTION

Richards Consulting Engineers have been engaged to complete a foundation re-level design for the dwelling at the above address. We understand the property has been purchased as is where is and that the re-level is required as part of residual earthquake damage to the dwelling. We inspected the dwelling, in its current state, on 6th March 2025 and to identify any windows and doors that may be adversely affected by a foundation re-levelling.

A re-level design will be completed to remove the dislevelment from the structure. Richards Consulting Engineers have not completed an earthquake level assessment but aim to restore the dwelling to a level state.

2.0 SCOPE OF WORK

The scope of work covered by the attached Producer Statement (PS1-design) is:

- Design levelling methodology
- Design replacement piles (if required)

Items that are specifically excluded from this work include:

- Weather and water proofing
- Services
- Structural framing elements where covered by NZS3604: 2011

3.0 MEANS OF COMPLIANCE

The design of the structure is in compliance with the New Zealand Building Code (NZBC) section B1.

The following alternative solutions have been adopted in the design of the structure:

- MBIE guidelines titled “Repairing and rebuilding houses affected by the Canterbury Earthquakes” dated December 2012.

4.0 DESIGN DOCUMENTATION

The design is described in the following documentation:

- Richards Consulting Engineers drawings titled “HOUSE RE-LEVEL DESIGN, 25 TUCKERS ROAD, REDWOOD” and numbered SK.01-.04.

5.0 ASSUMPTIONS

The following assumptions were made as part of the design process:

- The decision to re-level is been made by another party
- Re-levelling the structure will not improve the foundations performance in a future liquefaction event or under static conditions
- The subfloor framing is sound and can accommodate being re-levelled

6.0 CONDITION ASSESSMENT

The investigation and assessment included a site inspection of the dwelling on 6/03/2025. This included a visual inspection of the existing wall linings, the subfloor, and the piles. The assessment does not include structural capacity assessment, insulation, plumbing, electrical, durability for non-primary structural elements, and the roof framing.

6.1 Existing Structure

The existing building is a single-storey timber framed dwelling built in 1950 (approx.) with a ground floor area of approximately 100m². The structure is founded on a timber subfloor supported by concrete piles. There are no foundation walls present around the perimeter of the dwelling. The concrete entrance stairs at the front and rear door as well as a concrete chimney base partially support the subfloor in these areas. The dwelling has a heavy roof and light wall cladding consisting of timber weatherboards.

There is a standalone garage located at the back of the site which is not part of this re-level design.

6.2 Walls

The wall framing consists of timber studs lined with plasterboard elements. The bracing appears to be in good condition at the time of inspection with no cracks or drumminess. Currently, the windows and doors coincide with the floor level slopes. We envisage once the lifting has occurred, there will be no structural damage to these elements from re-levelling. Small cosmetic repairs may be required to make good.

Following re-levelling, any damaged wall linings will be made good. If a replacement is required, elements will be replaced with a GS1-N element.

6.3 Subfloor

The subfloor appeared to be in reasonable condition, with minor areas of deterioration located under wet areas in the dwelling. Any timber experiencing significant deterioration shall be replaced at the time of the inspection. As part of the proposed re-level the connections from the piles to the bearers will be altered. We consider from our inspections that the bearers can accommodate these new fixings.

6.4 Piles

Currently there are two types of piles supporting the subfloor. They appeared to be in good condition at the time of inspection and there were no excess leans noted. The existing piles appear to have performed reasonably well to date. As part of the proposed re-levelling, we will install packers up to 100mm to achieve the target level.

During our inspection, there did not appear to be any significant bracing elements throughout the foundation as such we intend to replace some of the existing piles with new anchor piles to ensure we are satisfying Section 112 of the Building Act. However, during construction, we will make an allowance for the removal of a pile to determine if it is acting as a cantilevered pile.

7.0 DESIGN LOADS

The structure has been determined as having an importance level of 2.

Dead:	Standard material loads: Lightweight wall and roof cladding
Live:	1.0 kPa restricted construction loads for re-level. 1.5 kPa residential floor loads post re-level
Barriers:	N/A
Snow and Ice:	N/A
Seismic:	N/A
Wind:	N/A
Retaining:	N/A

Construction: N/A
Other: N/A

8.0 GEOTECHNICAL CONDITIONS

8.1 Shallow Site Soil Investigation

The shallow soil investigation was undertaken on the 25th March 2025 and consisted of a visual site walkover, a total of five Scala Penetrometers, and two hand augers. Please refer to the attached site plan for the approximate test locations and the attached soil investigation test results. The maximum depth reached was 2.0m with a hand auger, and 4.0m with the Scala Penetrometer. The hand augered boreholes were logged in accordance with the procedures in the New Zealand Geotechnical Society 'Guidelines for the Field Classification and Engineering Description of Soil and Rock for Engineering Purposes' (2005).

The following soil strata was identified by the HA1 investigation:

Depth	Strata
0 – 300mm	TOPSOIL
300 – 1400mm	Sandy SILT, brown w/ orange mottles, soft, dry. Firm from 600
1400 – 1600mm	Sandy SILT, light brown w/ orange mottles, firm, moist
1600 – 2000mm	Silty SAND, with trace clay, bluish grey, saturated, soft
2000mm	End of hole – Poor Recovery

The following soil strata was identified by the HA2 investigation:

Depth	Strata
0 – 300mm	TOPSOIL
300 – 900mm	Sandy SILT, brown w/ orange mottles, dry, soft
900 – 1100mm	Sandy SILT, Dark brown w/ grey, dry, firm
1100 – 1400mm	Silty SAND, brown, firm, moist
1400 – 1500mm	Sandy SILT w/ trace gravels. Redish brown, firm, moist
1500 – 1850mm	Silty SAND w/ trace clay, grey, saturated, soft
1850mm	End of hole – Poor Recovery

The Scala Penetrometer test found the ultimate bearing capacity of the foundation to 300kPa from a depth of 2.2m bgl and 200kPa from 0.5m bgl. The ground water table was encountered at approximately 1.5m bgl during testing.

The site is flat, with a dwelling currently located towards the front of the property and a standalone garage in the southwest corner. The site is not located in a flood management area or within the coastal inundation zone as defined by Council maps. The site can be classified as TC2 as per MBIE meaning that minor to moderate land damage from liquefaction is possible in future significant earthquakes.

All new foundations shall be installed to below the top soil layer at a minimum depth of 0.5m bgl where 200 kPa Ultimate geotechnical bearing capacity was encountered.

A geotechnical strength reduction factor, $\phi_{bc}=0.5$ shall be used when calculating the design bearing pressure (q_d) for foundation design.

All Fill material used for the development shall consist of imported GAP 65 or AP40. Fill placed under foundations shall be installed in layers no greater than 200mm layers and compacted to 95% of dry density.

8.2 Subsoil Desktop Review

A subsoil desktop study was undertaken using New Zealand Geotechnical Data base, looking into the bore logs nearby the test site. A summary of the results of this bore log investigation are given in the following table.

Bore Log	Distance to Site	Depth of soil type	Strata description
HA_178815_232881	20m E	0m – 0.45m	<ul style="list-style-type: none"> Firm, fine to coarse sandy SILT, some gravel, some organics, trace clay; dark brown; moist, low plasticity, insensitive. Gravel: rounded, SW greywacke. Organics: rootlets.
		0.45m – 0.8m	<ul style="list-style-type: none"> Medium dense, silty fine to coarse SAND, trace fine gravel; brown, mottled orange; moist, non-plastic, insensitive.
		0.8m – 1.6m	<ul style="list-style-type: none"> Stiff, SILT, some fine to medium sand, trace clay; brown; moist, low plasticity, insensitive. 1.00m: Firm.
		1.6m – 1.7m	<ul style="list-style-type: none"> NO RECOVERY
		1.7m – 1.9m	<ul style="list-style-type: none"> Stiff, SILT, some fine to medium sand, trace clay; brown; moist, low plasticity, insensitive.
		1.9m – 2.1m	<ul style="list-style-type: none"> NO RECOVERY
		2.1m – 2.2m	<ul style="list-style-type: none"> Loose, silty fine to medium SAND, trace clay; bluish grey; wet, low plasticity, quick.
		2.2m – 2.3m	<ul style="list-style-type: none"> NO RECOVERY
		2.3m – 3.0m	<ul style="list-style-type: none"> Loose, silty fine to medium SAND, trace clay; bluish grey; wet, low plasticity, quick.
		3.0m	<ul style="list-style-type: none"> End of hand auger
HA-178816_232882	15m E	0 – 0.2m	<ul style="list-style-type: none"> Firm, fine to medium sandy SILT, minor organics, trace clay; dark brown; moist, low plasticity, insensitive. Organics: rootlets. [Topsoil]
		0.2m – 0.5m	<ul style="list-style-type: none"> Firm, fine to medium sandy SILT, trace clay; dark brown; moist, low plasticity, insensitive.
		0.5m – 1.3m	<ul style="list-style-type: none"> Firm, fine sandy SILT, minor clay; brown, streaked orange; moist, low plasticity, insensitive.
		1.3m – 1.8m	

		1.8m – 3.0m	<ul style="list-style-type: none"> • Firm, SILT, some fine to medium sand, trace clay; brown; moist, low plasticity, insensitive.
		3.0m	<ul style="list-style-type: none"> • Medium dense, fine to coarse SAND, some silt, trace clay; bluish grey; wet, low plasticity, quick. • End of hole

These results are relatively consistent with the soil strata data obtained during the shallow site soil investigation. Bearing around 1200mm b.g.l. in these adjacent sites is slightly lower than our site. This might indicate isolated soft spots.

9.0 STRUCTURAL PHILOSOPHY

The building has suffered differential settlement from historic static settlement or from the Canterbury Earthquake Sequence (CES). The re-level will aim to bring the dwelling back to level removing the differential settlement across the building.

9.1 Re-levelling criteria

Without knowledge of what is earthquake damage or not, we aim to get the structure as level as possible. RCE inspected the building and identified that most (not all) windows, doors, and ceilings match the current slope of the house and therefore re-levelling the building will not have an adverse effect on these elements. The chosen re-level criteria has therefore been set to a maximum floor variation of 20mm and maximum floor slope of 0.25% between any two points 2m or greater apart.

Tolerances will be lowered if obvious as-built issues arise during the re-levelling process such as doors or windows being constructed out of plumb. This will be monitored during construction.

9.2 Re-levelling methodology

Outlined below is a summary of the re-levelling methodology which is to be carried out:

- Remove the cladding attached to the exterior piles to gain access to the piles and remove any external features obstructing access to the piles.
- Remove entrance steps on the southern elevation. Note that the high point is located at the front door entrance so the chimney and front door steps can remain.
- Allow to remove and reinstate external services.
- Detach bearer to pile connections for the internal and external piles being re-levelled.
- Install jacking equipment and lift the affected areas concurrently.
- Install new piles as per Re-level Plan on SK.02.
- Pack the piles with H5 timber packers. The packer shall consist of a solid piece and a DPC placed between the pile and packer (maximum 100mm deep packer, pile to be replaced if greater than 100mm)
- Reinstate pile to bearer connection
- At the completion of the re-levelling, the contractor shall ease and adjust all doors, sashes and cupboard doors, drawers, and other openable or movable parts.
- The contractor shall make good any cracked linings, windows, flooring, and trims as a result of the re-levelling. Making good shall consist of plastering, priming, and painting.

The proposed foundation re-levelling will support the gravity loads of the structure. However, we note that the future performance of the foundation will not be improved as it will be founded on the same bearing layer.

9.3 Lateral load resisting system

There were no bracing piles identified during the subfloor investigation. As we are lifting the foundations off of the existing piles this could create an instability for the house. Therefore, to satisfy the New Zealand Building Code, new anchor piles have been specified, minimum 12 anchor piles each direction. The lateral load resisting system of the superstructure has not been considered as it will remain in place during the re-levelling process.

The chimney base, entry stairs, and internal chimney add bracing resistance to the system. If these are removed during the lift they will be replaced with new anchor piles to maintain any bracing removed.

9.4 Earthquake resilience

The proposed re-levelling of the structure will reinstate it to being “no worse”. This means that future damage related to foundation settlement from static or liquefaction induced settlements has not been improved as part of this work.

10.0 DURABILITY

The structure is not located within a high-risk durability zone and all material treatments will be specified to achieve a 50-year design life in this environment. All timber packers and piles shall be H5. All fixings are to be stainless steel.

11.0 SAFETY IN DESIGN

As part of the design process we have considered the safety of people during the erection, habitation, maintenance, and contractors involved in potential future alterations and demolition of the structure.

The proposed structure has a clear use with commonly understood and accepted risks and hazards associated with it. We therefore believe any risks associated with the re-level and use of the proposed structure can be managed by employing competent contractors using best practice health and safety and construction methods.

Additional care shall be taken during the re-levelling process, to manage differential settlement that may occur between piles. Due to the poor site conditions observed on site, pile stability must be monitored during construction with any piles exhibiting instability to be demolished and replaced.

12.0 CONSTRUCTION MONITORING

Richards Consulting Engineers has been engaged by 44 Properties Limited to undertake construction monitoring.

To verify that the structure is constructed in accordance with the design and is structurally adequate. It is required that the following construction monitoring be undertaken:

	Structural Element	Construction monitoring method	Notes/date completed
1	200 kPa Pile Excavation and Bearing	Richards Consulting Engineers	
2	Sub-floor packing and connections	Richards Consulting Engineers	
3	Post re-levelling floor levels	Richards Consulting Engineers	
4	Inspection of bracing walls post re-level	Richards Consulting Engineers	

Please note a PS4 will be issued on completion of this project.

13.0 REFERENCES

The following design standards and guidelines have been referenced as part of the design process:

- AS/NZS 1170: 2002
- NZS 3603: 1993
- NZS 3404: 1997
- MBIE guidelines titled “Repairing and rebuilding houses affected by the Canterbury Earthquakes” dated December 2012.

Prepared by



Joshua Rodgers
BE(Hons), MEM

RICHARDS CONSULTING ENGINEERS

Approved by



Chris Burrell-Smith
CPEng (Structural)

Project: 25123

4 April 2025

Local Building Consent Authority

**B2 COMPLIANCE IN RESPECT OF HOUSE RE-LEVEL DESIGN
AT 25 TUCKERS ROAD, REDWOOD LOT 144 DP 17711**

To whom it may concern,

Compliance with Building Code Clause B2 – Durability

The purpose of this letter is to demonstrate how compliance with Clause B2 (Durability) of the Building Code will be achieved for the above project. We can confirm that for specifically designed structural elements that are included within our design documentation:

Material	Means of compliance	Details
Structural timber	B2/AS1	Timber treatment has been selected in accordance with Table 1A of B2/AS1
Mild steel structure	Alternative Solution	Protection for mild steel has been specified in accordance with SNZ TS 3404 – Durability requirements for steel structures and components and AS/NZS2312 – Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings. This guide works on a time to first maintenance basis and assumes on-going maintenance. Refer to the attached maintenance plan (optional but recommended).

We trust this provides the information you are seeking.

Prepared by



Joshua Rodgers
BE(Hons), MEM
RICHARDS CONSULTING ENGINEERS

Approved by



Chris Burrell-Smith
CPEng (Structural)



PRODUCER STATEMENT – PS1 DESIGN

BUILDING CODE CLAUSE(S): B1 only
ISSUED BY: Richards Consulting Engineers Limited
(Engineering Design Firm)
TO: 44 Properties Limited
(Owner/Developer)
TO BE SUPPLIED TO: Christchurch City Council
(Building Consent Authority)
IN RESPECT OF: House Re-level Design
(Description of Building Work)
AT: 25 Tuckers Road, Redwood
(Address, Town/City)
LEGAL DESCRIPTION: Lot 144 DP 17711

JOB NUMBER: 25123

N/A

We have been engaged by the owner/developer referred to above to provide *(Extent of Engagement)*: refer to attached structural report for scope of work in respect of the requirements of the Clause(s) of the Building Code specified above for Part only, as specified in the Schedule, 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 *(Verification method/acceptable solution)* B1/VM4 and/or;
- Alternative solution as per the attached Schedule.

The proposed building work covered by this producer statement is described on the drawings specified in the Schedule, together with the specification, and other documents set out in the Schedule.

On behalf of the Engineering Design Firm, and subject to:

- Site verification of the following design assumptions: Refer to Section 6.0 and 8.0
- All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that:

- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the Schedule, will comply with the relevant provisions of the Building Code and that;
- the persons who have undertaken the design have the necessary competency to do so.

I recommend the **CM4** level of **construction monitoring**.

I, *(Name of Engineering Design Professional)* Chris Burrell-Smith, am

- CPEng number 1019482 and hold the following qualifications BE(Hons)

The Engineering Design Firm holds a current policy of Professional Indemnity Insurance no less than \$200,000
The Engineering Design Firm is a member of ACE New Zealand.

SIGNED BY *(Name of Engineering Design Professional)*: Chris Burrell-Smith
(Signature below)

ON BEHALF OF *(Engineering Design Firm)*: Richards Consulting Engineers Limited

Date: 4/04/2025

Note: This statement has been prepared solely for the Building Consent Authority named above and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to the Engineering Design Firm only. As a condition of reliance on this statement, the Building Consent Authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in tort or otherwise, 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.

SCHEDULE TO PS1

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

Refer to section 3.0

Memorandum from licensed building practitioner: Certificate of design work

14.0SECTION 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: **25 Tuckers Road**

Suburb: **Redwood**

Town/City: Christchurch	Postcode: 8051
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THE OWNER

Name(s): **44 Properties Limited**

Mailing address:

Suburb:	PO Box: 29328
Town/City: Christchurch	Postcode: 8440
Phone number: 021 357 510	Email address: denzil.prime@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 _____ Chris Burrell-Smith ____ 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	<i>[If appropriate, provide details of the restricted building work]</i>	<i>[Specify whether you carried out this design work or supervised someone else carrying out this design work]</i>	<i>[If appropriate, specify references]</i>

Primary structure			
All RBW Design work relating to B1	(x)		() Carried out () Supervised
Foundations and subfloor framing	(✓)	<i>House Foundation Re-level Design</i>	() Carried out (✓) Supervised
Walls	(x)		() Carried out () Supervised
Roof	(x)		() Carried out () Supervised
Columns and beams	(x)		() Carried out () Supervised
Bracing	(x)		() Carried out () Supervised
Other	(x)		() Carried out () Supervised

EXTERNAL MOISTURE MANAGEMENT SYSTEMS: E2

All RBW design work relating to E2	(-)		(-) Carried out (-) Supervised
Damp proofing	(-)		(-) Carried out (-) Supervised
Roof cladding or roof cladding system	(-)		(-) Carried out (-) Supervised
Ventilation system (for example, subfloor or cavity)	(-)		(-) Carried out (-) Supervised
Wall cladding or wall cladding system	(-)		(-) Carried out (-) Supervised
Waterproofing	(-)		(-) Carried out (-) Supervised
Other	(-)		(-) 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
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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 () Yes (✓) No

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

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

Note: continue on another page if necessary.

ISSUED BY

Name: Chris Burrell-Smith	LBP or Registration number: 1019482
The practitioner is a: () Design LBP () Registered architect (✓) Chartered professional engineer	
Design Entity or Company (optional): Richards Consulting Engineers Limited	
Mailing address(if different from below):	
Street address / Registered office: Unit 4a, 303 Blenheim Road	
Suburb: Upper Riccarton	Town/City: Christchurch
PO Box/Private Bag:	Postcode: 8041
Phone number: 03 347 1624	Mobile:
After Hours:	Fax:
Email address: chris@rcengineers.co.nz	Website: www.rcengineers.co.nz

DECLARATION

I Chris Burrell-Smith *[name of practitioner]*, LBP,

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: 

Date: 4 April 2025

1.0 GENERAL

- 1.1 All drawings to be read in conjunction with all relevant services, Structural Engineer's and Specialist's drawings and specifications.
- 1.2 All Work shall comply with the relevant clauses of the New Zealand Building Code, best practice and relevant New Zealand Standards and Codes of practice.
- 1.3 The Contractor shall be responsible for verifying all dimensions on site and ensuring that all dimensions and levels shown on the drawings are correct and consistent with other relevant drawings. Any discrepancies are to be reported immediately to the Engineer
- 1.4 If at any time prior to Practical Completion, the Contractor should become aware of any signs of distress, excessive settlement or deflection, conflict of components or any other indications whatsoever of actual or potential damage to the Contract Works or any part thereof, they shall forthwith notify the Engineer, and confirm such notice in writing as soon as is practicable.

2.0 INSPECTIONS

- 2.1 To verify the works have been constructed as per the design the following inspections:
 1. Confirm 200kPa soil bearing capacity for base of new piles – by RCE
 2. Post re-levelling floor levels – By RCE
 3. Check pile packing and subfloor connections - By RCE
 4. Inspection of bracing walls post re-level – By RCE
- 2.2 A minimum of 48 hours notice shall be provided to the Engineer before an inspection is required.
- 2.3 Failure to have the structural work inspected may result in Richards Consulting Engineers Limited not able to issue a PS4 or destructive testing to expose hidden structural elements.

3.0 EXCAVATIONS AND FOUNDATIONS

- 3.1 All organic material shall be stripped from under the jacking pads. All soft spots to be fully excavated and backfilled as per Engineers direction. **DO NOT over excavate without approval.**
- 3.2 Assumed geotechnical ultimate bearing capacity of 200kPa unless noted otherwise. If the recommended founding stratum is not encountered at the foundation level, the Engineer is to be informed before work proceeds in that area.
- 3.3 The Contractor shall confirm construction methodology of foundations before commencing work. Alternative construction methodologies / detailing will be considered by the Engineer.

4.0 CARPENTRY

- 4.1 All timber shall be SG 8, H3.2 unless stated otherwise. New piles shall be H5.
- 4.2 Timber shall be treated as set out in NZS 3602:2003 – Timber and Wood-based Products for use in Buildings.
- 4.3 All fixings shall be stainless steel unless noted otherwise.

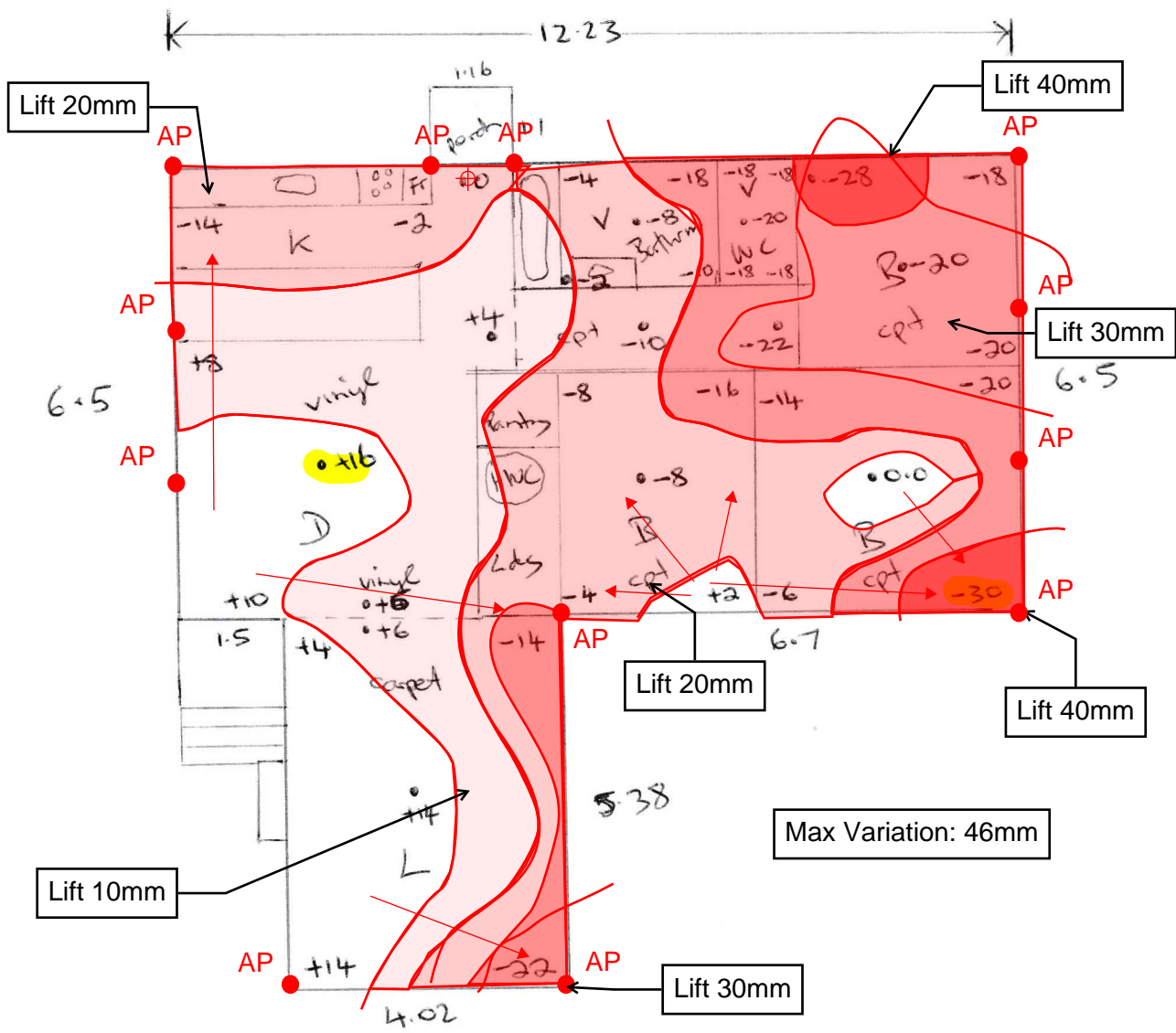
5.0 RE-LEVELLING HOUSE (GENERAL)

- 5.1 The Contractor shall inspect the subfloor before submitting a tender to confirm access and levelling methodology.
- 5.2 The Contractor shall make allowance for the lateral stability of the house when lifting the house.
- 5.3 The floors shall be measured with a laser level while re-levelling.
- 5.4 The timber floor shall be re-levelling by jacking to the specified level and installing packers above the existing piles.
- 5.5 The objective of the re-levelling is to bring the house back to level as far as reasonably practicable. Therefore, the re-levelling should be undertaken to the following tolerances / parameters. It is noted that the re-leveller may need to compromise between the following points:
 - Ensure floor slopes less than 0.25% between any two points further than 2 metres apart. However, if door and window frames would be significantly deformed as a result of the levelling then this criterion may need to be relaxed.
 - Create a planar floor with a maximum 20mm variation.
 - Where window frames, bay windows and other structures have been built out of level then these structures should be levelled to match the pre-earthquake levels as far as reasonably practicable without damaging the claddings and structure.

6.0 RE-LEVELLING SEQUENCE (DWELLING)

- 6.1 Remove the cladding attached to the exterior piles to gain access to the piles and remove any external features obstructing access to the piles.
- 6.2 Remove entrance steps on the southern elevation. Note that the high point is located at the front door entrance so the chimney and front door steps can remain.
- 6.3 Allow to remove and reinstate external services.
- 6.4 Detach bearer to pile connections for the internal and external piles being re-levelled.
- 6.5 Install jacking equipment and lift the affected areas concurrently.
- 6.6 Install new piles as per Re-level Plan on SK.02.
- 6.7 Pack the piles with H5 timber packers. The packer shall consist of a solid piece and a DPC placed between the pile and packer (maximum 100mm deep packer, pile to be replaced if greater than 100mm)
- 6.8 Reinstate pile to bearer connection
- 6.9 At the completion of the re-levelling, the contractor shall ease and adjust all doors, sashes and cupboard doors, drawers, and other openable or movable parts.
- 6.10 The contractor shall make good any cracked linings, windows, flooring, and trims as a result of the re-levelling. Making good shall consist of plastering, priming, and painting.

Project:	25 Tuckers Road, Redwood House Re-level Design	
Reference:	25125	By: JR
Date:	20/03/25	Sketch: SK.01



KEY:
 AP - NZS3604:2011 Anchor Pile

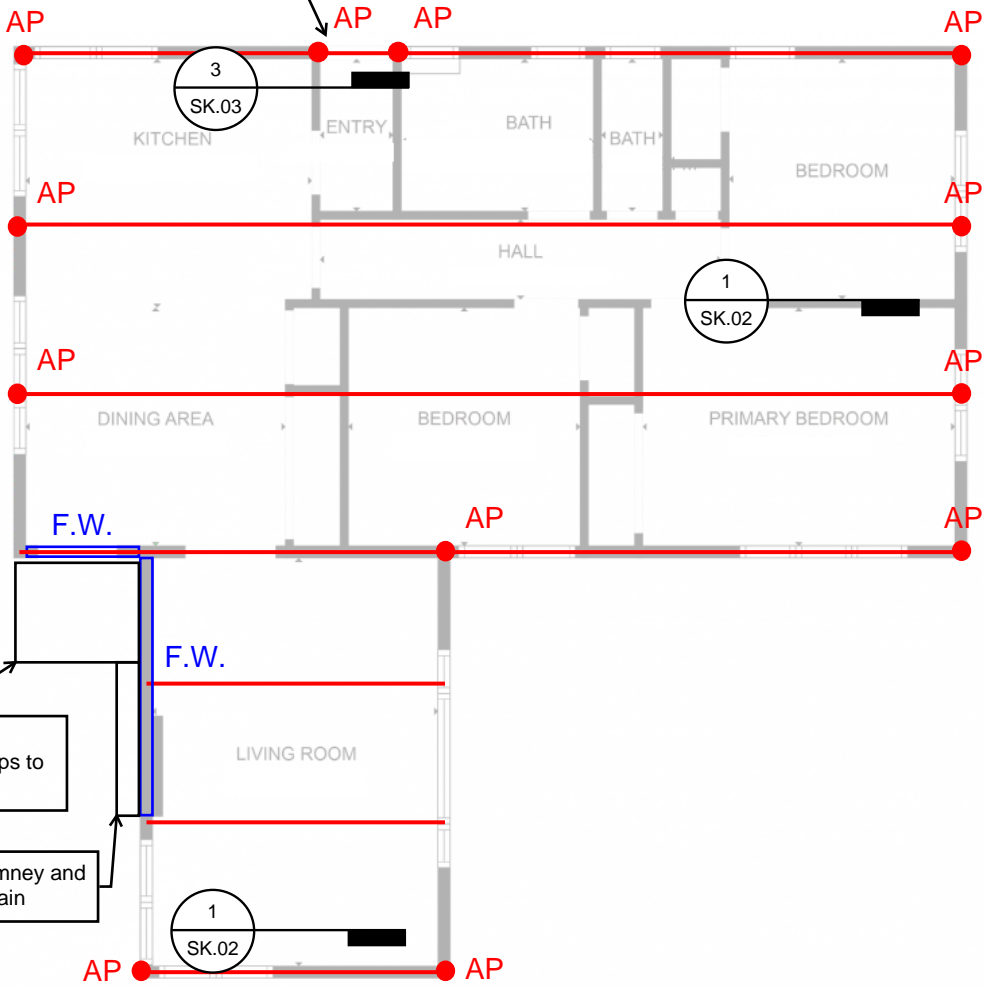
Levels taken by others on:
 11/02/2025.

Spot height checks were
 completed at random to confirm
 accuracy of levels.

Adjusted for floor coverings.

Project:	25 Tuckers Road, Redwood House Re-level Design	
Reference:	25125	By: JR
Date:	20/03/25	Sketch: SK.02

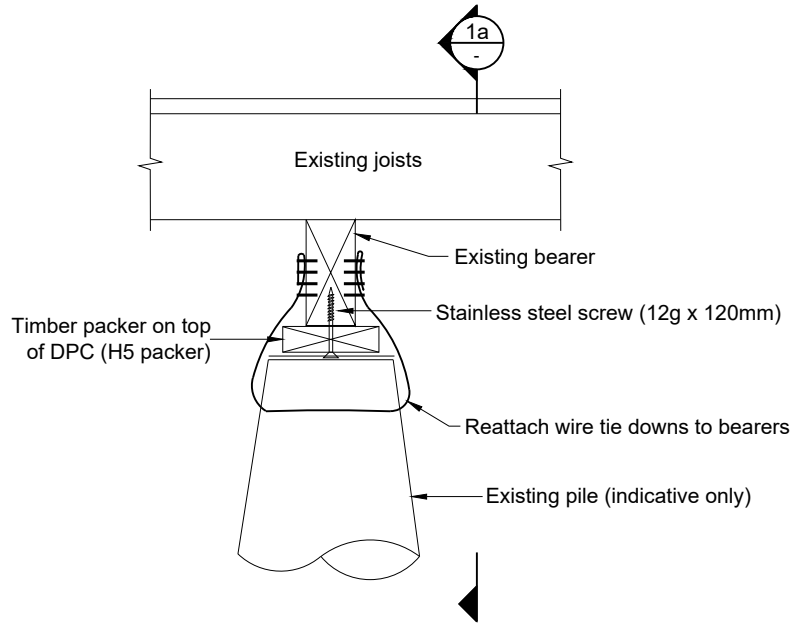
Allow to remove porch and replace with entry steps (by others)



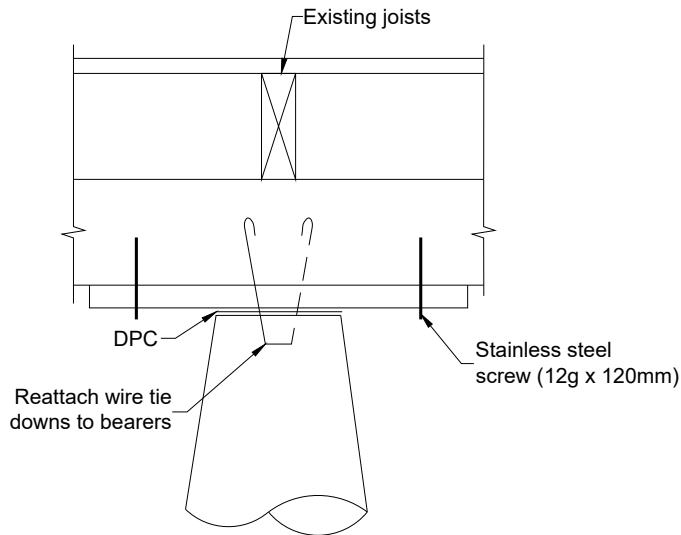
RE-LEVEL PLAN

KEY:
 AP - NZS3604:2011 Anchor Pile
 F.W. - Existing Concrete Foundation Wall

Project:	25 Tuckers Road, Redwood House Re-level Design	
Reference:	25125	By: JR
Date:	20/03/25	Sketch: SK.03

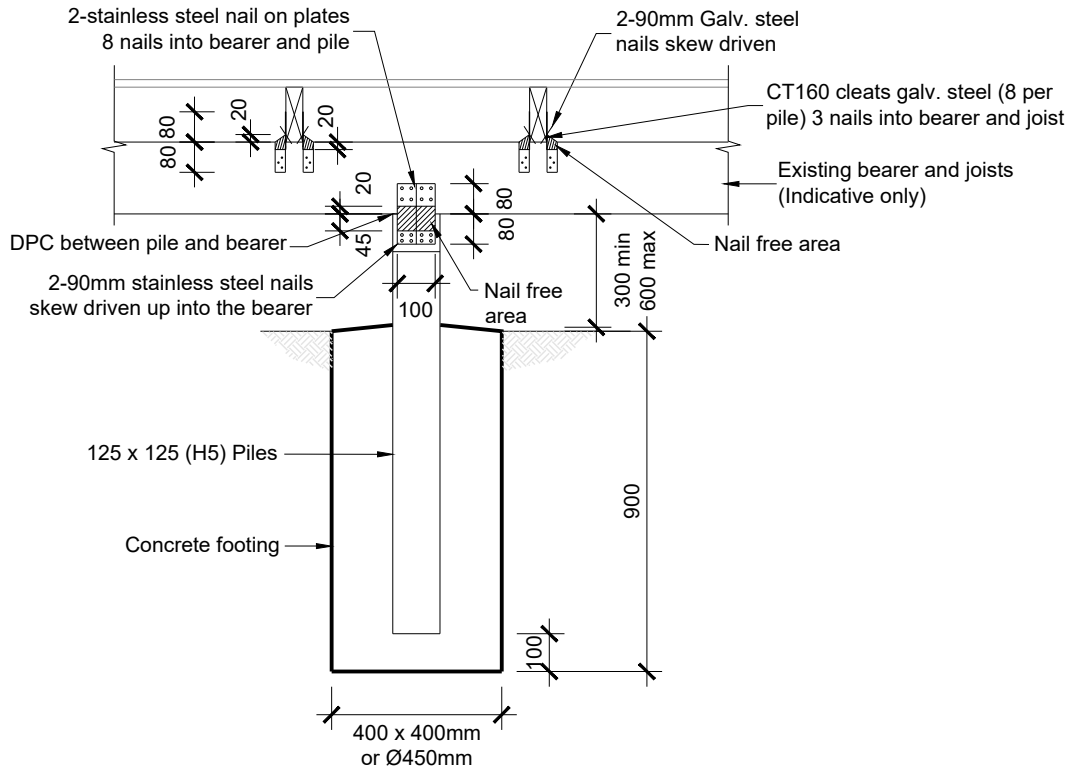


1 PILE PACKING DETAIL



1a PILE PACKING DETAIL

Project:	25 Tuckers Road, Redwood House Re-level Design	
Reference:	25125	By: JR
Date:	20/03/25	Sketch: SK.04



STANDARD ANCHOR PILE DETAIL
SCALE 1:20

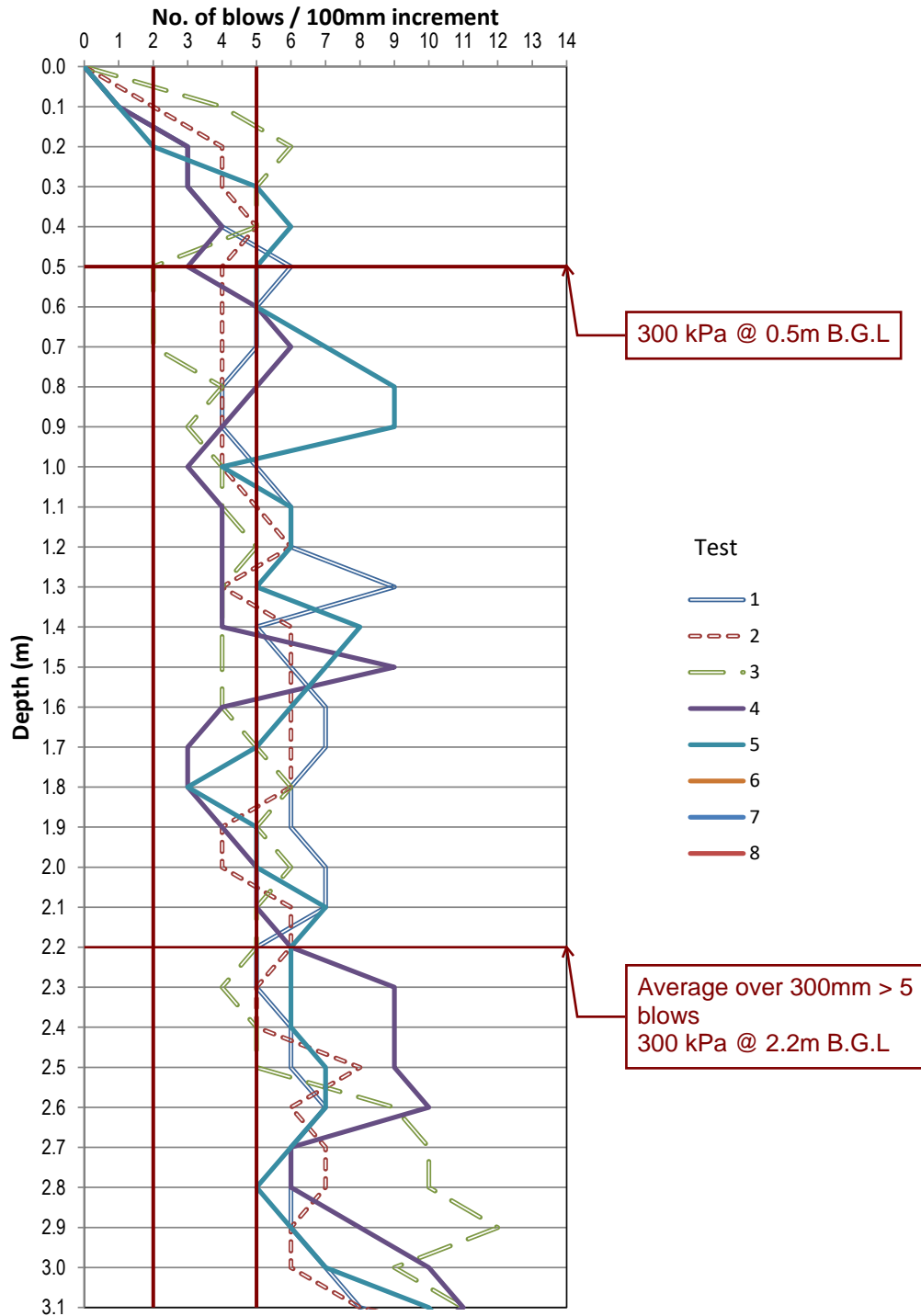
SITE SOILS INVESTIGATION

Project No.: 25123
Project: House Re-level Design
Address: 25 Tuckers Road, Redwood

RICHARDS
CONSULTING ENGINEERS

Date tested: 25 March 2025

Combined Site Soil Penetrometer Test results



Test method used: NZS 4402:1988 Test 6.5.2

SITE SOILS INVESTIGATION

Project No.: 25123
 Project: House Re-level Design
 Address: 25 Tuckers Road, Redwood



Date tested: 25 March 2025 Test ID: 1

Notes:

Depth below ground level	blows/100m m	Scala Penetrometer Results	Soil Description
0.0	0		TOPSOIL
0.1	1		Sandy SILT , brown w/ orange mottles, soft, dry. Firm from 600
0.2	3		
0.3	3		
0.4	4		
0.5	6		
0.6	5		
0.7	5		
0.8	4		
0.9	4		
1.0	5		
1.1	6		Sandy SILT , light brown w/ orange mottles, firm, moist
1.2	6		
1.3	9		Silty SAND , with trace clay, bluish grey, saturated, soft
1.4	5		
1.5	6		
1.6	7		
1.7	7		
1.8	6		
1.9	6		
2.0	7		
2.1	7		
2.2	5		
2.3	5		
2.4	6		
2.5	6		
2.6	7		
2.7	6		
2.8	6		
2.9	6		
3.0	7		
3.1	8		
3.2	12		
3.3	12		
3.4	12		
3.5	13		
3.6	13		
3.7	12		
3.8	13		
3.9	12		
4.0	12		
4.1			

Test method used: NZS 4402:1988 Test 6.5.2

SITE SOILS INVESTIGATION

Project No.: 25123
 Project: House Re-level Design
 Address: 25 Tuckers Road, Redwood



Date tested: 25 March 2025 Test ID: 2

Notes:

Depth below ground level	blows/100m m	Scala Penetrometer Results	Soil Description
0.0	0	0.1	
0.1	2	0.2	
0.2	4	0.3	
0.3	4	0.4	
0.4	5	0.5	
0.5	4	0.6	
0.6	4	0.7	
0.7	4	0.8	
0.8	4	0.9	
0.9	4	1.0	
1.0	4	1.1	
1.1	5	1.2	
1.2	6	1.3	
1.3	4	1.4	
1.4	6	1.5	
1.5	6	1.6	
1.6	6	1.7	
1.7	6	1.8	
1.8	6	1.9	
1.9	4	2.0	
2.0	4	2.1	
2.1	6	2.2	
2.2	6	2.3	
2.3	5	2.4	
2.4	5	2.5	
2.5	8	2.6	
2.6	6	2.7	
2.7	7	2.8	
2.8	7	2.9	
2.9	6	3.0	
3.0	6	3.1	
3.1	8	3.2	
3.2	13	3.3	
3.3		3.4	
3.4		3.5	
3.5		3.6	
3.6		3.7	
3.7		3.8	
3.8		3.9	
3.9		4.0	
4.0		4.1	

Test method used: NZS 4402:1988 Test 6.5.2

SITE SOILS INVESTIGATION

Project No.: 25123
 Project: House Re-level Design
 Address: 25 Tuckers Road, Redwood



Date tested: 25 March 2025 Test ID: 3

Notes:

Depth below ground level	blows/100m m	Scala Penetrometer Results	Soil Description																																																																														
0.0	0	<table border="1" style="display: none;"> <caption>Scala Penetrometer Results Data</caption> <thead> <tr> <th>Depth (m)</th> <th>No. of blows / 100mm increment</th> </tr> </thead> <tbody> <tr><td>0.0</td><td>0</td></tr> <tr><td>0.1</td><td>4</td></tr> <tr><td>0.2</td><td>6</td></tr> <tr><td>0.3</td><td>5</td></tr> <tr><td>0.4</td><td>5</td></tr> <tr><td>0.5</td><td>2</td></tr> <tr><td>0.6</td><td>2</td></tr> <tr><td>0.7</td><td>2</td></tr> <tr><td>0.8</td><td>4</td></tr> <tr><td>0.9</td><td>3</td></tr> <tr><td>1.0</td><td>4</td></tr> <tr><td>1.1</td><td>4</td></tr> <tr><td>1.2</td><td>5</td></tr> <tr><td>1.3</td><td>4</td></tr> <tr><td>1.4</td><td>4</td></tr> <tr><td>1.5</td><td>4</td></tr> <tr><td>1.6</td><td>4</td></tr> <tr><td>1.7</td><td>5</td></tr> <tr><td>1.8</td><td>6</td></tr> <tr><td>1.9</td><td>5</td></tr> <tr><td>2.0</td><td>6</td></tr> <tr><td>2.1</td><td>5</td></tr> <tr><td>2.2</td><td>5</td></tr> <tr><td>2.3</td><td>4</td></tr> <tr><td>2.4</td><td>5</td></tr> <tr><td>2.5</td><td>5</td></tr> <tr><td>2.6</td><td>9</td></tr> <tr><td>2.7</td><td>10</td></tr> <tr><td>2.8</td><td>10</td></tr> <tr><td>2.9</td><td>12</td></tr> <tr><td>3.0</td><td>9</td></tr> <tr><td>3.1</td><td>11</td></tr> <tr><td>3.2</td><td>12</td></tr> <tr><td>3.3</td><td></td></tr> <tr><td>3.4</td><td></td></tr> <tr><td>3.5</td><td></td></tr> <tr><td>3.6</td><td></td></tr> <tr><td>3.7</td><td></td></tr> </tbody> </table>	Depth (m)	No. of blows / 100mm increment	0.0	0	0.1	4	0.2	6	0.3	5	0.4	5	0.5	2	0.6	2	0.7	2	0.8	4	0.9	3	1.0	4	1.1	4	1.2	5	1.3	4	1.4	4	1.5	4	1.6	4	1.7	5	1.8	6	1.9	5	2.0	6	2.1	5	2.2	5	2.3	4	2.4	5	2.5	5	2.6	9	2.7	10	2.8	10	2.9	12	3.0	9	3.1	11	3.2	12	3.3		3.4		3.5		3.6		3.7		
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Test method used: NZS 4402:1988 Test 6.5.2

SITE SOILS INVESTIGATION

Project No.: 25123
 Project: House Re-level Design
 Address: 25 Tuckers Road, Redwood



Date tested: 25 March 2025 Test ID: 4

Notes:

Depth below ground level	blows/100m m	Scala Penetrometer Results	Soil Description
0.0	0		
0.1	1		
0.2	3		
0.3	3		
0.4	4		
0.5	3		
0.6	5		
0.7	6		
0.8	5		
0.9	4		
1.0	3		
1.1	4		
1.2	4		
1.3	4		
1.4	4		
1.5	9		
1.6	4		
1.7	3		
1.8	3		
1.9	4		
2.0	5		
2.1	5		
2.2	6		
2.3	9		
2.4	9		
2.5	9		
2.6	10		
2.7	6		
2.8	6		
2.9	8		
3.0	10		
3.1	11		
3.2	9		
3.3			
3.4			
3.5			
3.6			
3.7			
3.8			
3.9			
4.0			
4.1			

Test method used: NZS 4402:1988 Test 6.5.2

SITE SOILS INVESTIGATION

Project No.: 25123
 Project: House Re-level Design
 Address: 25 Tuckers Road, Redwood



Date tested: 25 March 2025 Test ID: 5

Notes:

Depth below ground level	blows/100m m	Scala Penetrometer Results	Soil Description
0.0	0		TOPSOIL
0.1	1		
0.2	2		
0.3	5		
0.4	6		
0.5	5		
0.6	5		
0.7	7		
0.8	9		
0.9	9		
1.0	4		
1.1	6		
1.2	6		
1.3	5		
1.4	8		
1.5	7		
1.6	6		
1.7	5		
1.8	3		
1.9	5		
2.0	5		
2.1	7		
2.2	6		
2.3	6		
2.4	6		
2.5	7		
2.6	7		
2.7	6		
2.8	5		
2.9	6		
3.0	7		
3.1	10		
3.2	11		
3.3			
3.4			
3.5			
3.6			
3.7			
3.8			
3.9			
4.0			
4.1			

Sandy **SILT**, brown w/ orange mottles, dry, soft

Sandy **SILT**, Dark brown w/ grey, dry, soft

Silty **SAND**, brown, soft, moist

Sandy **SILT** w/ trace gravels. Reddish brown, soft, moist

Silty **SAND** w/ trace clay, grey, saturated, soft

E.O.H. = 1.85m - Poor Recovery

Test method used: NZS 4402:1988 Test 6.5.2

Demand Calculation Sheet

Job Details

Name: House Relevel Design
 Street and Number: 25 Tuckers Road
 Lot and DP Number:
 City/Town/District: Christchurch
 Designer: JR
 Company: RCE
 Date: Thursday, 20 March 2025

Building Specification

Number of Storeys 1
 Floor Loading 2 kPa
 Foundation Type Subfloor
 Subfloor Cladding Weight Light
Single
 Cladding Weight Light
 Roof Weight Heavy
 Room in Roof Space No
 Roof Pitch (degrees) 25
 Roof Height above Eaves (m) 2.1
 Building Height to Apex (m) 5
 Ground to Lower Floor (m) 0.4

 Average Stud Height (m) 2.4
 Building Length (m) 12.23
 Building Width (m) 11.88
 Building Plan Area (m²) 102

Building Location

Wind Zone = Low

Earthquake Zone 2

Soil Type D & E (Deep to Very Soft)
 Annual Prob. of Exceedance: 1 in 500 (Default)

Bracing Units required for Wind

	Along	Across
Single Level	328	313
Subfloor Level	535	526

Bracing Units required for Earthquake

	Along & Across
Single Level	1212
Subfloor Level	1350

Subfloor Level Along Resistance Sheet

Job Name: House Relevel Design

Wind	EQ
Demand	
535	1350
Achieved	

Line	Element	Length or No.	Angle (degrees)	Type	Supplier	Wind (BUs)	EQ (BUs)	1920	1440
A	1	12.00		Anchor Pile	NZS3604	1920	1440	359%	107%
								1920 OK	1440 OK

12 anchor piles required in longitudinal direction

Subfloor Level Across Resistance Sheet

Job Name: House Relevel Design

Wind	EQ
Demand	
526	1350
Achieved	
2800	2280
532%	169%
2800 OK	2280 OK

pile in porch area contributes in this direction

Line	Element	Length or No.	Angle (degrees)	Type	Supplier	Wind (BUs)	EQ (BUs)
M	1	13.00		Anchor Pile	NZS3604	2080	1560
	2	2.40		Masonry 4.5	NZS3604	720	720

minimum length met to contribute to bracing resistance of dwelling

length 2.4m
height 0.45m

$$2.4/0.45 = 5.33$$

DESIGN OF FOOTING UNDER LOAD BEARING POINT

Location

RICHARDS <small>CONSULTING ENGINEERS</small>	Project: 25 Tuckers Road		Page:
	Reference: 25123	Date: 26/03/25	By: JR

<p>Gravity Loads</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Trib Width (m)</th> <th>Trib Length (m)</th> <th>Load (kPa)</th> <th>N (kN)</th> <th>Load (kN)</th> </tr> </thead> <tbody> <tr> <td>G</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Roof</td> <td>1.5</td> <td>1.6</td> <td>0.85</td> <td></td> <td>2.04</td> </tr> <tr> <td>Floor</td> <td>1.2</td> <td>1.6</td> <td>0.4</td> <td></td> <td>0.768</td> </tr> <tr> <td>Wall</td> <td>1.6</td> <td>2.4</td> <td>0.4</td> <td></td> <td>1.536</td> </tr> <tr> <td>Other</td> <td></td> <td></td> <td></td> <td></td> <td>0</td> </tr> <tr> <td>Self Weight</td> <td></td> <td></td> <td></td> <td></td> <td>3.44</td> </tr> <tr> <td>Q</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Floor</td> <td>1.2</td> <td>1.6</td> <td>1.5</td> <td></td> <td>2.88</td> </tr> <tr> <td>Roof</td> <td>1.5</td> <td>1.6</td> <td>0.25</td> <td></td> <td>0.6</td> </tr> <tr> <td>Other</td> <td>0</td> <td>0</td> <td></td> <td></td> <td>0</td> </tr> <tr> <td>S (snow)</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Roof</td> <td>1.5</td> <td>1.6</td> <td>0.63</td> <td></td> <td>1.512</td> </tr> <tr> <td>W (wind)</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Roof</td> <td>1.5</td> <td>1.6</td> <td>0.62</td> <td></td> <td>1.488</td> </tr> <tr> <td>Miscellaneous</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>User Input for Bearing</td> <td></td> <td></td> <td></td> <td></td> <td>0</td> </tr> <tr> <td>User Input for Uplift</td> <td></td> <td></td> <td></td> <td></td> <td>0</td> </tr> </tbody> </table>		Trib Width (m)	Trib Length (m)	Load (kPa)	N (kN)	Load (kN)	G						Roof	1.5	1.6	0.85		2.04	Floor	1.2	1.6	0.4		0.768	Wall	1.6	2.4	0.4		1.536	Other					0	Self Weight					3.44	Q						Floor	1.2	1.6	1.5		2.88	Roof	1.5	1.6	0.25		0.6	Other	0	0			0	S (snow)						Roof	1.5	1.6	0.63		1.512	W (wind)						Roof	1.5	1.6	0.62		1.488	Miscellaneous						User Input for Bearing					0	User Input for Uplift					0	<p>Assumptions</p> <ol style="list-style-type: none"> Governing ULS determined by largest N* Floor Live loads are from Residential Floors Roof Live loads are from Other Roofs Combination live loads include all live loads with ψ factor Lateral loads are applied to the major axis (i.e. to the breadth) First 1m depth of soil has been ignored in calculating skin friction UDL acts over full length of pile above ground Assume relative density of soil < 40% (conservative) - Test 4.2.3 NZS 4402 <div style="text-align: center;"> </div> <p>Cfig(down) = 0.3 Cfig(up) = -1</p>
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<p>Lateral Loads</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Trib Width (m)</th> <th>Load (kPa)</th> <th>W (kN/m)</th> <th>P (kN)</th> <th>y (m)</th> </tr> </thead> <tbody> <tr> <td>W (wind)</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Wall</td> <td></td> <td>Wind sls</td> <td>0.00</td> <td>0</td> <td></td> </tr> <tr> <td>EQ (ω)</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Wall</td> <td></td> <td>EQ sls</td> <td>0.00</td> <td>0</td> <td></td> </tr> <tr> <td>Q (Body Impact)</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Wall</td> <td></td> <td></td> <td></td> <td>0.7</td> <td>0.45</td> </tr> <tr> <td>Miscellaneous</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>User Input</td> <td></td> <td></td> <td>0.00</td> <td></td> <td></td> </tr> </tbody> </table>		Trib Width (m)	Load (kPa)	W (kN/m)	P (kN)	y (m)	W (wind)						Wall		Wind sls	0.00	0		EQ (ω)						Wall		EQ sls	0.00	0		Q (Body Impact)						Wall				0.7	0.45	Miscellaneous						User Input			0.00			<p>Cfig = 1 F_(SLS/ULS) = 0.75</p> <p>Cp = 1 R_{SLS}/R_{ULS} = 0.25</p> <p style="text-align: right;">AS/NZS 1170.2 Horizontal Part Coefficient NZS 1170.5 (Section 8)</p>
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<p>Pile and Soil Properties</p> <p>Slab restraint = No Condition = Drained/Cohesionless/Free head Driven or Bored = Bored Footing type = Circular <i>Note, rectangular footings not covered</i> Diameter of circular footing = 0.45 (m)</p> <p>H = 0.45 <i>Height of pile above ground (m)</i> L = 0.9 <i>Length of the pile shaft (m)</i> Bearing capacity method = Manual</p> <p>Ultimate unfactored bearing = 200 kPa</p> <p>ω = 0 <i>Slope, downhill from edge of foundation (degrees).</i> D_e = <input type="text"/> <i>Minimum horizontal distance from the underside edge of the foundation to the adjacent downward slope (m)</i></p>	<p>Cohesionless soil Φ = 28 <i>Angle of shear stress resistance (degrees)</i> K_p = 2.76983 <i>Coefficient of passive earth pressure</i> γ = 18 <i>Unit weight of the soil (kN/m³)</i></p> <p>Cohesive soil C/S_u = <input type="text"/> <i>Undrained shear strength (kPa)</i> f_o = 0.675 <i>Assumed unsupported pile shaft length = 1.5D_s</i></p> <p>N_{q Piles} = <input type="text"/> <i>N_q for deep pile foundations, refer to Figure 4 below</i></p> <p>Pile Material = <input type="text"/></p>
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<p>Check Pile Moment and Shear Strength</p> <p>Φ = 0.5 <i>B1/VM4 table 1, strength reduction factor</i></p> <p>Hu = 6.06 kN ΦHu = 3.03 kN Hu* < ΦHu = 0.347 OK</p> <p>Mmax = 4.44 kNm ΦMmax = 2.22 kNm M* < ΦMmax = 0.21 OK</p>	<p>M* = 0.47 kN.m Hu* = 1.05 kN</p> <p style="text-align: right;">1.5Q 1.5Q</p>
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<p>Check Compression/Bearing and Uplift</p> <p>Skin friction = No Φ = 0.5 <i>B1/VM4 table 1, strength reduction factor</i> Combination factor = 0.8 <i>Applied to compression load only</i> a = 0.70 <i>Side Adhesion Factor</i> Additional weight = <input type="text"/> kN <i>Applied to uplift only (i.e. weight of slab tied into footing)</i></p> <p>Bearing: N* = 13.66 kN</p> <p>Uplift: N_{up}* = 0.00 kN</p> <p>ΦN_{bearing} = 15.90 kN ΦN_{Total} = 15.90 kN N* < ΦN_{Total} = 0.859 OK</p> <p>ΦN_{Concrete} = 3.09 kN ΦN_{Total} = 3.09 kN N_{up}* < ΦN_{Total} = 0.000 OK</p>	<p>N* = 13.66 kN N_{up}* = 0.00 kN</p> <p style="text-align: right;">1.2G+1.5Q Miscellaneous</p> <p style="text-align: right;">Depth Skin Friction Acts Over: 0.00</p>
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