GEOTECHNICAL INVESTIGATION REPORT

PROPOSED DWELLING

9 ISTANA PLACE
BRITANNIA HEIGHTS
NELSON
Lot 20 DP 417875

Peter de Groot

C/- Contour Architectural

Reference:	23096
Prepared:	30 August 2023
Revision:	1
Issued to:	Hannah Harrowven *drawings@contourbuildings.nz*

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1. INTRODUCTION

This report presents the findings of a geotechnical assessment carried out on a residential lot at 9 Istana Place, Nelson for construction of a proposed dwelling.

The purpose of our investigation was to assess subsoil conditions and geotechnical risks to determine the geotechnical suitability of the proposed development. This report presents the findings of the site investigation and provides foundation design recommendations for the proposed dwelling.

This report has been prepared for Peter de Groot in accordance with our proposal for geotechnical services dated 16 June 2023 and subject to a review of the final development plans may be used in support of an application to Nelson City Council (NCC) for building consent in respect of the proposed development as described herein.

This report is intended to inform the design of the proposed building and any associated retaining walls. By itself, this report may not be used to accompany an application for building consent. A geotechnical review of the finished plans will be required and both this report and the subsequent plan review letter would need to accompany the application for building consent.

2. SITE DESCRIPTION

2.1 General

The subject site (legally described as Lot 20 DP 417875) is located in Britannia Heights, Nelson, approximately 3 km south-west of Nelson city centre. The site covers an approximate land area of 750 m^2 and is moderately steeply sloping with a north-eastern aspect. A fairly steep west to east trending gully is present to the north of the site, and is vegetated with scrub.

The site is vacant and has remained so since subdivision. As part of the August 2022 weather event, a slip occurred in the northern part of the site where the area immediately below the stormwater and wastewater manholes was evacuated and entered the gully to the north.

A site plan is attached, Figure 23096-01.

3. GEOLOGY AND GEOMORPHOLOGY

The published Geology of the Nelson region[1] shows the site is underlain by Port Hills Gravel (tp).

A review of the GNS Active Faults Database indicates the nearest active fault is the Bishopdale Fault which trends in an approximate east-west direction approximately 1.5 km south-east of the site.

4. EXISTING INFORMATION

4.1 Geotechnical Reports

The earthworks and building site completion report[2] for this stage of the Tasman Heights subdivision was completed by T&T[3]. From a review of the report and associated attachments, the following were noted pertaining to the site.

- Istana Place earthworks were carried out by KB Quarries in September 2004. Reporting indicates the fill was around 1 m deep.
- The site comprises natural and filled ground, with good ground indicated at shallow depths (<0.45 m).

1 Johnston et al; v3-2022 '*Revised Geological Map of the Nelson-Richmond Urban Area.*

[2] Tonkin & Taylor, 2009. Earthworks and Building Site Certification Report. *Istana Place/Crown Terrace Subdivision, Tasman Heights, Nelson.* Rec. 81069.010 dated June 2009.

[3] Tonkin & Taylor

- The majority of the site is designated a Specific Investigation and Design (SID) area, with the area below the service manholes at the base of the site designated a Restricted Building Area (RBA).
- No earthworks or buildings other than minor non-habitable structures should be undertaken within the area designated RBA.
- Within the SID area, foundations shall be investigated, designed and constructed by a GeoProfessional[4]. All temporary or permanent cuts greater than 0.8 m in height shall be specifically investigated by a GeoProfessional.
- All fills within the SID area greater than 1 m thickness shall be investigated and designed by a GeoProfessional. No unretained fill shall be placed on ground sloping greater than 2.5H:1V.
- In the SID area, retaining walls should be specifically investigated and designed by a GeoProfessional.
- The fill placed during subdivision filling was certified per NZS 4431:1989 per the T&T statement of suitability of earthfill for residential development.

4.2 New Zealand Geotechnical Database

A review of the New Zealand Geotechnical Database (NZGD) indicates that one test pit has been previously completed at 13 Istana Place, approximately 40 m east of the site. NZGD ref.TP-108061 encountered topsoil and subdivision fill to 0.9 m depth, over a 0.3 m thick layer of stiff to hard gravelly silty CLAY, with very dense clayey Gravels of the Port Hills Gravel formation encountered below 1.2 m depth to the base of the hole at 3.0 m depth.

4.3 Natural Hazards

4.3.1 Liquefaction Hazard

Nelson City Council mapping indicates that the site is located within an area of very low liquefaction vulnerability. Per Table 6.2 of the MfE Guidelines[5], site-specific liquefaction assessment is typically not required for this type of development.

4.3.2 Fault Rupture

The site is not mapped within a Fault Hazard Overlay under the Nelson Resource Management Plan[6] (NRMP).

4.3.3 Slope Instability

The site was mapped within a Tier III Slope Instability Susceptibility Area during recent mapping released by the NCC, meaning that it has been identified as susceptible to slope instability based on the geological and geomorphic setting and/or with previous records of slope instability failure.

5. PROPOSED DEVELOPMENT

We have been supplied with concept architectural plans for the proposed development, prepared by Contour Architectural ref.2232 dated 26 May 2023. Based on this information and discussions with the client and architect, we understand that the proposed development will comprise a split level two-storey dwelling supported on piled foundations and potentially with concrete block walls supporting cuts. Retaining walls are also proposed to support the driveway access to the site.

The location of the proposed dwelling is shown on the attached site plan Figure 23096-01.

[4] Chartered Professional Engineer practising in geotechnical engineering or an Engineering Geologist
[5] Planning and Engineering Guidance for Potentially Liquefaction Prone Land, September 2017
[6] NRMP online Planning Maps accessed 15/08/2023

6. SITE INVESTIGATION

On 1 August 2023 GeoSolutions completed a shallow geotechnical investigation across the proposed development area. The fieldwork comprised the following:

- A walk over visual appraisal of the site;
- Three digger excavated test pits to depths between 1.6 m and 1.9 m (TP01 – TP03).
- One Scala penetrometer test (SC01) was completed from the existing ground surface adjacent to TP03.

The approximate location of geotechnical test positions is shown on the attached site plan, Figure 23096-01. The test pit logs and Scala test results are attached.

Soil descriptions given on the logs are in general accordance with the New Zealand Geotechnical Society's "Field Description of Soil and Rock." Groundwater levels were measured where encountered and are indicated on the relevant test logs.

7. GROUND MODEL

7.1 Subsoil Conditions

Detailed descriptions of the subsoils encountered in the test pits are attached on the test pit logs. The subsoils were generally found to comprise:

- **Topsoil (0.3 m to 0.65 m deep)**, overlying:
- **Certified Subdivision Fill (to 0.65 m depth)**, comprising medium dense, clayey silty GRAVEL, overlying:
- **Colluvium (1.2 m to 1.4 m depth)**, comprising stiff to very stiff, grey to brown, silty CLAY to clayey SILT with trace to minor gravel, overlying:
- **Port Hills Gravel (to the base of the holes @ 1.9 m depth)**, comprising very stiff to hard, orange brown and grey, gravelly clayey SILT with cobbles.

Where fine grained cohesive soils were encountered, shear vane testing was completed at discrete locations within the shallow soil profile. The results indicate that the colluvium soils overlying the Port Hills Gravels are generally very stiff with undrained shear strengths in excess of 100kPa. Scala penetrometer testing indicates that the Port Hills Gravel soils are generally hard.

7.2 Groundwater

During site testing completed on 1 August 2023, no groundwater was encountered in any test hole and due to the elevation of the property, would be expected to be at depth. It is possible that perched groundwater may exist during or immediately following heavy or prolonged rainfall events.

8. GEOTECHNICAL ASSESSMENT

8.1 Building Importance Level

IL2: Typical residential, commercial and industrial buildings.

8.2 Seismic Site Subsoil Category

In accordance with NZS 1170.5:2004 and to account for earthquake amplification effects, the site subsoil classification is interpreted from the surface geology and estimates of depth to underlying rock, to be a site subsoil 'Class C - shallow soil'.

8.3 Faulting

No evidence of faulting was observed during the investigations and as no fault line hazards are identified on the site, per the NRMP the risk of fault rupture hazard does not require further assessment.

8.4 Liquefaction and Lateral Spread

Due to the cohesive and gravelly nature of the soils associated with the Port Hills Gravel Formation and elevated position of the site there is a very low risk of seismic liquefaction or lateral spreading affecting the site.

8.5 Slope Instability

The site is situated on moderately steeply sloping ground observed to be standing at around 26° to 27° (1V:2H). The topography of the site was slightly undulating and hummocky, particularly immediately above the manholes where ground cracking was observed. This topography could be as a result of creep of the topsoil, sidecast material not tidied up following the installation of the manholes and drains present in the northern part of the site, or associated with slow creep or shallow instability of the colluvium soils. Some or all of these may be contributing factors in this case.

During the August 2022 weather event, the area immediately below (north) of the NCC stormwater and wastewater manholes was evacuated and slipped down into the gully north of the site. This has left a scarp around 5 m wide with a backscarp standing up to around 1 m high. On inspection, it appeared the slip was limited to the topsoil and colluvium soils, slipping along the surface of the more competent PHG soils. Following discussions with the client, it is considered likely that the slip may have been exacerbated by the presence of the manholes and drains immediately upslope which may either be leaking or were only loosely backfilled promoting water infiltration. The client mentioned that while planting out the area of the slip and surrounding area that these soils closer to the manholes were more moist than those further away and much easier to dig as a result.

Given the recent instability at the site and the evidence of potential soil creep or shallow instability, foundation and retaining wall design at the site will be subject to specific engineered design. More detailed recommendations are given below in Section 9.

8.6 Bearing Capacity

While the colluvium was found to vary between firm and stiff in nature, due to the previously discussed possibility of soil creep within that layer and its possible weakness in wet conditions, it is recommended that all foundations and retaining walls extend through the colluvium to found into the underlying *in situ* material of the Port Hills Gravel Formation which was consistently stiff to very stiff.

8.7 Static settlement

Consolidation settlement or static settlement occurs due to the presence of soft, potentially compressible soil layers within the zone of influence of proposed building foundations. Consolidation settlement is the vertical displacement of the ground under a load which can result in damage to foundations.

At this site those soils would include the topsoil layer and any uncontrolled fill that may be encountered. Provided that these are either removed and replaced by hardfill during construction or that foundations are taken down through these materials into more competent materials below, the risk of static settlement affecting future residential development on the proposed development site is low.

9. RECOMMENDATIONS

9.1 Foundations

9.1.1 General

The subsoils at this site were found to comprise 300 mm to 700 mm thick layer of topsoil overlying subdivision fill and colluvium soils, with competent Port Hills Gravel soils encountered below around 1.4 m depth. Given the slope of the site and the risk of further slope instability, the founding conditions are outside the criteria for "Good Ground" as given in NZS 3604:2011.

9.1.2 Piled Foundations

Given the slope of the site and depth to competent Port Hills Gravel soils, a timber piled foundation system would be the simplest and most cost-effective foundation type. Piles should be taken down through all topsoil, fill and colluvium soils, and be socketed a minimum of 3D (where D is the pile hole diameter) into competent PHG soils. Indicative pile depths are given in the table below.

Parameter	**Pile Diameter (mm)**		
	300	**450**	**600**
Minimum embedment into bearing stratum *	900	1350	1800
Total depth below existing GL.	2300	2750	3200
Notes: * The bearing stratum is defined as ground with a consistent Scala reading of >5 blows per 100 mm penetration – In this case the Port Hills Gravel layer.			

We consider that the subfloor system could be designed per NZS 3604:2011 but the piles shall not be relied upon for long-term lateral support (i.e. subfloor bracing is to be provided, with the piles providing axial load resistance only). The pile designer may elect to optimise the pile/bearer layout beyond the fairly conservative approach advocated by NZS 3604:2011. If higher pile capacity is required, the design should be referred back to us.

Given the slope of the site and the presence of hummocky topography and minor ground cracking near the base of the site, allowance should be made for slow creep of the topsoil and upper colluvium layer (i.e. within the top 1.4 m).

9.1.3 Concrete Foundations

Where located on cut ground or retained by an engineered retaining wall (*to address the potential for instability above the PHG*), small portions of the dwelling may be founded on concrete footings or foundations, made possible by retaining segments of the site. It is anticipated that such retaining would need to be by timber pole retaining walls rather than concrete block to achieved the desired stability outcome. Walls supporting cuts may be concrete block or tilt slab (or similar).

As given above, all foundations shall be subject to Specific Investigation and Design (SID) by a GeoProfessional[7] in order to take into account the proximity to sloping ground and depth to competent Port Hills Gravels.

9.2 Earthworks

The site is moderately steeply sloping and it is understood that the proposed earthworks at the site will comprise the excavation of dwelling pile holes and cuts to establish retaining walls.

Depending on the scale and location of the earthworks, Council may require a site-specific erosion & sediment control plan. Guidance on the development of such plans can be found in the Nelson Tasman Erosion and Sediment Control Guidelines (July 2019). Rules around erosion and sedimentation control are defined in the NRMP and we recommend that you contact council and have the scope of works reviewed by its compliance team to ensure that if required, consents can be obtained and the necessary controls put in place.

All cuts steeper than 1V:2H should be retained by an engineer designed retaining wall.

All fill shall be placed in full accordance with NZS 4431:2022. No slope steeper than 2.5H:1V is to be steepened by the placement of fill material.

All excavated topsoil and unsuitable material should be removed from site.

9.3 Retaining Walls

Retaining walls are to be designed by a CPEng or GeoProfessional assuming the following:

- Soils below 0.9 m depth:
  - $\phi' = 28°$
  - Su = 80 kPa
  - $\gamma = 19$ kN/m^3
- Soils below 1.4 m depth:
  - $\phi' = 34°$
  - Su = 120 kPa
  - $\gamma = 19$ kN/m^3

It is important that:

- Retaining walls integral to the building are designed with K_0;
- Stand-alone walls are designed with K_a, unless they are supporting a stiff structure, where K_0 would be more appropriate;
- For walls which are integral to the building at one end and then continue beyond the building at the other, a seismic gap shall be included at the edge of the building. The external part of the wall may then be designed with K_a (or K_0);
- For embedment conditions, S_u should be used due to the poor-draining nature of the materials present;
- Appropriate allowance to be made for any surcharge loads above walls.

Given the slope of the site and the presence of hummocky topography and minor ground cracking near the base of the site, allowance should be made for slow creep of the topsoil and upper colluvium layer.

Any foundations upslope of any retaining wall shall be extended downwards to found below a line extended up at 45° from the heel of the lower wall, unless the surcharging effect is specifically included in the design of the wall.

[7] Chartered Professional Engineer specialising in geotechnical engineering (CPEng(Geotech)) or Professional Engineering Geologist (PEngGeol), both as administered by Engineering NZ.

All retaining walls are to include adequate drainage measures behind the wall to capture any groundwater seepage and the ground above/behind the wall graded to avoid the possibility of surface water ponding behind the wall.

9.4 Stormwater Management

Stormwater from roofs, hardstandings, tank overflows and other impermeable areas shall be collected and piped to discharge to Council's reticulated network.

Where reticulation is not available, given the gravelly nature of the underlying soils, it is anticipated that discharge to ground soakage would be feasible, subject to specific design.

9.5 Wastewater

All wastewater is to be piped to Council's reticulation.

9.6 Temporary Site Stability

Large excavations have the potential to destabilise the site and for this reason it is important that all the earthworks are appropriately managed and staged. Any proposal to undertake excavations deeper than 2.0 m or deeper than 1.5 m and longer than 8 m along the contour, is to be reviewed by a GeoProfessional and a staged approach agreed with the Contractor prior to any works commencing on site.

Such potential instability also presents a hazard to people working below the cut slopes and partially constructed retaining walls. Prior to works commencing on site, the Contractor is to develop an Excavation Management Plan which shall as a minimum provide details of:

- Excavation/retaining wall construction staging and programme;
- Excavation profiles and temporary propping details if required;
- Mitigation measures in the event of wet weather;
- Temporary stormwater control.

This written document is to be provided to the GeoProfessional for comment.

Excavation and retaining wall construction work is to be staged and managed such that the excavated temporary batters are left unsupported for a minimum period of time, not more than a fortnight. Provision shall be made for staging of construction of individual walls, temporary propping of the cut face if necessary and for covering the face with polythene sheeting should the weather become inclement. Temporary drainage is to be provided to re-direct surface runoff away from the excavation. Excavation shall be undertaken only when the weather forecast is favourable (dry).

A GeoProfessional is to inspect the excavated batter slopes to verify the ground conditions and review the stability, prior to construction of the retaining walls.

9.7 Planting

Planting can provide a degree of protection against small-scale instability and erosion of surficial soils. We recommend that where possible, sloping ground is planted out with species appropriate for the area, with an emphasis on deep rooting varieties. Pines, gums and wattles should be avoided.

9.8 Test Pits

Investigations on the site involved the excavation of three test pits. They have only been loosely backfilled. The pits were sited to minimise the impact on subsequent development, but where they clash with proposed hardstandings, services or shallow foundations, the pits must be undercut and backfilled in accordance with NZS 4431:2022.

9.9 Existing Services

The drainage plan for the site should be reviewed prior to construction to ensure that any development will not adversely impact these services. Building developments involving foundations within a 45° zone of influence from service pipe inverts will require specific design by a CPEng with a view to piling foundation loads below that zone.

10. Plan Review

10.1 Prior to Application for Building Consent

A geotechnical review of the detailed development plans will be required prior to application for building consent. This should include geotechnical review of the proposed earthworks, foundation design, stormwater disposal and any retaining wall design. This is to ensure that the information used as the basis of this report is consistent with final development proposals and that the recommendations outlined in this report have been interpreted correctly.

11. Site Inspections during Construction

Geotechnical inspection of all earthworks and foundation excavations will be required at the time of construction. This is to confirm expected ground conditions and to ensure compliance with the recommendations contained in this report.

It is the Client's responsibility to ensure that we are notified of any required inspections and that we are given adequate notice to carry out the inspections (at least 48 hours). We will issue a certification letter upon successful completion of the inspected works.

12. Next Steps

We recommend that you complete designs for the new dwelling noting the requirements for specific design and/or review noted above.

13. LIMITATIONS

This report has been prepared solely for the use and benefit of Peter de Groot, their professional advisers and Nelson City Council, in relation to the specific project described. No liability is accepted in respect of its use for any other purpose or by any other person or entity. Data or opinions contained in it may not be used in other contexts, by other parties or for any other purpose without our prior review and agreement.

As subsurface information has been obtained from discrete investigation locations, which by their nature only provide information about a relatively small volume of soils, there may be special conditions pertaining to this site that have not been disclosed by the investigation and that have not been taken into account in the report. If variations in the soil occur from those described or assumed to exist then the matter should be referred back to GeoSolutions immediately.

For an on behalf of
GEOSOLUTIONS NZ LTD

Author:	**Sam Buckner** Engineering Geologist BSc PMEG	**Signed:**
Review:	**Sally Hargraves** Professional Engineering Geologist BSc PhD CMEngNZ (PEngGeol)	**Signed:**

Attachments:

- Figure 23096-01 – Geotechnical Site Plan
- Figure 23096-02 – Indicative Geological Section
- Test pit logs (TP01 to TP03)
- Scala penetrometer test results (SC1)

N
W E
S

0m 2m 4m 6m 8m 10m

LEGEND

- TP1 — Test pit
- SC1 — Scala penetrometer test
- Lot boundary
- Restricted Building Area per T&T
- Proposed Building Footprint
- Area of Certified Subdivision Fill

Notes:

1) Test locations based on approximate measurements only.
2) Plan based on data from Top of the South Maps and LINZ.
3) Contour interval 0.5 m. All heights in terms of NZVD2016.
4) Proposed development layout provided by Contour Architectural (ref. 2232 dated 26/05/2023).
5) Dimensions in metres unless otherwise shown.

geo SOLUTIONS
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	Date	Name
Designed:	2/08/23	SB
Printed:	30/08/23	

Project Ref: 23096

Client: Peter de Groot

PROPOSED DWELLING
9 ISTANA PLACE, NELSON
Geotechnical Site Plan

Figure 23096-01

Rev. 0

Date: 30/08/23

Scale: 1:200 at A3

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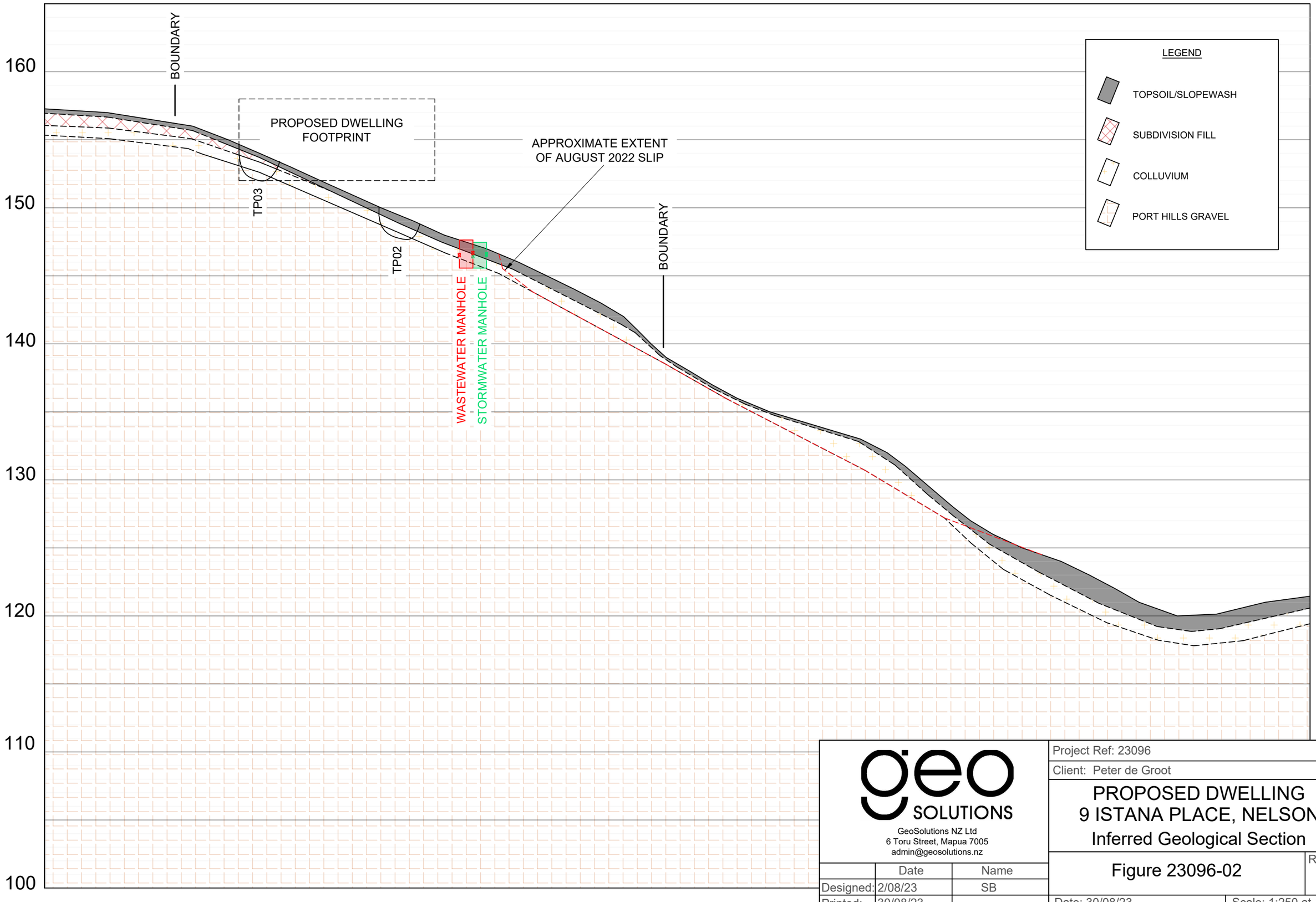

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Client: Peter de Groot

PROPOSED DWELLING 9 ISTANA PLACE, NELSON

Inferred Geological Section

Figure 23096-02

Rev. 0

Date: 30/08/23

Scale: 1:250 at A3

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EXCAVATION LOG

EXCAVATION NO: **TP01**

JOB NO.	23096	**LOCATION:**	9 Istana Place, Nelson		
PROJECT:	Proposed Dwelling	EXCAVATION TYPE:	Machine Excavated Test Pit	HOLE STARTED:	1/08/2023
COORDINATES:		EQUIPMENT:	8T Yanmar	HOLE FINISHED:	1/08/2023
RL:		OPERATOR:	Nick - Rod Thompson Contracting	LOGGED BY:	SB
DATUM:		EXCAVATION DIMENSIONS:	0.5 x 2.0m	CHECKED BY:	SH

EXCAVATION AND TESTS					ENGINEERING DESCRIPTION				GEOLOGICAL	
PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS PP = Pocket Penetrometer qu kPa SV = Shear Vane (corrected kPa) DCP = Dynamic Cone Penetrometer (blow counts/50mm)	RL (m) / DEPTH (m)	SOIL DESCRIPTION Fraction - colour - structure - strength - moisture - bedding - plasticity - sensitivity - additional	MOISTURE CONDITION	SHEAR STRENGTH / RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH (kPa) 10 25 50 100 200	ORIGIN TYPE, MINERAL COMPOSITION DEFECTS, STRUCTURE	UNIT
				0.1	Clayey SILT; dark brown and black; trace fibrous organics.	M			TOPSOIL	
				0.2						
				0.3	Silty CLAY; black; trace fibrous organics.	M-W				
				0.4						
				0.5						
				0.6						
				0.7	Silty CLAY; grey and light brown.		St		COLLUVIUM	
				0.8						
			SV = 150	0.9	Clayey SILT; brown and light orange brown; minor gravel (fine to coarse, SW to HW, subrounded to rounded).		VSt			
				1.0						
				1.1						
				1.2						
				1.3	Gravelly Clayey SILT; orange brown and grey; trace cobbles. Gravel: fine to coarse, SW to HW, subrounded to rounded.	M	VSt-H		PORT HILLS GRAVEL	
				1.4						
				1.5						
				1.6						
				1.7	End of hole - terminated in target material					
				1.8						
				1.9						
				2.0						

SKETCH / NOTES

EXCAVATION LOG

EXCAVATION NO: **TP02**

JOB NO.	23096	**LOCATION:**	9 Istana Place, Nelson		
PROJECT:	Proposed Dwelling	EXCAVATION TYPE:	Machine Excavated Test Pit	HOLE STARTED:	1/08/2023
COORDINATES:		EQUIPMENT:	8T Yanmar	HOLE FINISHED:	1/08/2023
RL:		OPERATOR:	Nick - Rod Thompson Contracting	LOGGED BY:	SB
DATUM:		EXCAVATION DIMENSIONS:	0.5 x 2.0m	CHECKED BY:	SH

EXCAVATION AND TESTS					ENGINEERING DESCRIPTION				GEOLOGICAL	
PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS PP = Pocket Penetrometer qu kPa SV = Shear Vane (corrected kPa) DCP = Dynamic Cone Penetrometer (blow counts/50mm)	RL (m) / DEPTH (m)	SOIL DESCRIPTION Fraction - colour - structure - strength - moisture - bedding - plasticity - sensitivity - additional	MOISTURE CONDITION	SHEAR STRENGTH / RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH (kPa) 10 25 50 100 200	ORIGIN TYPE, MINERAL COMPOSITION DEFECTS, STRUCTURE	UNIT
				0.1	Clayey SILT; dark brown and black; trace fibrous organics.	M			TOPSOIL	
				0.2						
				0.3	Silty CLAY; black; trace fibrous organics.	M-W				
				0.4						
				0.5						
				0.6	Silty CLAY; grey and light brown.		St		COLLUVIUM	
			SV = 180	0.7						
				0.8						
				0.9						
				1.0	Silty CLAY; brown and light orange brown; minor gravel (fine to coarse, SW to HW, subrounded to rounded).		VSt			
				1.1						
				1.2						
				1.3						
				1.4	Gravelly Clayey SILT; orange brown and grey; trace cobbles. Gravel: fine to coarse, SW to HW, subrounded to rounded.	M	VSt-H		PORT HILLS GRAVEL	
				1.5						
				1.6						
				1.7	End of hole - terminated in target material Topsoil depth varies due to hummocks of topsoil slumping or fill					
				1.8						
				1.9						
				2.0						

SKETCH / NOTES

EXCAVATION LOG

EXCAVATION NO: **TP03**

JOB NO.	23096	**LOCATION:**	9 Istana Place, Nelson		
PROJECT:	Proposed Dwelling	EXCAVATION TYPE:	Machine Excavated Test Pit	HOLE STARTED:	1/08/2023
COORDINATES:		EQUIPMENT:	8T Yanmar	HOLE FINISHED:	1/08/2023
RL:		OPERATOR:	Nick - Rod Thompson Contracting	LOGGED BY:	SB
DATUM:		EXCAVATION DIMENSIONS:	0.5 x 2.0m	CHECKED BY:	SH

EXCAVATION AND TESTS					ENGINEERING DESCRIPTION				GEOLOGICAL	
PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS PP = Pocket Penetrometer qu kPa SV = Shear Vane (corrected kPa) DCP = Dynamic Cone Penetrometer (blow counts/50mm)	RL (m) / DEPTH (m)	SOIL DESCRIPTION Fraction - colour - structure - strength - moisture - bedding - plasticity - sensitivity - additional	MOISTURE CONDITION	SHEAR STRENGTH / RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH (kPa) 10 25 50 100 200	ORIGIN TYPE, MINERAL COMPOSITION DEFECTS, STRUCTURE	UNIT
			See SC1	0.1	Clayey SILT; dark brown and black; trace fibrous organics.	M			TOPSOIL	
				0.2						
				0.3						
				0.4	Clayey Silty GRAVEL; brown. Gravel: fine to coarse, UW, rounded.		LP		SUBDIVISION FILL	
				0.5						
				0.6						
				0.7	Silty CLAY; grey and light brown; trace fine gravel (fine to medium, SW to HW, rounded).	M-W	St		COLLUVIUM	
				0.8						
				0.9	Silty CLAY; grey and orange brown; minor gravel (fine to coarse, SW to HW, subrounded to rounded).		VSt			
				1.0						
				1.1						
				1.2						
				1.3						
				1.4						
				1.5	Gravelly Clayey SILT; orange brown and light greyish brown; trace cobbles. Gravel: fine to coarse, SW to HW, subrounded to rounded.	M	VSt-H		PORT HILLS GRAVEL	
				1.6						
				1.7						
				1.8						
				1.9						
				2.0	End of hole - terminated in target material					

SKETCH / NOTES

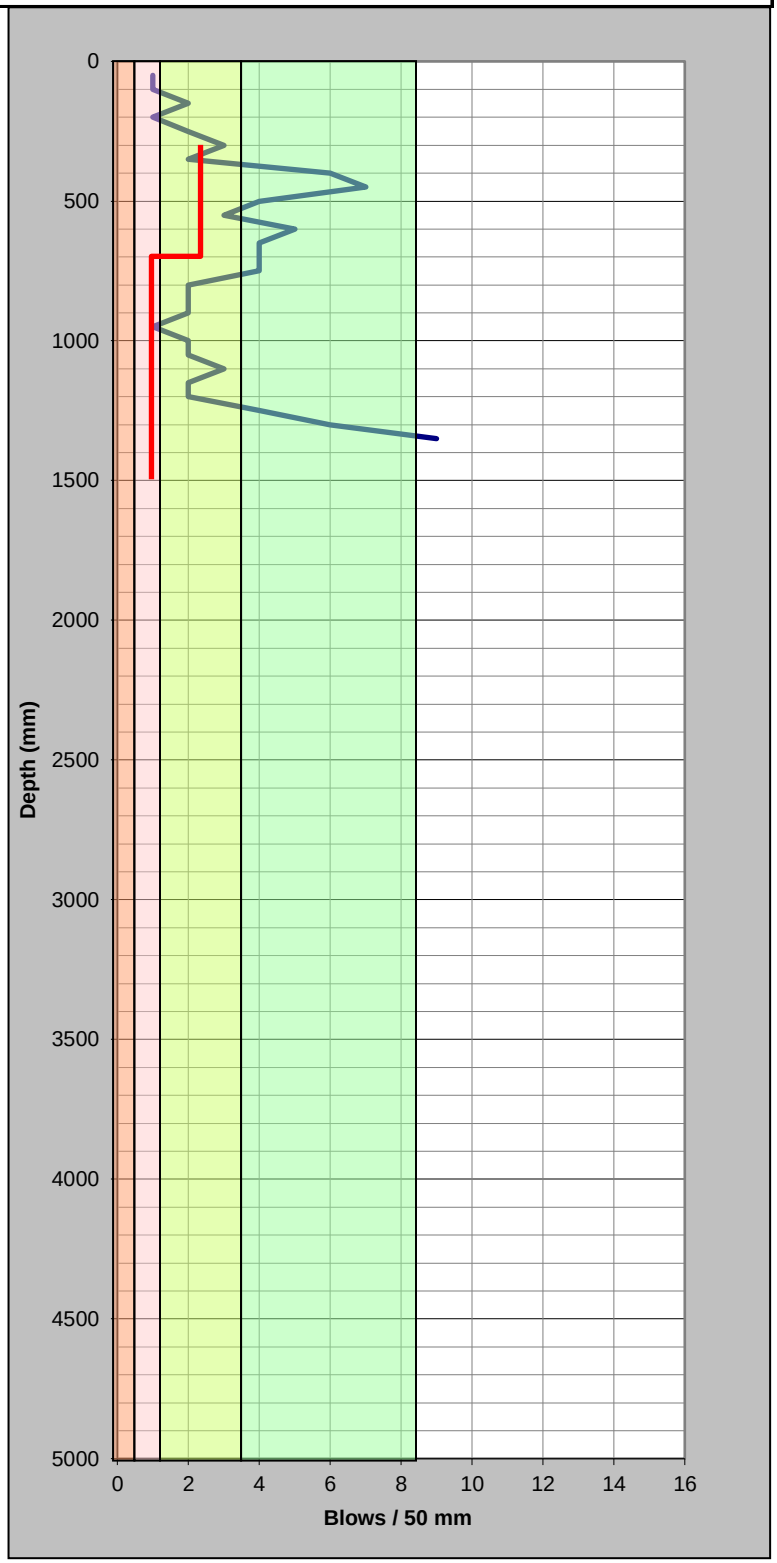
SCALA PENETROMETER LOG

Job No: 23096
Project: Proposed Dwelling
Location: 9 Istana Place, Nelson
(Refer Plan)

Date: 1/8/2023
Operated by: SB

Test No.
SC01

mm Driven	No. of Blows	mm Driven	No. of Blows
50	1	2550	
100	1	2600	
150	2	2650	
200	1	2700	
250	2	2750	
300	3	2800	
350	2	2850	
400	6	2900	
450	7	2950	
500	4	3000	
550	3	3050	
600	5	3100	
650	4	3150	
700	4	3200	
750	4	3250	
800	2	3300	
850	2	3350	
900	2	3400	
950	1	3450	
1000	2	3500	
1050	2	3550	
1100	3	3600	
1150	2	3650	
1200	2	3700	
1250	4	3750	
1300	6	3800	
1350	9	3850	
1400		3900	
1450		3950	
1500		4000	
1550		4050	
1600		4100	
1650		4150	
1700		4200	
1750		4250	
1800		4300	
1850		4350	
1900		4400	
1950		4450	
2000		4500	
2050		4550	
2100		4600	
2150		4650	
2200		4700	
2250		4750	
2300		4800	
2350		4850	
2400		4900	
2450		4950	
2500		5000	



Testing Complies with NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer
Interpretation based on Guidelines Published by NZ Geomechanics Soc. (1988) and NZS 3604:2011

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