Geotechnical Investigation Report

280 Taylor Road, Taipa

Lot 1 DP 102703

For

Ann-Marie & Layton Whale

Haigh Workman reference 19 164

November 2019

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Revision History

Revision Nº	Issued By	Description	Date
A	John Power	First Issue	October 2019

Prepared By	Reviewed By	Approved By
John Power	Wayne Thorburn	John Pappesch
Geologist	Senior Geotechnical Engineer CPEng, CMEngNZ	Director MEngNZ

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FIGURES

Executive Summary

Haigh Workman Limited (Haigh Workman) were engaged by Ann-Marie and Layton Whale (the Clients) to undertake a geotechnical investigation for a proposed dwelling at 280 Taylor Road, Taipa (Lot 1 DP 102703).

Ground conditions encountered during the geotechnical investigation confirmed the published geology maps, with Whangai Formation soils underlying the site. Evidence of non-certified fill placement below the proposed footprint was observed. Up to 0.7m of non-certified fill material lies below the southwest corner of the proposed building platform. The natural soils below the non-certified fill material were generally described as being very stiff silt and clay. Groundwater was encountered within all four boreholes at depths of between 1.3mbgl and 3.0mbgl. Groundwater levels can and do fluctuate and higher groundwater levels may be encountered following periods of prolonged or heavy rainfall.

Slope instability is synonymous with Northland Allochthon, particularly within soils of the Mangakahia Complex. It is considered that at present, the proposed development platform and the generally gentle to moderate slopes to the east of the proposed development area are currently stable and suitable for the proposed development. However, it is considered that the steep west facing cut slope west of the proposed dwelling will overtime regress to reach equilibrium of a slope angle at or close to 16°. Therefore, we consider a suitable setback distance from the crest of the cut slope to allow for regression of the cut face should be allowed for in the final dwelling location, refer Section 3.3.

Based on our findings, we consider the natural in-situ soils encountered during our investigation are suitable for supporting foundations subject to ground verification during construction. We understand that the proposed dwelling will comprise a suspended timber floor supported on concrete encased timber piles embedded into the natural soil. Foundations will require specific engineering design.

Foundations may be designed as follows:

- Ultimate bearing capacity of 200kPa;
- Geotechnical strength reduction factor – 0.5;
- Soil expansivity class – Site Class H1 (highly reactive soils);
- Minimum embedment for standard or braced piles of 1.2m below finished ground level (founded into natural soils with S_u >40kPa);
- Minimum embedment for anchor piles of 1.5m below finished ground level (founded into natural soils with S_u >40kPa);
- Seismic class – Site Class C (shallow soil site).

We recommend that the consent drawings are submitted for review to either ourselves, or another professional geotechnical engineer who is familiar with the contents of this report, once they are ready for submission to Council for approval. We recommend this review is carried out in order to check the compatibility of the design with the recommendations given within this report.

The following specific items will need to be observed at the time of construction to ensure the foundation soils are consistent with the assumptions made in this geotechnical report:

1. Observe the ground conditions within foundation pile holes prior to placement of foundation piles, pouring of concrete and to ensure piles are founded into natural soils with S_u >40kPa.

All stormwater should be piped well away from any proposed building platform and away from any steep slopes to avoid over saturation of the subsoils and to maintain stability across the site. All stormwater overflow drainages should be channelled away from the development platform and discharged in a controlled manner.

We recommend that a stormwater cut-off drain be installed around the perimeter of the building platform and that stormwater be collected and channeled to be disposed of in a controlled, dispersive manner. Under no circumstances should stormwater runoff be directed on to, or below the building platform as this will increase the risk of slope instability.

1 Introduction

1.1 Project Brief and Scope

Haigh Workman Ltd (Haigh Workman) has been commissioned by Ann-Marie and Layton Whale (the Clients) to undertake a geotechnical investigation for a proposed dwelling at 280 Taylor Road, Taipa. This report presents the information gathered during the site investigation, interpretation of data obtained and site-specific geotechnical recommendations relevant to the site.

The scope of this report encompasses the geotechnical suitability in the context of the proposed development as defined in the Short Form Agreement signed on 22 August 2019. This appraisal has been designed to assess the subsoil conditions for foundation design and identify geotechnical constraints for the proposed development.

This report provides the following:

- A summary of the published geology with reference to the geotechnical investigations undertaken;
- Analysis of the data obtained from site investigations, providing a ground model and geotechnical design parameters;
- Foundation recommendations;
- Provide comment on ground stability and;
- Identification of any additional geotechnical risks and/or hazards;

1.2 Proposed Development

The Client intends to construct a single-storey dwelling of light weight construction at the site. This report considers the geotechnical aspects of the proposed development, with particular reference to the proposed development location (refer to Figure 1 - Site Location).

Should the proposed development site vary from the proposals described above and/or be relocated outside of the investigated area, further investigation and/or amendments to the recommendations made in this report may be required.

1.3 Site Description

The property is legally described as Lot 1 DP 102703 with a total land area of approximately 7.683 ha. The property is irregular in plan shape and currently comprises a large rural block that is predominantly bush covered with some smaller cleared areas towards through the central and southern parts of the property. The property forms a generally bowl-shaped feature with steep bush clad slopes extending from the northeast around to the southwest. A valley feature occupies the central portion of the site with an unsealed driveway extending from the northwest boundary along the valley to an existing dwelling located towards the southeast corner of the property, as shown on Figure 1.

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The proposed development is to be located centrally within the property adjacent the existing unsealed driveway on the lower slopes of the valley feature. An existing cleared building platform that was until recently, occupied by an old dwelling is to house the proposed development. The proposed development will comprise the construction of a new dwelling of light weight construction, measuring approximately 9.0m by 6.0m (56m²) located on an elevated cut platform above and northeast of the unsealed driveway with bush clad slopes behind and northeast of the development. A shallow dish drain was located at the base of the slopes and at the time of our site visit channelled runoff from the above slopes around the proposed development platform.

To the northeast, above and behind the proposed building platform, an existing shallow valley feature extends up the bush clad slope. Below the proposed building platform and existing unsealed driveway, the ground slopes towards the valley floor at slope angles of between 0° and 16°. An existing watercourse flows roughly south to north across the valley floor.

The proposed building platform is located near the base of moderately steep west to southwest facing slopes. Based on review of aerial photographs and from our site walkover, it is considered that the lower slopes that comprise the proposed building platform and surrounding area are likely to comprise colluvial material consisting of mobilised Whangai Formation soils from the slopes above. The geomorphology of the of the area surrounding the proposed building platform is indicative of this type of geological formation with the natural slopes surrounding the proposed development platform and broader area were typically measured at around 16 degrees, reflecting the variable residual shear strength of the colluvial soils.

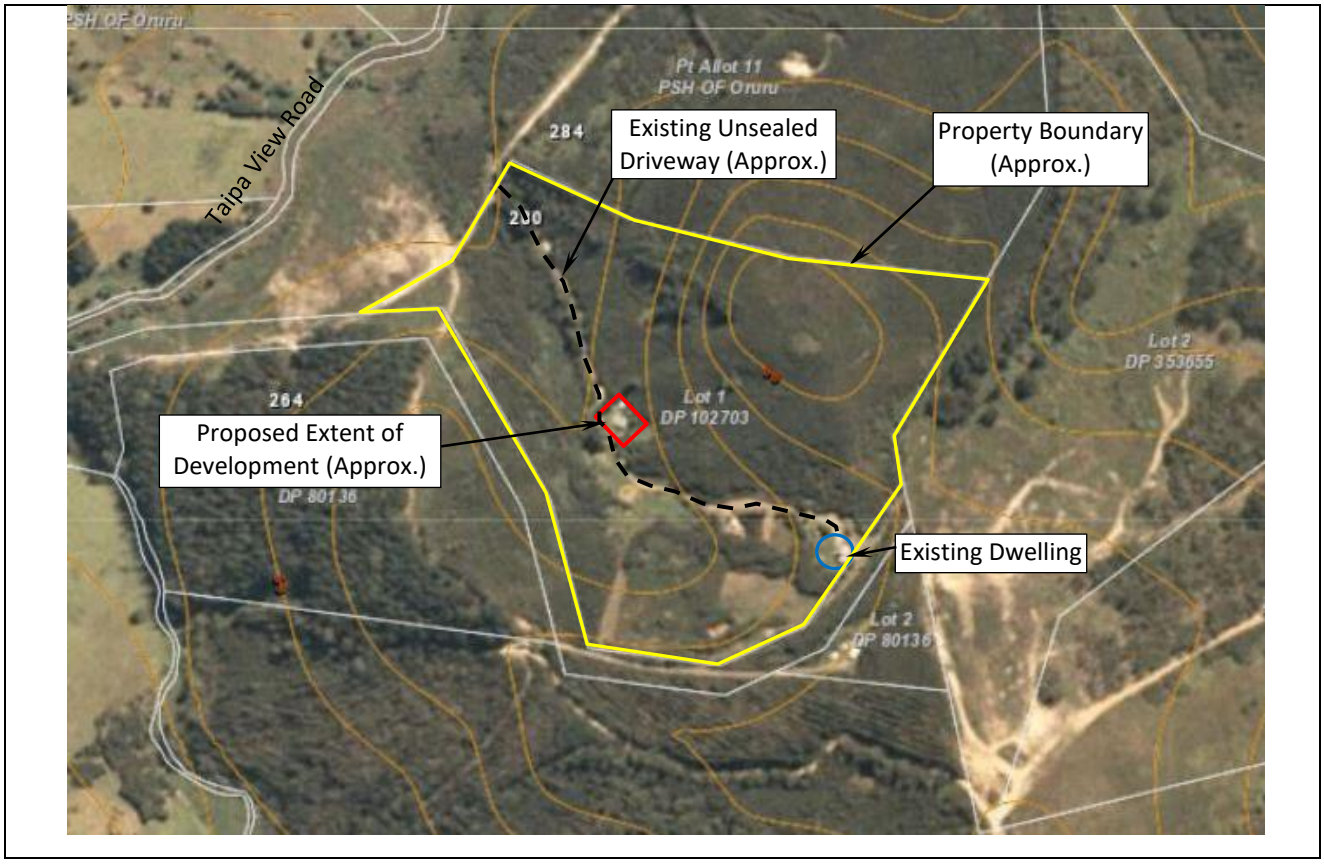

Figure 1 - Site Location

2 Geology

2.1 Published Geology

Sources of Information:

- Institute of Geological & Nuclear Sciences, 1:250,000 Scale, 1996: "*Geology of the Kaitaia area*";
- NZMS 290 Sheet O043/04/05, 1: 100,000 scale, 1979: *"Soil map of Kaitaia-Rawene area".*

The site is within the bounds of the GNS Geological Map 1 "Geology of the Kaitaia area", 1:250,000 scale*. The published geology shows the site to be underlain by the Whangai Formation (Kkw) comprising "*dark grey, white-weathering, siliceous and calcareous mudstone. Minor thin-bedded micritic limestone*." The Whangai Formation is part of the Mangakahia Complex of the Northland Allochthon. The Whangai Formation is considered to be of Cretaceous age.

An excerpt of the geological map is shown in Figure 2, with geological units presented in Table 1.

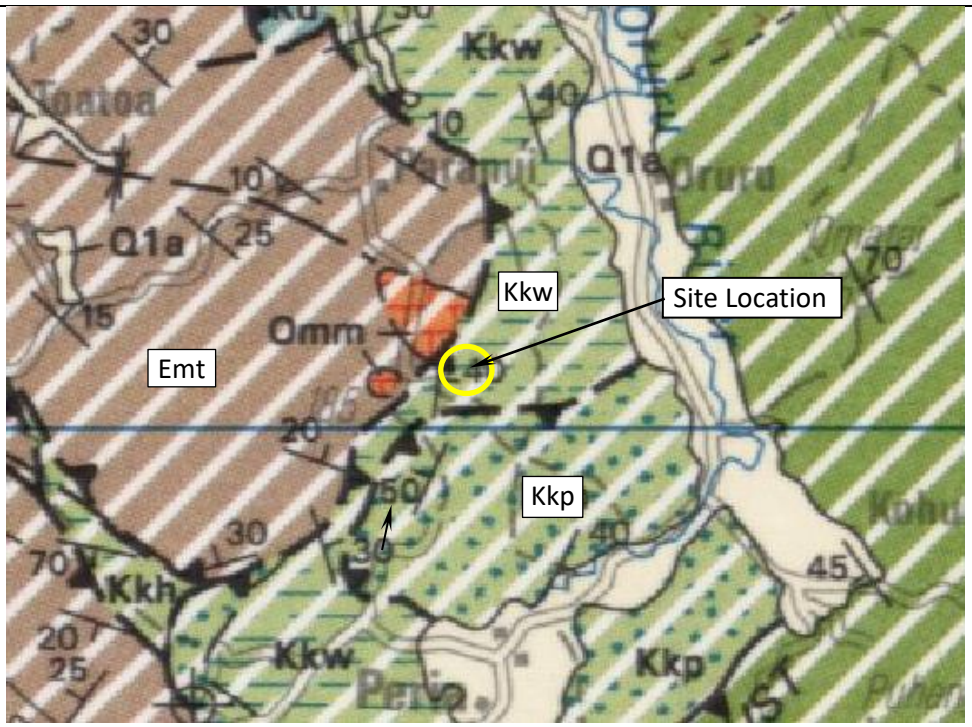

Figure 2 – Geology Map (Kaitaia Map, 1:250,000)

* Isaac, M.J. (compiler) 1996. Geology of the Kaitaia area. Institute of Geological and Nuclear Sciences 1:250 000 geological map 1.

Table 1 - Geological Legend

Symbol	Unit Name	Description
Kkw	Whangai Formation (Mangakahia Complex, Northland Allochthon)	*Dark grey, white-weathering, siliceous and calcareous mudstone. Minor thin-bedded micritic limestone. Minor black carbonaceous shale (Waipawa Black Shale).*
Kkp	Punakitere Sandstone (Mangakahia Complex, Northland Allochthon)	*Weakly to moderately indurated, alternating thin- to thick-bedded, quartzofeldspathic, commonly micaceous sandstone and mudstone. Minor mudstone-dominated flysch facies and conglomerate*.
Omm	Mahurangi Limestone (Motatau Complex, Northland Allochthon)	*Micritic coccolith foraminiferal muddy limestone, commonly with redeposited beds of glauconitic sandstone beds.*
Emt	Taipa Mudstone. (Motatau Complex, Northland Allochthon)	Weakly to moderately indurated grey to blue-grey calcareous mudstone, commonly with redeposited glauconitic sandstone beds.

Further reference to the published New Zealand land inventory maps (Kaitaia-Rawene, 1980), indicates the site is underlain by Hukerenui silt loam (HKH) that are imperfectly to very poorly drained. Further reference to the published New Zealand land inventory maps, indicate a deep weathering profile with weathering to soft silty clay to depths of 10m.

The Northland Allochthon geology is a complex geological unit and is synonymous with slope instability, care must be taken when assessing sites for development that are underlain by Allochthonous soils. The geomorphology of slopes underlain by the Mangakahia Complex is very distinctive, with long moderately grading broad hummocky slopes typical in the region. The hummocks typically extend from the toe of the slope to the crest of the ridge. The geomorphology provides an indication on the lithology of the underlying materials, with lower gradient (<12° degrees) sites often sites underlain by non-calcareous mudstones.

3 Ground Investigations

3.1 Subsurface Investigations

Haigh Workman undertook geotechnical investigations on 30 September 2019. The investigations comprised the drilling of four hand auger boreholes (BH1 to BH4), located around the proposed building platform. An additional shallow borehole (BH5) was drilled for use in wastewater disposal field assessment and design. Borehole BH5 was drilled on the bush clad slopes to the north of the proposed development site. For the purposes of this report, we have focused primarily on the results from boreholes BH1 to BH4. Investigations were logged in accordance with The New Zealand Geotechnical Society, "Guidelines for the Field Classification and Description of Soil and Rock for Engineering Purposes" (2005).

Hand augers were advanced to a maximum depth of 4.0 metres below ground level (mbgl). Vane shear tests were undertaken at regular intervals within the hand augered boreholes. Investigation borehole logs are included in Appendix B.

Groundwater was not encountered during our site investigations. Conditions at the time of our site investigation were dry and no surface water features were observed

Groundwater was encountered within all four boreholes art the completion of drilling. The depth to measured groundwater ranged from 1.3mbgl (BH3) to 3.0mbgl (BH1). Boreholes BH5 did not encounter groundwater. Conditions at the time of our site investigation were moist with some recent periods of rain in the days preceding the site visit. A shallow dish drain had been dug at the toe of the slopes around the eastern perimeter of the proposed development site. Water seepage into the dish drain from the slopes above was observed at the time of our investigation.

3.2 Ground Conditions

Based on the results of the geotechnical investigation conducted by Haigh Workman and review of the published geological maps, it is considered that the natural soils directly underlying the site comprise soils belonging to the Whangai Formation of the Northland Allochthon. The investigation area comprised an existing cut building platform that had been cleared of the existing structure. Some evidence of fill placement on the existing slopes immediately to the west of the proposed building platform was observed with some non-certified fill material being encountered within borehole BH1.

For the purposes of this report, subsoil conditions on the site have been interpolated between the boreholes and some variation between borehole positions are likely. Detailed logs are presented within Appendix B. Table 2 below summarises the materials encountered, with depth to base of each unit provided. A geological model has been developed based on the investigation and is presented in Appendix A.

Table 2 provides a summary of the materials encountered.

Table 2 - Summary of Borehole Results

Borehole Number	Topsoil (m)	Non-Certified Fill Material (m)	Whangai Formation (Colluvial Soils) (m)	Groundwater and Soil Moisture Observations
BH1	NA	0.7	0.7 to 4.0	Groundwater Encountered at 3.0mbgl
BH2	0.2	NE	0.2 to 3.0	Groundwater Encountered at 1.6mbgl
BH3	NA	NE	0.0 to 2.5	Groundwater Encountered at 1.3bgl
BH4	NA	NE	0.0 to 3.0	Groundwater Encountered at 2.2mbgl
*BH5	0.3	NE	0.3 to 1.2	No groundwater encountered.

NA = Not Applicable. NE = Not Encountered. *BH5 – Wastewater disposal field purposes only.

3.2.1 *Non-Certified Fill Material*

Fill material was encountered within borehole BH1 to a maximum encountered depth of 0.7mbgl and is considered as non-certified fill for the purposes of reporting. The fill material comprised intermixed light brown, brown, light orange and grey clayey silt with some fine to medium gravel that was described as very stiff, moist to wet and of low plasticity. The placed fill material encountered is considered to be comprised of re-worked Whangai Formation soils.

Based on our site observations, we conclude that some of the soil material removed to create the original building platform has been pushed outwards over the edge of the existing building platform. It is estimated that up to 0.7m of non-certified fill material lies below the southwest corner of the proposed building platform. Our observations indicate that the majority of the proposed dwelling will be located on the natural soils and that the non-certified fill encountered is likely to comprise a wedge of fill material limited to the southwest corner of the building platform, as shown on Drawing 19 164/02. The non-certified fill material is considered to be unsuitable for foundations.

3.2.2 *Whangai Formation (Colluvial) Soils*

Whangai Formation (colluvial) soils were encountered within all four hand auger boreholes, and was generally consistent within all four boreholes. The soils were generally described as being very stiff silty clay and clayey silt with variable fine gravel content. The soils were typically variable in colour from grey, light grey, light brownish grey, greyish brown, mottled orange and light brown. Soils were typically moist to wet, becoming wet to saturated at depth (below ~2.0m) and of having low to moderate plasticity. Recorded vane shear strengths were generally in excess of 100 kPa, indicating very stiff soils. However, a general reduction in recorded vane shear strength was observed in all four boreholes below depths of between 2.0m and 2.6mbgl (minimum). The reduction in vane shear strength readings at depth may be related to an increase in soil moisture content with depth.

Laboratory testing in similar soils indicates Mangakahia Complex soils have a high plasticity index, i.e. >60%. Bjerrum's correction factor for vane shear tests in highly plastic soils suggests a correction factor of 0.7 should be applied to vane shear strengths to determine the undrained shear strength (S_u). A correction factor of 0.7 from vane shear strength to undrained shear strength (S_u) has been adopted in this case.

In general, recorded vane shear strengths below 2.0m of between 37kPa and 95kPa (S_u=26kPa to 66kPa) indicates predominantly firm (25-50kPa) soils, rather than stiff (50-100kPa) soils once Bjerrum's correction factor has been applied. An adopted S_u of 40kPa has been applied for calculating bearing capacity.

3.2.3 *Groundwater*

Groundwater levels were encountered within borehole BH1 to BH4 at depths of between 1.3mbgl and 3.0mbgl. Groundwater levels recorded were measured shortly after drilling was completed, it is considered that groundwater levels will not have had sufficient time to reach equilibrium, i.e. the fine-grained clayey soils have low permeability and it may take several days for the groundwater level to equalise. Measured groundwater levels can be expected to change after the effects of ground investigations have dissipated. Water seepage in to the existing pond below the proposed building platform was were observed at the time of our investigation. Water seepage from the slopes above the proposed development was observed at the time of our site visit, a shallow dish drain was channelling the water around the and away from the proposed building platform. Groundwater levels can and do fluctuate and higher groundwater levels may be encountered following periods of prolonged or heavy rainfall.

3.3 Slope Stability

The natural ground conditions across the site were found to be generally consistent, i.e. very stiff natural soils of the Whangai Formation. The Whangai Formation belongs to the Northland Allochthon geological unit, which comprises a complex geology unit, well known across northland for slope instability, often on slope angles as gentle as 7° to 10°.

During our site walkover survey, no recent evidence of slope instability was identified across the development area and the immediate surrounding slopes. However, it is considered that the site soils that form the building platform (excluding fill material) are likely to comprise a block of Whangai Formation soils that were deposited at or near the toe of the existing west facing slope as a result of historic slope instability and land slide. These previously mobilised soils can be referred to in this instance as colluvial soils that now form the insitu soils for the proposed development.

In general, and ignoring any modified and cut slopes around the proposed development platform, it is considered that the natural slope angle within the colluvial soils is in the order of 16°. Although the site soils are considered to comprise soils of a previous landslip, it is considered that these soils are unlikely to be mobilised again, with no visual indicators of continued or ongoing slope movement. It is considered that at present, the proposed development platform and the generally gentle to moderate slopes to the east of the proposed development area are currently stable and suitable for the proposed development.

However, the steep (40°) cut slope to the west of the proposed building platform that was excavated to form the existing unsealed driveway is considered to be over steep, i.e. >16° and is therefore considered prone to future instability and slope creep over time.

It is considered that the steep west facing cut slope will overtime regress to reach equilibrium of a slope angle at or close to 16°. We consider a suitable setback distance from the crest of the cut slope to allow for regression of the cut face should be allowed for in the final dwelling location. We recommend a minimum distance of 2.5m between the dwelling and the crest of the slope be maintained, as shown on, refer Drawing 19 164/02 & 03.

To help reduce continued erosion of the steep cut faces, we recommend protective measures are considered, such as retaining walls or planting of the slopes to protect against erosion and or instability. Provided a suitable setback distance is applied to the dwelling location, the cut faces are not expected to impact the proposed dwelling location.

4 Foundation Recommendations

4.1 General

Foundation drawings were not available at the time of writing this report. However, concept drawings indicate the proposed dwelling is to comprise as a single storey structure of light weight construction. We envisage that the proposed dwelling will comprise shallow foundations consisting of a suspended timber floor supported on timber piles encased in concrete (senton piles).

Based on our findings, we consider the natural in-situ soils encountered during our investigation are suitable for supporting foundations subject to ground verification during construction. We recommend that prior to foundation construction, a subgrade inspection is undertaken to confirm the ground conditions comply with those presented within this report.

4.2 Expansive Soil Class (shrink swell characteristics)

The subsoils encountered during the site investigation indicate fine-grained clayey soils, which are susceptible to shrinking in the summer and swelling in the summer due to seasonal variations of water content. Whangai Formation soils are considered 'swelling clays' due to the presence of smectite minerals.

In lieu of site-specific laboratory data and for the purposes of design, we recommend the site be designated as *'H1', 'highly reactive'* soil in accordance with AS2870:2011[†], allowing for characteristic ground movement of between 40 mm to 60 mm.

4.3 Seismic Site Subsoil Category

The site conditions have been assessed to be consistent with seismic subsoil Class C (Shallow site soils) in accordance with NZS1170.5.

4.4 Shallow Foundations (concrete encased timber piles)

Based on concept drawings provided, we understand that the proposed dwelling will comprise a suspended timber floor supported on concrete encased timber piles embedded into the natural soil. The ground conditions were found to be generally consistent across the proposed development area, with natural soils of the Whangai Formation below a wedge of non-certified fill material in the southwest corner of the proposed building footprint.

The foundation should be designed in accordance with AS2870:2011 with an allowance for class *'H1', 'highly expansive'* soil, allowing for characteristic ground movement of between 40mm to 60mm. An ultimate bearing capacity of 200kPa can be adopted for limit state design for shallow foundations based on the firm natural soils encountered below 2.0m.

[†] Residential Slabs and Footings, AS2870-2011

We recommend the proposed dwelling be supported on concrete encased timber piles embedded into the very stiff natural soils. Due to the presence of non-certified fill material below the proposed dwelling footprint, we recommend that piles in the *"fill zone"* be deepened to have a minimum embedment depth of 1.2m below existing ground level. For consistent foundation performance across the structure, we recommend all foundation piles be founded a minimum of 1.2m below existing ground level into natural soils (with S_u >40kPa) of the Whangai Formation (refer Figure 3 below).

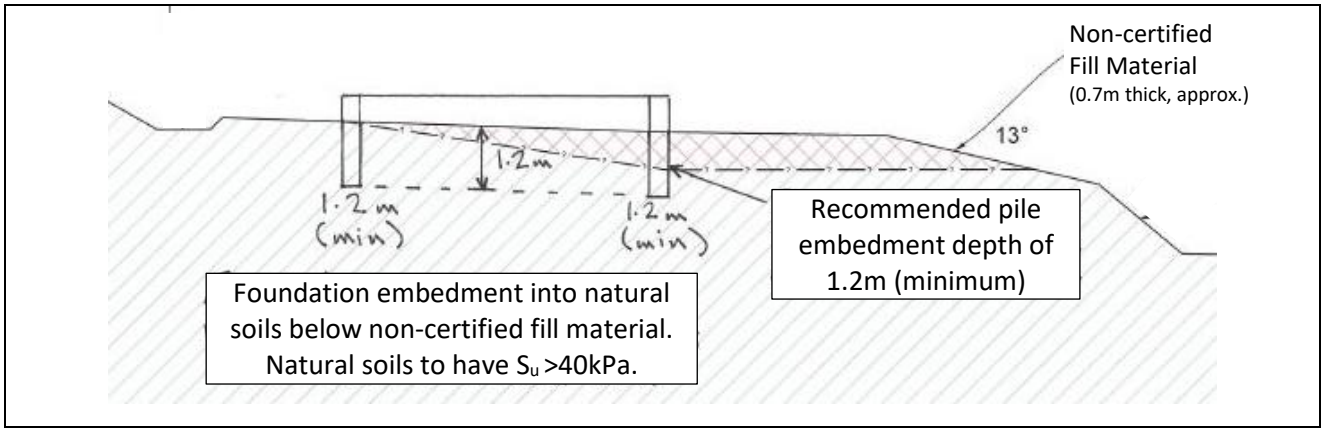

Figure 3 – Potential extent of fill below proposed footprint. Foundations to be embedded below fill material.

We recommend all standard and braced piles be embedded a minimum of 1.2m below existing ground level into stiff natural soils below the non-certified fill material. If anchor piles are used, then these piles should be embedded a minimum of 1.5m below existing ground level.

We recommend confirmation of ground conditions within foundation pile holes is undertaken by an appropriately trained engineer prior to pouring of concrete.

Foundations may be designed as follows:

- An Ultimate bearing capacity of 200kPa;
- Geotechnical strength reduction factor – 0.5;
- Soil expansivity class – Site Class H1 (highly reactive soils);
- Minimum embedment for standard or braced piles of 1.2m below finished ground level (founded into natural soils with S_u >40kPa);
- Minimum embedment for anchor piles of 1.5m below finished ground level (founded into natural soils with S_u >40kPa);
- Seismic class – Site Class C (shallow soil site).

Bearing capacity values included in this report have been calculated in accordance with B1/VM4 and are for vertical loads only and do not take in to account horizontal shear or moment actions.

5 Construction

5.1 Earthworks

At the time of writing, no earthworks plans were available for the proposed development.

Based on the available information, we understand that only minor earthworks (i.e. topsoil strip), if any will be required across the site as part of the site preparation for foundations. We recommend confirmation of ground conditions within foundation pile holes is undertaken by an appropriately trained engineer prior to pouring of concrete.

5.2 Filling

Based on the concept drawings provided, we do not expect any filling to be undertaken as part of the proposed development.

Additional filling across the building platform and surrounding areas should be avoided to ensure ongoing slope stability across the site is maintained.

5.3 Geotechnical Review

We recommend that the consent drawings are submitted for review to either ourselves, or another professional geotechnical engineer who is familiar with the contents of this report, once they are ready for submission to Council for approval. We recommend this review is carried out in order to check the compatibility of the design with the recommendations given within this report.

5.4 Construction Observations

Specific engineering inspections of building platform preparation and/or foundation construction with certification by a Producer Statement, PS4, are often required by Council and outlined in the Building Consent documents. These observations are generally required to ensure that the foundation soils exposed at the time of construction are consistent with the assumptions made in this geotechnical report.

We consider the following specific items, but not limited to, will need to be observed at the time of construction to ensure the foundation soils are consistent with the assumptions made in this geotechnical report:

1. Observe the ground conditions within foundation pile holes prior to placement of foundation piles, pouring of concrete and to ensure piles are founded into natural soils with S_u >40kPa.

Provision should be allowed for modifying the foundation solution at this time should unforeseen ground conditions be encountered.

5.5 Services

At the time of writing, no known underground services cross beneath the proposed development area. We recommend that any new services are accurately located on site and the depth to invert be determined prior to the commencement of foundation excavations.

5.6 Stormwater Disposal

All stormwater should be piped well away from any proposed building platform and away from any steep slopes to avoid over saturation of the subsoils and to maintain stability across the site. All stormwater overflow drainages should be channelled away from the development platform and discharged in a controlled manner.

We recommend that a stormwater cut-off drain be installed around the perimeter of the building platform and that stormwater be collected and channeled to be disposed of in a controlled, dispersive manner. Careful consideration should be given to the grading of the site surface to channel any stormwater runoff away from the dwelling and towards a suitable discharge point.

Under no circumstances should stormwater runoff be directed on to, or below the building platform as this will increase the risk of slope instability. All stormwater drains should be maintained to ensure continued effective discharge of stormwater.

6 Limitations

This report has been prepared for the use of by Ann-Marie and Layton Whale with respect to the particular brief outlined to us. This report is to be used by our Client and their Consultants and may be relied upon when considering geotechnical advice. Furthermore, this report may be utilised in the preparation of building and/or resource consent applications with local authorities. The information and opinions contained within this report shall not be used in other context for any other purpose without prior review and agreement by Haigh Workman Ltd.

The recommendations given in this report are based on site data from discrete locations. Inferences about the subsoil conditions away from the test locations have been made but cannot be guaranteed. We have inferred an appropriate geotechnical model that can be applied for our analyses. However, variations in ground conditions from those described in this report could exist across the site. Should conditions encountered differ to those outlined in this report we ask that we be given the opportunity to review the continued applicability of our recommendations.

Appendix A – Drawings

Drawing No.	Title	Scale
19 164/01	Site Location	1:1000
19 164/02	Site Features and Borehole Location Sketch	Not to Scale
19 164/03	Geological Cross Section A – A'	1:200

NOTES:

1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION TAKEN FROM LAND INFORMATION NEW ZEALAND (LINZ).

Issue	Date	Revision
A	04/07/2019	FIRST ISSUE

DWG Site Location

Scale 1:5000 @A3 | Date 17/10/19

Drawn OT | Checked WT | Approved JP

File Z:\HW FILES\19 JOBS\19 164 ANN-MARIE & LAYTON WHALE\ENGINEERING\DRAWINGS\GEOTECH DRAWINGS\19 164_ GEOTECH DRAWINGS.DWG

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Project: Geotechnical Investigation
280 Taylor Road, Taipa (Lot 1, Deposited Plan 102703)

Client: Ann-Marie and Layton Whale

Project No. 19 164 | RC no.

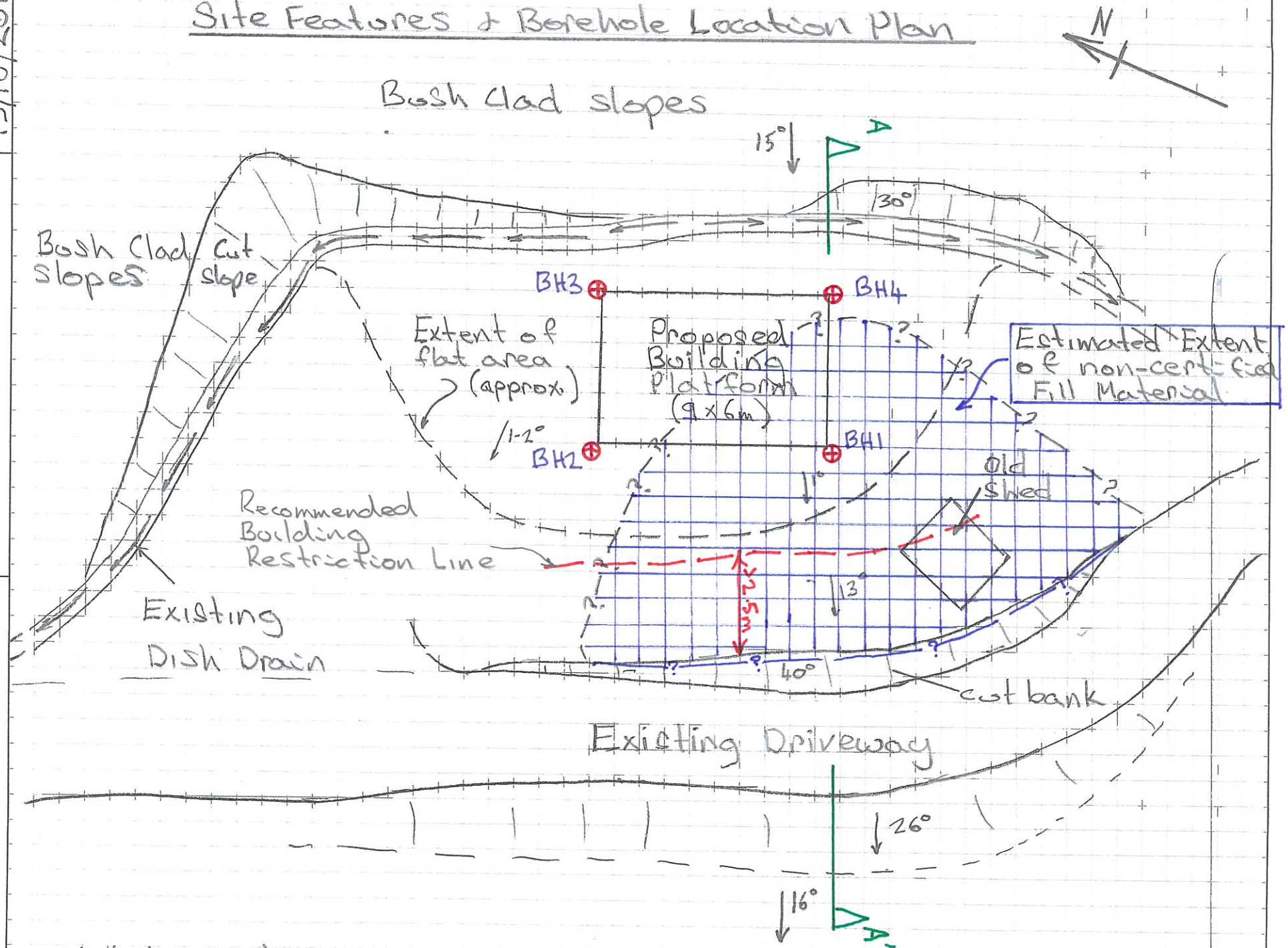
DWG No. 1

Sheet No. 1 of 3

Plotted By Okona Teu at 29/10/2019 2:43:42 p.m.

COPY

Site Features & Borehole Location Plan



Not to Scale

Drawing No. 19164/01

Page

Job No. 19164

Designer J. Parker

Date 15/10/2019

Job Title 280 Taylor Road, Tai Po

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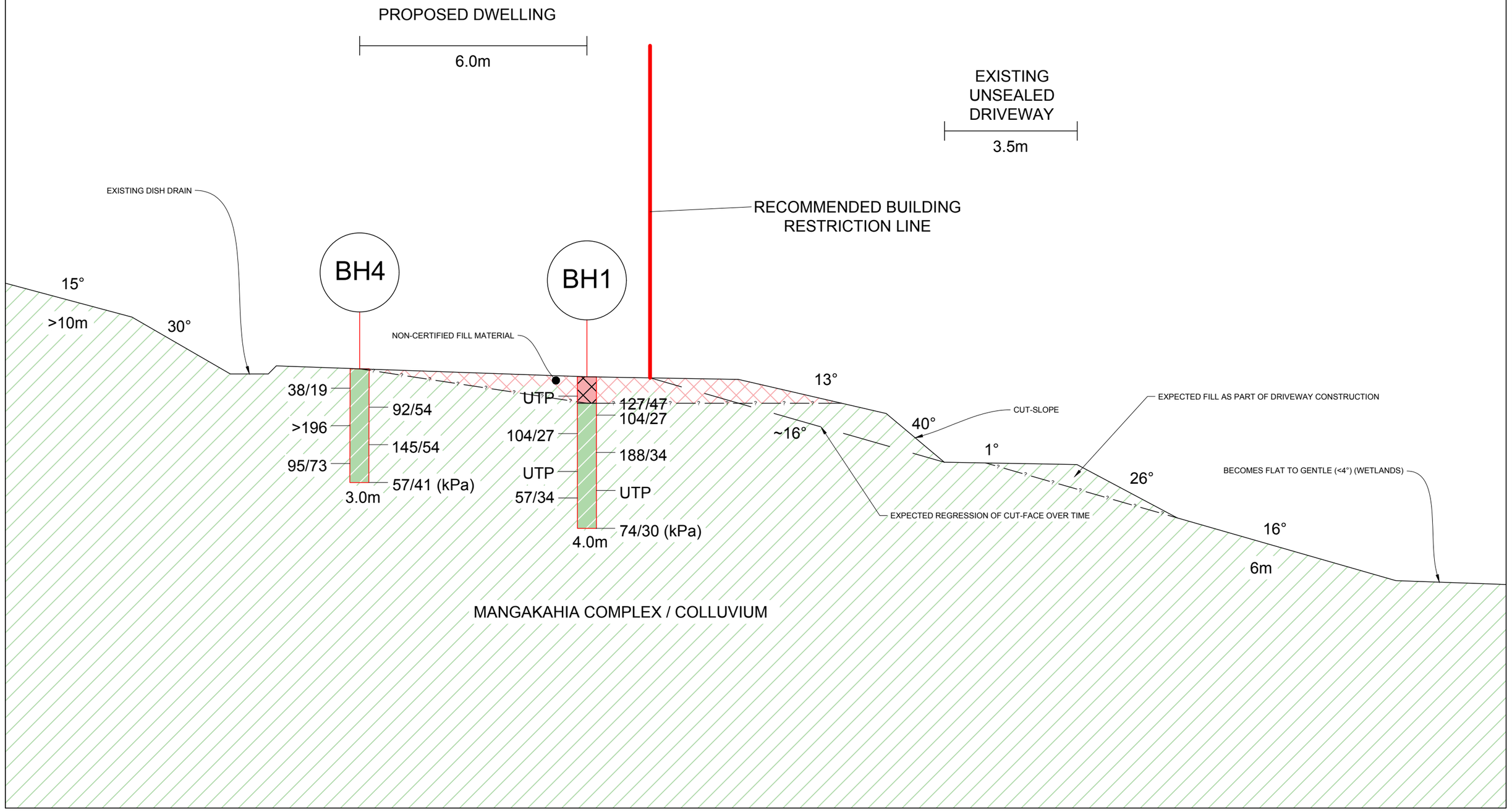

Issue	Date	Revision
A	04/07/2019	FIRST ISSUE

DWG Geological Cross Section

Scale 1:100 @A3 | Date 17/10/19

Drawn OT | Checked WT | Approved JP

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Project: Geotechnical Investigation
280 Taylor Road, Taipa (Lot 1, Deposited Plan 102703)

Client: Ann-Marie and Layton Whale

Project No. 19 164 | RC no.

DWG No. 3

Sheet No. 3 of 3

Plotted By Okona Teu at 29/10/2019 2:43:45 p.m.

Appendix B – Hand Auger Logs

PO Box 89, 0245
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Borehole Log - BH1

Hole Location: Refer to Site Plan

JOB No. 19 164

CLIENT:	Ann-Marie & Layton Whale	**SITE:**	250 Taylor Road, Taipa		
Date Started:	30/09/2019	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	JP
Date Completed:	30/09/2019	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	OT

Soil Description (Based on NZGS Logging Guidelines 2005)	Depth (m)	Geology	Graphic Log	Water Level	Sensitivity	Corrected Shear Vane Strength (kPa)	Scala Penetrometer (blows/100mm)
Clayey **SILT**, some fine to medium gravel; light brown, brown, light orange and grey intermixed. Very stiff, moist to wet, low plasticity. Gravel; sub-angular, weak. [Fill]	0.0	FILL				UTP	0 5 10 15 20
0.4m: becomes light grey, mottled orange.	0.5						
Clayey **SILT**; light grey, dark grey & orange. Very stiff, wet, low plasticity.							
Silty **CLAY**; light grey, streaked light orange. Very stiff, moist, medium plasticity. [Mangakahia Complex]		MANGAKAHIA COMPLEX			3	127 / 47	
1.1m: becomes light grey to light brownish grey, streaked orange.	1.0				4	104 / 27	
	1.5				6	188 / 34	
Clayey **SILT**; light brown to light greyish brown, mottled orange. Very stiff, moist to wet, medium plasticity. Trace fine rootlets.							
1.9m: becomes light grey and light brownish grey.	2.0					235	
Clayey **SILT**, some fine gravel; light grey to brownish grey. Very stiff, moist, low plasticity. Gravel; fine, weak.						UTP	
Gravely **SILT**, some clay; greyish brown to brown. Very stiff, wet, no plasticity.	2.5						
3.0 to 3.05m: fibrous organics; dark brown. Stiff, moist, no plasticity.	3.0					UTP	
Silty **CLAY**, trace fine gravel; light grey to grey. Firm to stiff, wet, medium plasticity. Trace organics.					2	57 / 34	
3.4m: becomes wet to saturated.	3.5						
					2	74 / 30	
End of hole at 4.0m (Target Depth)	4.0						
	4.5						

Groundwater Measured @ 3.0mbgl

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: Hand Held Shear Vane S/N: 2278. UTP = Unable to penetrate. T.S. = Topsoil.
Groundwater measurement undertaken before departing site.
Scala penetrometer testing not undertaken.

Average Soil Sensitivity 3.3

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Borehole Log - BH2

Hole Location: Refer to Site Plan

JOB No. 19 164

CLIENT:	Ann-Marie & Layton Whale	**SITE:**	250 Taylor Road, Taipa		
Date Started:	30/09/2019	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	JP
Date Completed:	30/09/2019	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	OT

Soil Description (Based on NZGS Logging Guidelines 2005)	Depth (m)	Geology	Graphic Log	Water Level	Sensitivity	Corrected Shear Vane Strength (kPa)	Scala Penetrometer (blows/100mm)
Clayey **SILT**; dark brown, mottled orange. Very stiff, moist, low plasticity. [Topsoil]	0.0	T.S.					
Silty **CLAY**; light orangish brown, mottled orange and brown. Very stiff, moist, medium plasticity.		MANGAKAHIA COMPLEX		Groundwater Measured @ 1.6mbgl	4	117 / 27	
0.6m: becomes light orange and light brown, mottled orange.	0.5						
	1.0				3	174 / 54	
Clayey **SILT**, trace fine gravel; light brown, mottled orange and dark brown. Very stiff, moist, low to medium plasticity. Gravel; weakly cemented clasts. At 1.35m: Tyrace amorphous organics, dark brown.						UTP	
Gravely **SILT**; light grey to light brownish grey. Very stiff, dry , no plasticity. Gravel; fine to medium, angular, weak.	1.5						
Silty **CLAY**, some fine gravel; light brown to greyish brown. Very stiff, moist, low plasticity.					4	198 / 54	
	2.0						
Clayey **SILT**; light grey, streaked light brown. Very stiff, moist to wet, low plasticity.							
SILT; light grey to whitish grey. Very stiff, dry, no plasticity. 2.5m: becomes moist.						UTP	
	2.5						
SILT, some clay; light grey. Very stiff, moist, low plasticity. 2.8m: becomes firm, wet to saturated.					4	37 / 10	
End of Hole at 3.0m (Target Depth)	3.0						
	3.5						
	4.0						
	4.5						

Scala Penetrometer scale: 0 5 10 15 20

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: Hand Held Shear Vane S/N: 2278. UTP = Unable to penetrate. T.S. = Topsoil.
Groundwater measurement undertaken before departing site.
Scala penetrometer testing not undertaken.

Average Soil Sensitivity 3.7

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Borehole Log - BH3

Hole Location: Refer to Site Plan

JOB No. 19 164

CLIENT:	Ann-Marie & Layton Whale	**SITE:**	250 Taylor Road, Taipa		
Date Started:	30/09/2019	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	RH
Date Completed:	30/09/2019	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	OT

Soil Description (Based on NZGS Logging Guidelines 2005)	Depth (m)	Geology	Graphic Log	Water Level	Sensitivity	Corrected Shear Vane Strength (kPa)	Scala Penetrometer (blows/100mm)
Silty **CLAY;** light grey, streaked brown. Firm to stiff, moist, high plasticity. [Mangakahia Complex]	0.0	MANGAKAHIA COMPLEX		Groundwater Measured @ 1.3mbgl	2	95, 63	0 5 10 15 20
0.5m: some weakly cemented clasts; light grey to light brown. Wet to saturated.	0.5						
Gravely **SILT**; light grey. Stiff to very stiff, dry, no plasticity. Gravel; weakly cemented clasts.							
Silty **CLAY**, minor fine gravel; light grey. Very stiff, moist, medium plasticity, tree roots.	1.0					UTP	
	1.5					196	
1.8m: gravel (weakly cemented clasts) become bluish grey.					5		
2.0m: becomes wet to saturated.	2.0					164, 35	
2.5m: becomes stiff.					1	73, 51	
End of hole at 2.5m (Unable to Penetrate)	2.5						
	3.0						
	3.5						
	4.0						
	4.5						

LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: Hand Held Shear Vane S/N: 1698. UTP = Unable to penetrate. T.S. = Topsoil.
Groundwater measurement undertaken before departing site.
Scala penetrometer testing not undertaken.

Average Soil Sensitivity 2.6

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Borehole Log - BH4

Hole Location: Refer to Site Plan

JOB No. 19 164

CLIENT:	Ann-Marie & Layton Whale	**SITE:**	250 Taylor Road, Taipa		
Date Started:	30/09/2019	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	RH
Date Completed:	30/09/2019	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	OT

Soil Description

Based on NZGS Logging Guidelines 2005

Silty **CLAY**; light grey, streaked brown. Firm, moist, high plasticity. [Mangakahia Complex]

0.3m: becomes light brownish grey. Trace organic material; tree roots. With minor weakly cemented clasts.

0.8m: becomes stiff, wet to saturated.

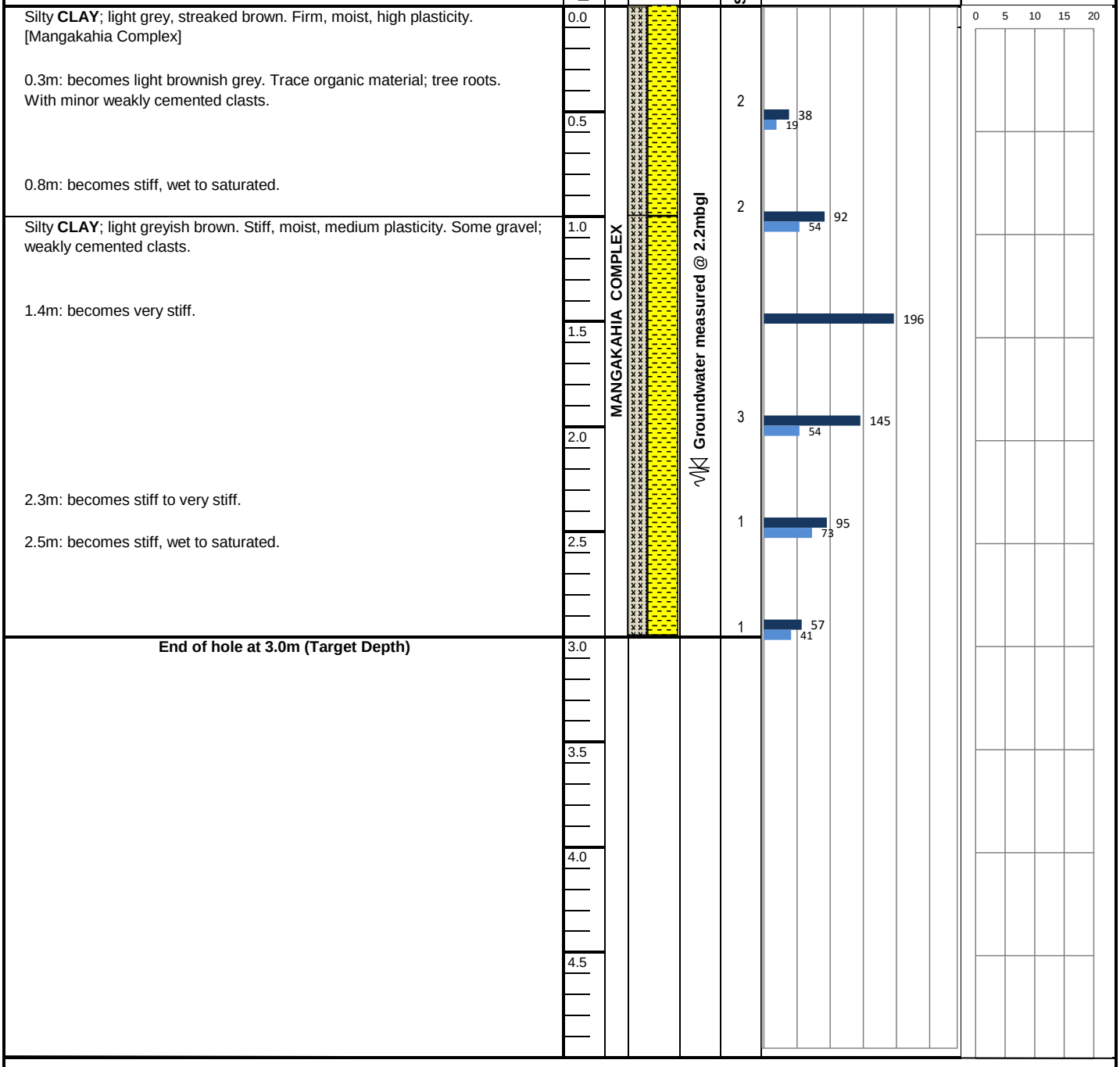
Silty **CLAY**; light greyish brown. Stiff, moist, medium plasticity. Some gravel; weakly cemented clasts.

1.4m: becomes very stiff.

2.3m: becomes stiff to very stiff.

2.5m: becomes stiff, wet to saturated.

End of hole at 3.0m (Target Depth)



LEGEND

TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

Note: Hand Held Shear Vane S/N: 1698. UTP = Unable to penetrate. T.S. = Topsoil.
Groundwater measurement undertaken before departing site.
Scala penetrometer testing not undertaken.

Average Soil Sensitivity 1.8

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Borehole Log - BH5

Hole Location: Refer to Site Plan

JOB No. 19 164

CLIENT:	Ann-Marie & Layton Whale	**SITE:**	250 Taylor Road, Taipa		
Date Started:	30/09/2019	**DRILLING METHOD:**	Hand Auger	**LOGGED BY:**	RH
Date Completed:	30/09/2019	**HOLE DIAMETER (mm)**	50mm	**CHECKED BY:**	OT

Soil Description (Based on NZGS Logging Guidelines 2005)	Depth (m)	Geology	Graphic Log	Water Level	Sensitivity	Corrected Shear Vane Strength (kPa)	Scala Penetrometer (blows/100mm)
Clayey **SILT**; dark grey. Firm, moist to saturated, medium plasticity. Fine rootlets. [Topsoil]	0.0	T.S.		Groundwater Not Encountered			0 5 10 15 20
Clayey **SILT**; light grey, speckled brown. Stiff, moist, low plasticity. Some rootlets.		MANGAKAHIA COMPLEX					
0.7m: becomes low to medium plasticity.	0.5						
Silty **CLAY**; light grey to white. Stiff, moist, medium plasticity. Minor tree gum.							
Clayey **SILT**; light grey. Stiff, dry to moist, low plasticity.	1.0						
End of hole at 1.2m (Target Depth)	1.5						
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						
	4.5						

LEGEND

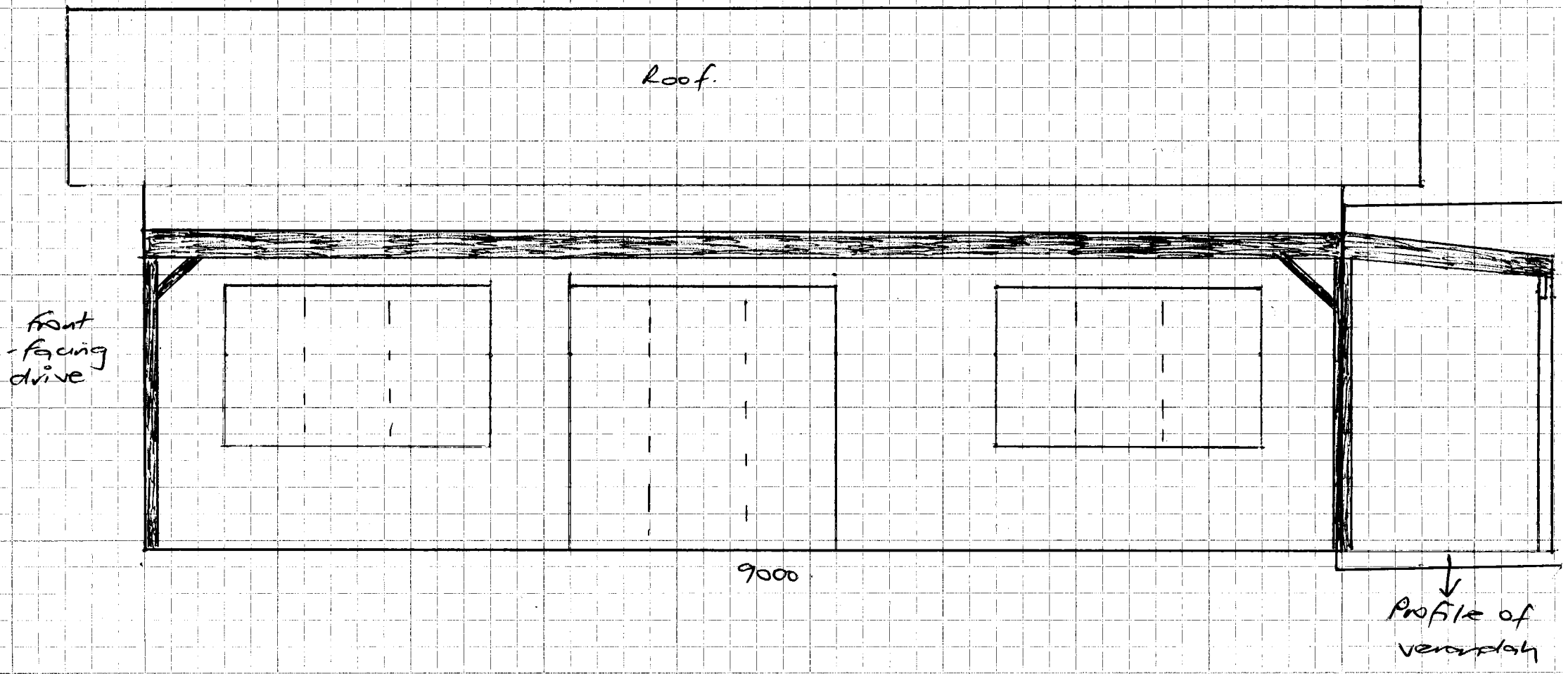
TOPSOIL | CLAY | SILT | SAND | GRAVEL | FILL

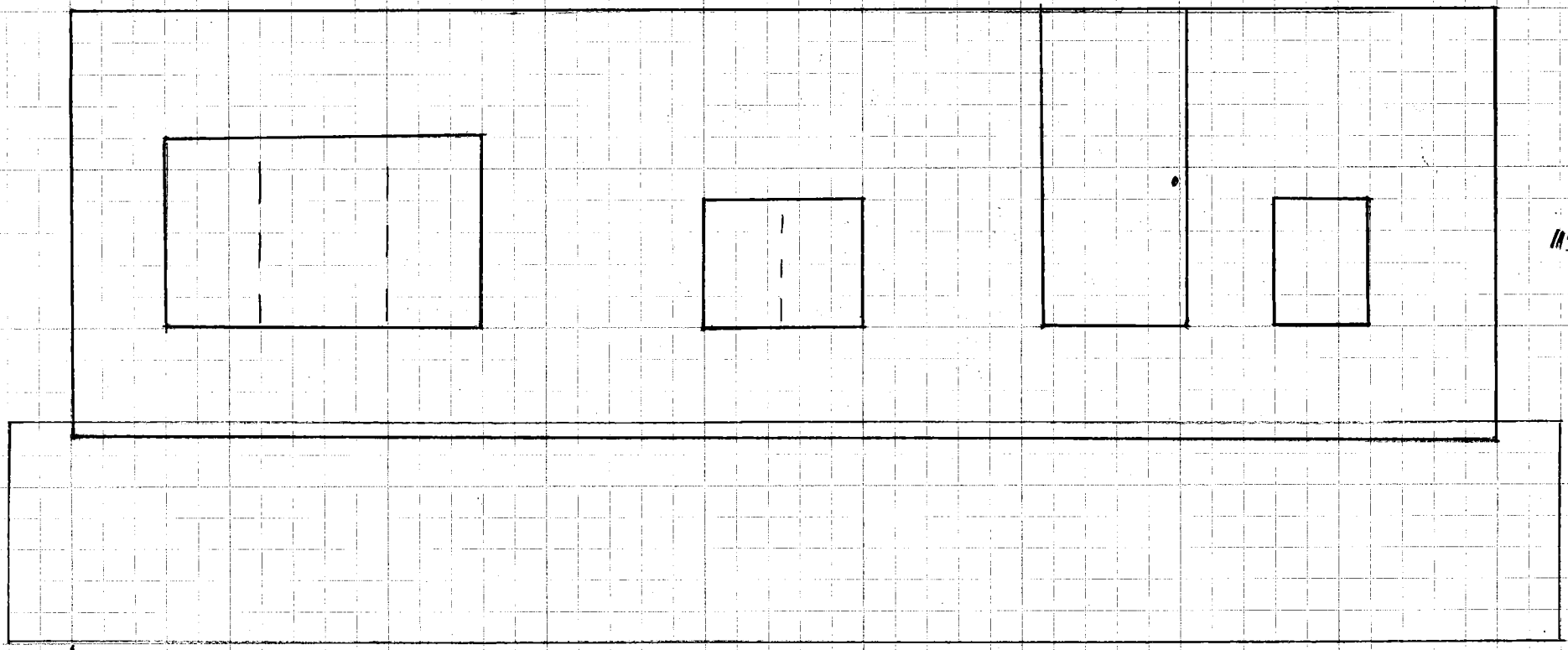
Corrected shear vane reading
Remoulded shear vane reading
Scala Penetrometer

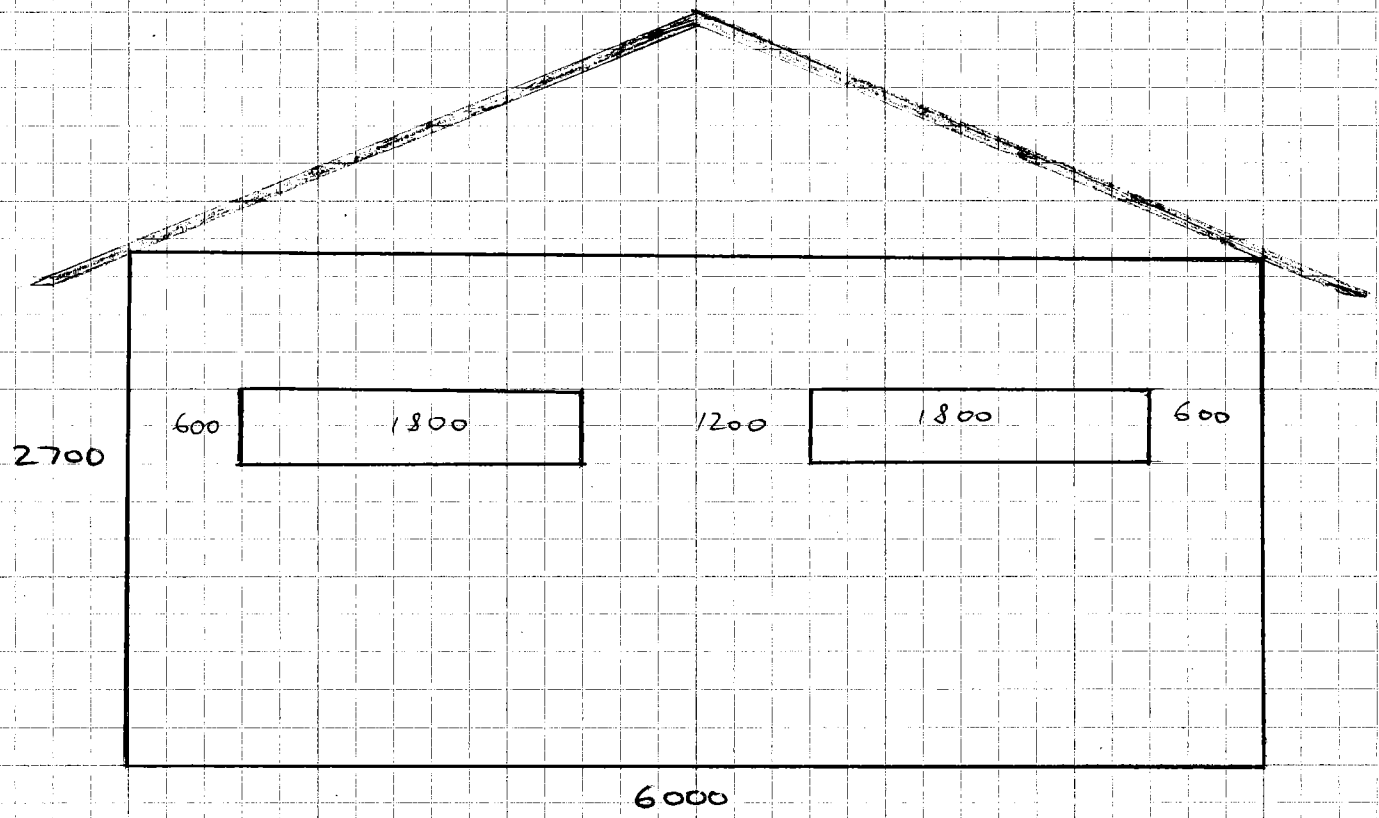
Note: Hand Held Shear Vane S/N: n/a. UTP = Unable to penetrate. T.S. = Topsoil.
Groundwater measurement undertaken before departing site.
Shear strength and scala penetrometer testing not undertaken.

Average Soil Sensitivity N/A

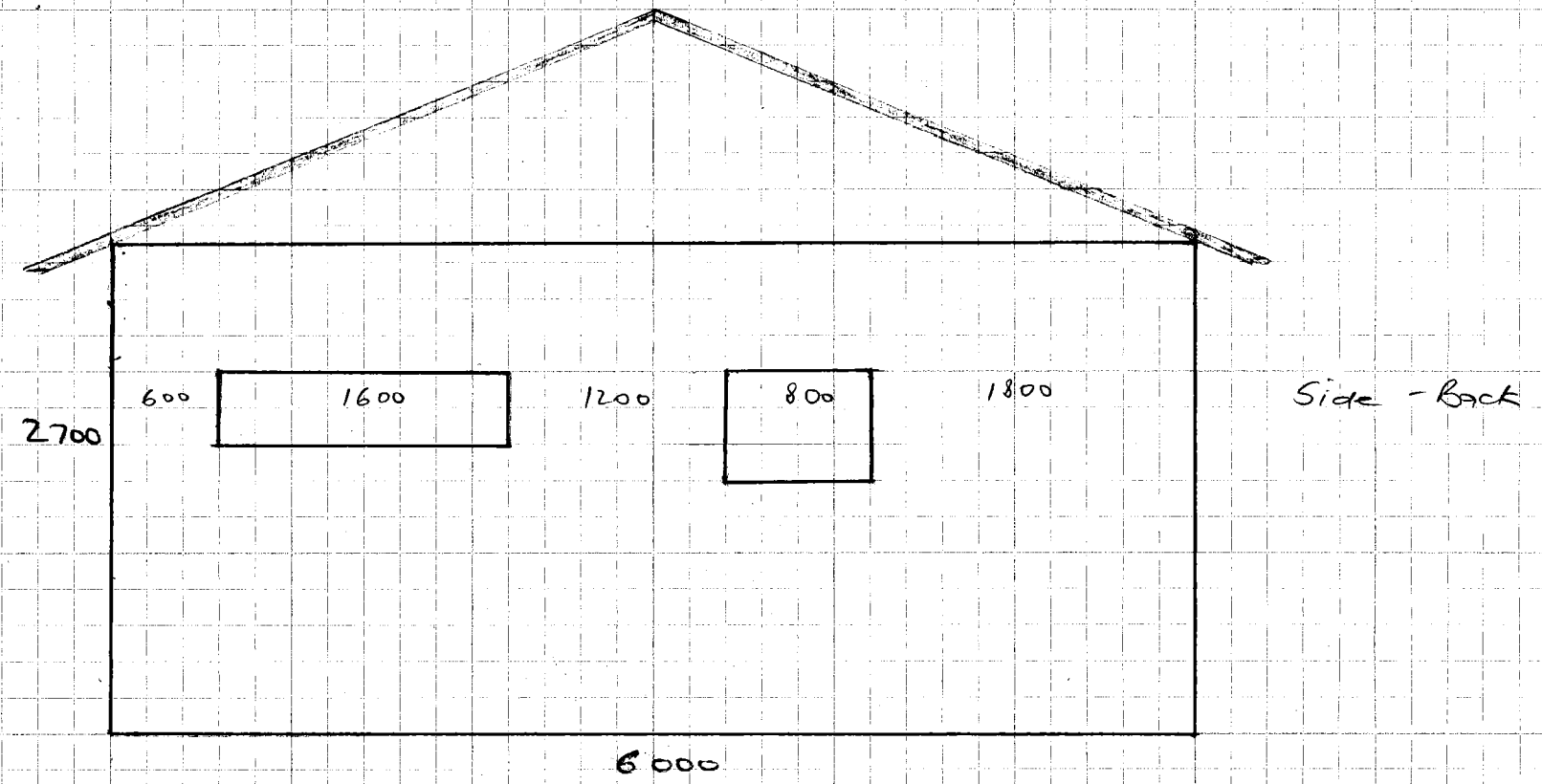
Appendix C – Concept Drawings

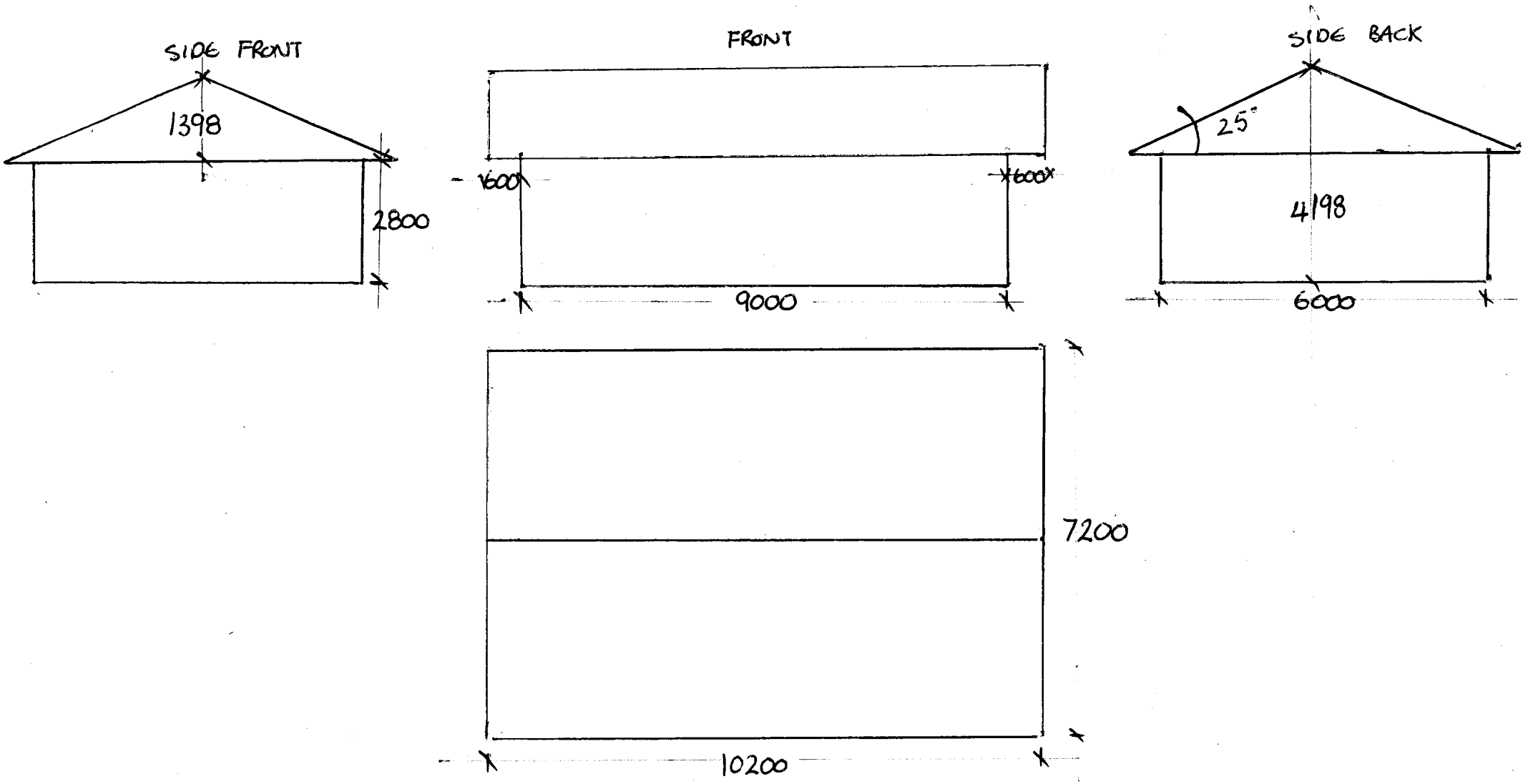

Roof.
Front - facing drive
9000
Profile of verandah



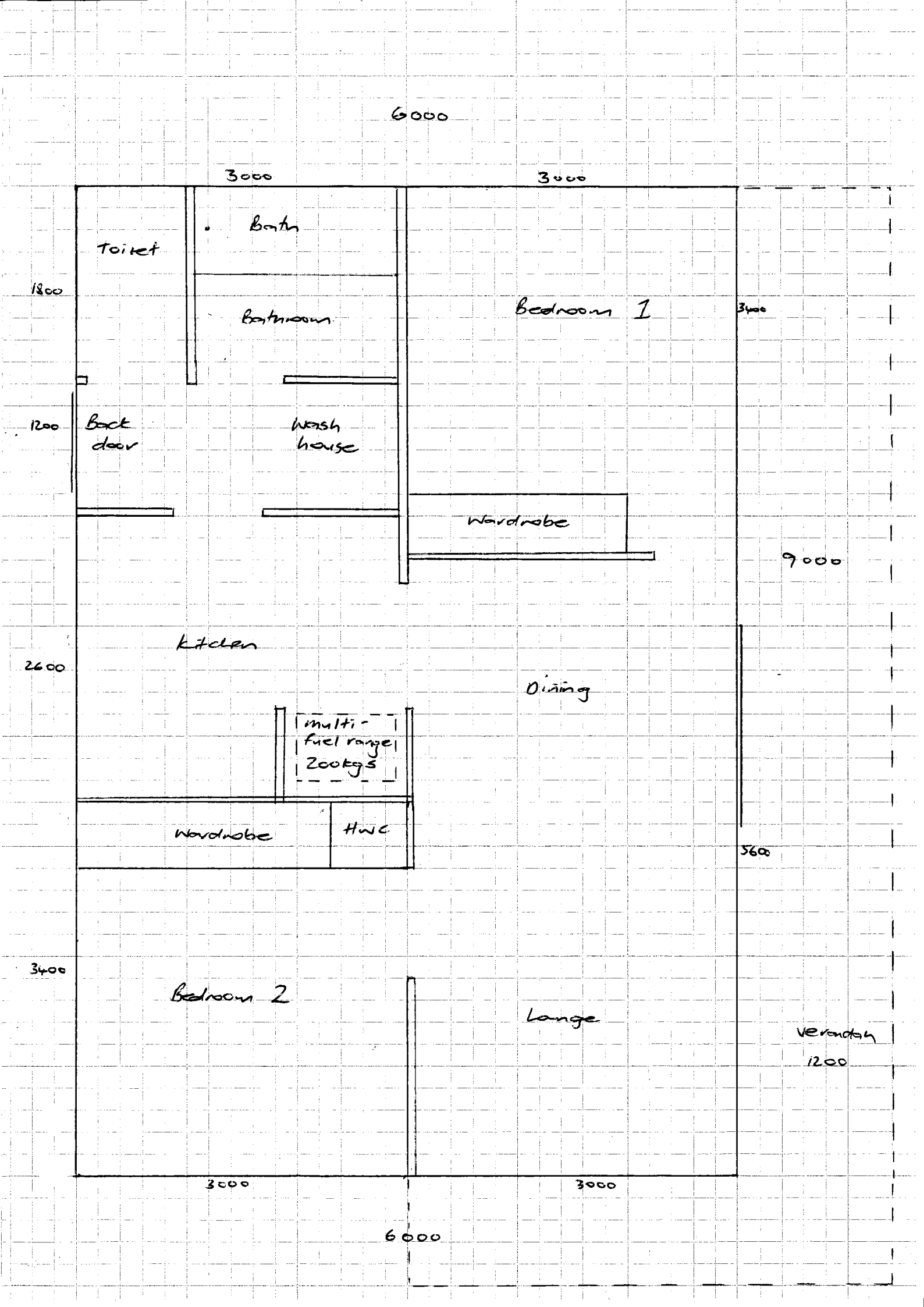


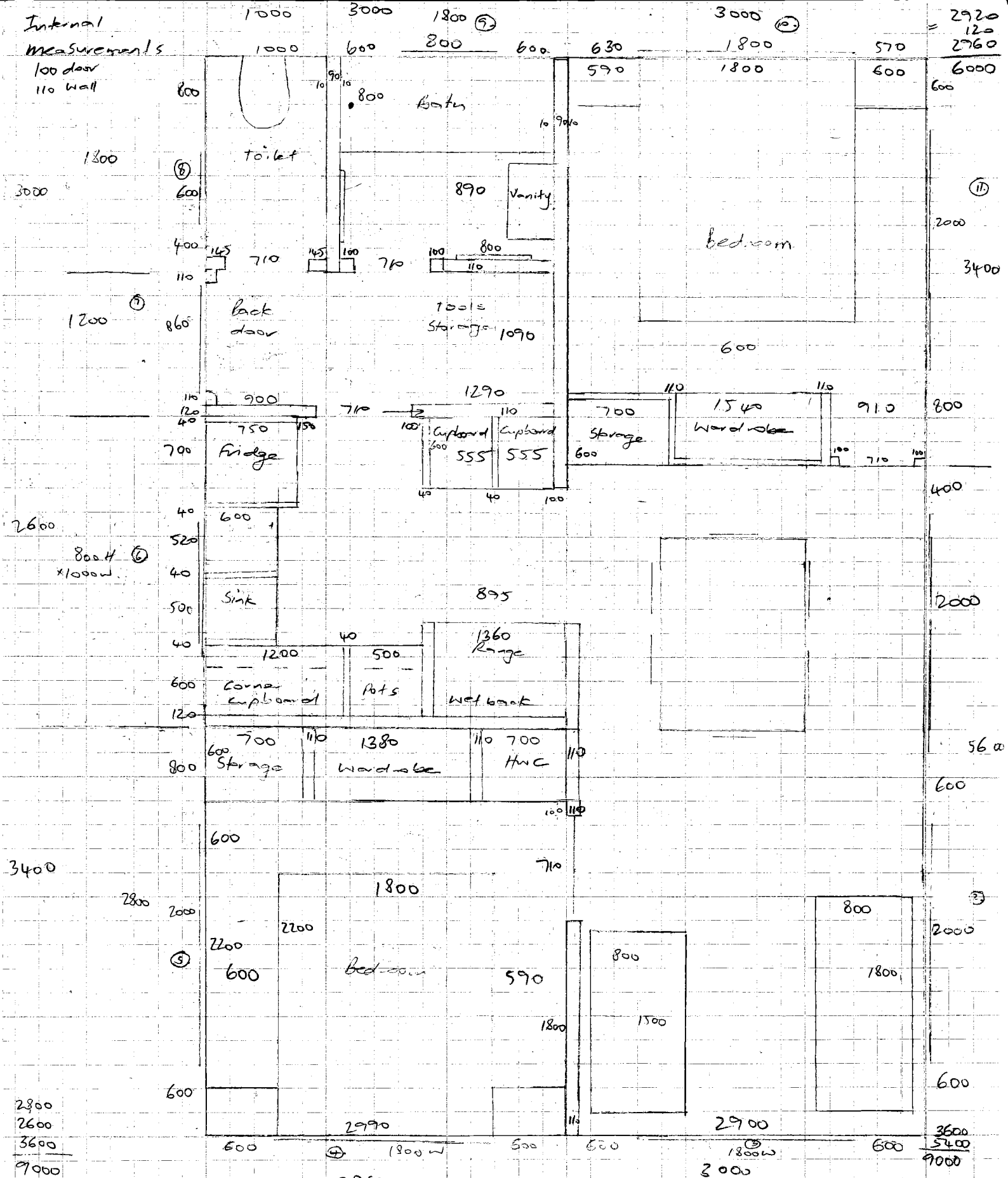
Side - front


600
1600
1200
800
1800
2700
6000
Side - Back



TOP - Aerial view of roof


6000
3000
3000
Toilet
Bath
1800
Bathroom
Bedroom 1
3400
1200
Back door
Wash house
Wardrobe
9000
Kitchen
2600
Dining
multi-fuel range 200kgs
Wardrobe
HWC
560
3400
Bedroom 2
Lounge
Verandah
1200
3000
3000
6000



Windows & Doors

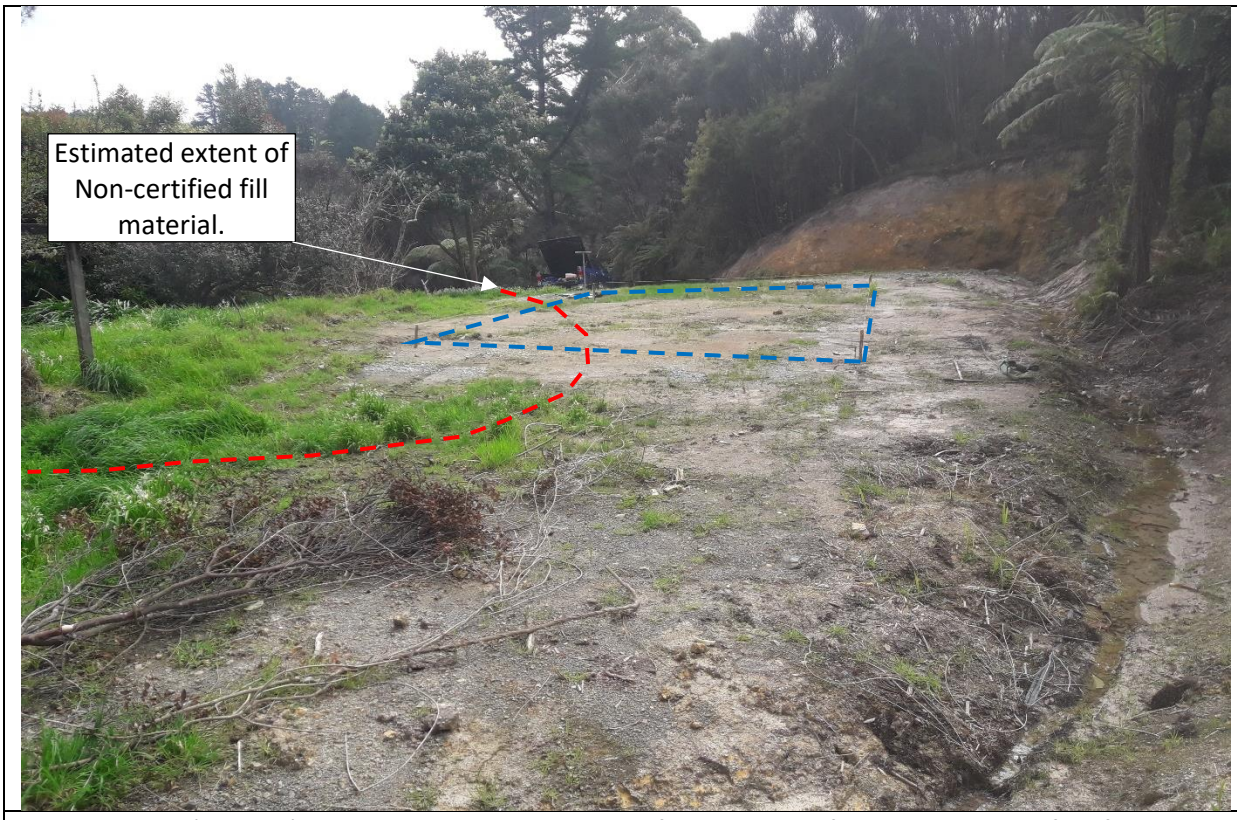
1. French 2000H 2000W $2199
2. Lounge 1200H 2000W $875
3. High lounge 1800W 400H
4. High Bedroom 400H 1800W
5. Bedroom 1200H 2000W $875
6. kitchen 800H 1000W
7. Door 2000H 860W $1045
8. 600H × 800W frosted Toilet $389
9. Bathroom frosted 600H × 800W $439
10. High Bedroom 400H 1200W $495
11. Bedroom 1200H 2000W $875

$7400 ish excluding wooden surrounds

Appendix D – Site Photographs

Looking northeast (approx.) across proposed building platform. Pegs denote approximate dwelling location. Note the steep cut bank with exposed soils and open drain at base of slope, top of image.

Looking north (approx.) across proposed building platform (dashed line). Note open drain at base of slope that extends around the perimeter of the propose building platform.



Looking north (approx.) across proposed building platform, centre of image. Non-certified fill material encountered at western (left) side of build platform.

Looking south (approx.) across proposed building platform. Bank below building platform to top right of image (grassed area). Non-certified fill material encountered at far corner of build platform.

Appendix E – Advisory Note

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IMPORTANT ADVISORY NOTE

PRODUCER STATEMENT – CONSTRUCTION REVIEW (PS4)

The Building Consent Authority (BCA) frequently requires Producer Statements–Construction Review (PS4) to be submitted to the BCA in order for a Code of Compliance Certificate (CCC) to be issued. A PS4 is usually required for each specialist area. The requirement for a consultant to issue a PS4 related to their area of work will appear as a condition in the Building Consent documents.

It is the consent holder's responsibility to notify Haigh Workman Limited for geotechnical construction monitoring and testing required for subsequent issue of a PS4. An initial inspection of stripped or excavated ground must take place before any fill or blinding concrete is placed. Retrospective site monitoring of completed or partially completed geotechnical work is not possible and a PS4 will not be issued without all the required observations.

In order to secure our construction monitoring services and avoid delays on site, Haigh Workman Limited require at least 24 hours' notice prior to the time the site visit is required. Construction monitoring is limited to items that have been recommended, designed and detailed by Haigh Workman Limited. We are unable to inspect non-consented or unauthorised work. Haigh Workman Limited do not carry out construction monitoring or issue PS4's for work that has been recommended, designed or detailed by other consultants without prior approval from Haigh Workman Limited. Haigh Workman Limited will not issue a PS4 where construction monitoring and/or testing have been carried out by any other consultant. The PS4 must be sought from the consultant who carried out those inspections.

The full Building Consent, with stamped plans with consent numbers (or a legible copy of the same) including all amendments, shall be made available to us during inspections. We will not commence construction monitoring until the documentation is available or provided to us prior to our site visit.

Unless stated otherwise in our terms of engagement, the fees associated with construction monitoring and the issue of PS4's are separate from any work carried out prior to commencement of construction. We are able to provide a fee estimate for this work if required. We cannot provide a fixed quote because the quantum of work required frequently depends on the construction program and the performance of others. These things are not known to us in advance of construction. Our normal terms of trade require payment of fees monthly during the inspection period and full settlement prior to release of any PS4.