

3 December 2025

G00417

Scarbro Civil Limited
5-7 Hannigan Drive
St Johns
AUCKLAND 1071

Attention: Liam Scarborough

PROPOSED FILL FACILITY DEVELOPMENT AT 362 JONES ROAD, HUNUA – LANDSLIDE HAZARD RISK ASSESSMENT REPORT FOR NORTH FILLING AREA

1.0 GENERAL

The Fraser Thomas Ltd drawing set, reference 33250, indicate that filling operations at 362 Jones Road, Hunua, will be undertaken in two separate areas, i.e. the North Filling area and South Filling area, separated by an east/west trending ridge feature that runs through the centre of the site.

It is understood that, from communication with Auckland Council, a resource consent condition will be applied to the South Filling area which states that additional geotechnical investigation, appraisal and reporting is required to determine the suitability of the area prior to commencement of any filling operations within the southern part of the site.

As requested, a landslide hazard risk assessment has therefore been undertaken, in accordance with Appendix 24 of Plan Change 120: Housing Intensification and Resilience (PC120) of the Auckland Unitary Plan (AUP), for the proposed North Filling area.

A Geotechnical Investigation Report, Project No. G00417, dated 14 October 2024, was prepared by Fraser Thomas Ltd to determine the subsoil conditions beneath the site as they may affect the proposed development, with particular regard to slope stability considerations.

The purpose of this report is to present the results of a landslide hazard risk assessment, and to determine the suitability of the site for the proposed development in support of an application for Resource Consent.

This landslide hazard risk assessment report should be read in conjunction with the Fraser Thomas Ltd, Geotechnical Investigation Report, dated October 2024.

2.0 PREVIOUS REPORTS

As discussed in Section 1.0, a Geotechnical Investigation Report, Project No. G00417, dated 14 October 2024, was prepared by Fraser Thomas Ltd to determine the subsoil conditions

beneath the site as they may affect the proposed development, with particular regard to slope stability considerations.

Twenty three hand augered boreholes, numbered H1 to H23 inclusive, were undertaken as part of the ground investigation completed for the October 2024 report. It is noted that Boreholes H1 to H8 inclusive were generally located within the footprint of the proposed North Filling area.

The field investigation, undertaken in the proposed North Filling area footprint, generally encountered a surficial layer of topsoil overlying residual soils of the Waipapa Group, which are in turn underlain by highly to slightly weathered argillite and sandstone of the Waipapa Group from depths ranging between approximately 5.8 m and 6.6 m below the existing ground surface.

The October 2024 report states the following with respect to the visual appraisal undertaken in the northern part of the site:

“The topography of the subject site generally comprises an east-west trending ridge located in the central part of the site with accompanying broad north/south trending spurs and gullies. The gully side slopes generally comprised moderately steep to steep, up to 21° to the horizontal (1V:2.6H), slopes.”

And that:

“...benched and hummocky topography, inferred to be indicative of historic shallow seated slope instability, was noted within the moderately steep, gully side slope[s].”

It is noted that no deep seated slope instability features were observed in the northern part of the site at the time of the visual appraisal undertaken for the October 2024 report.

Slope stability analyses were undertaken along three critical cross sections, i.e. Cross Section AA, BB and CC, for the proposed managed fill end slopes formed at a gradient of up to approximately 18° to the horizontal (1V:3H), with 4 m wide benches at appropriate vertical intervals of 1 bench per 10 m vertical height.

The results of the slope stability analyses show that the proposed managed fill end slopes and natural ground profile, constructed in accordance with the conclusions and recommendations presented in the October 2024 report, achieve adequate factors of safety with respect to slope stability, as outlined in Chapter 2 of the Auckland Council Code of Practice for Land Development and Subdivision, Version 2.0, dated May 2023.

3.0 LANDSLIDE HAZARD RISK ASSESSMENT

3.1 ASSESSMENT STAGE 1

3.1.1 General

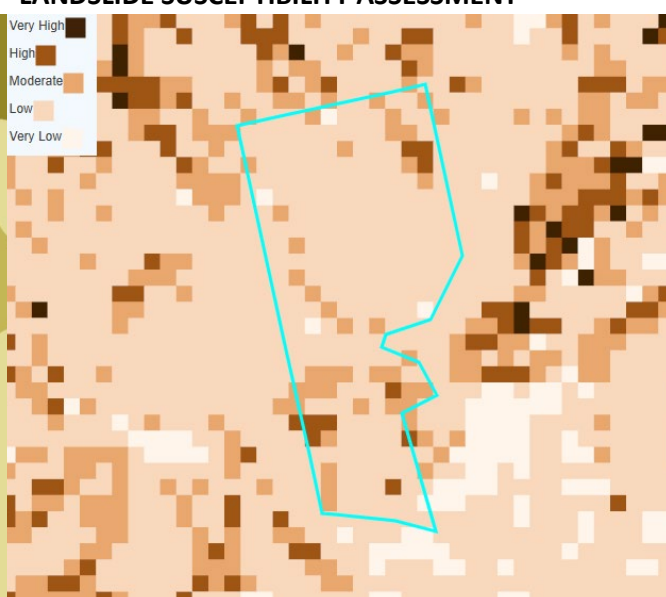
The Auckland Council GeoMaps software indicates that, with respect to landslide hazards, the northern part of the subject site is defined as “High Susceptibility” by the Level A Large Scale Landslide Susceptibility Assessment. The northern part of the site is generally defined as “Low Susceptibility” by the Level A Shallow Landslide Susceptibility Assessment with a localised area within the north-eastern corner defined as “Moderate to High Susceptibility”.

The Auckland Council GIS Large Scale Landslide Susceptibility Assessment and Shallow Landslide Susceptibility Assessment overlays are shown in Figure 1 and Figure 2, respectively.

FIGURE 1: AUCKLAND COUNCIL GIS LARGE SCALE LANDSLIDE SUSCEPTIBILITY ASSESSMENT



FIGURE 2: AUCKLAND COUNCIL GIS SHALLOW LANDSLIDE SUSCEPTIBILITY ASSESSMENT



It is noted that, from a review of Appendix 24 of PC120 of the AUP, should the Auckland Council Landslide Susceptibility maps indicate that the site has a Medium, High or Very High susceptibility classification, a landslide hazard risk assessment is required.

Given the foregoing susceptibility classifications for the site, a landslide hazard risk assessment has therefore been undertaken, in accordance with Appendix 24 of PC120 of the AUP, on the existing moderately steep gully side slope, represented by Cross Section BB presented in the October 2024 report, and located in the north-eastern corner of the subject site, as shown on the appended Fraser Thomas Ltd drawing G00417/2.

As discussed in Section 2.0, the October 2024 report states the following with respect to the visual appraisal undertaken in the northern part of the site:

“The topography of the subject site generally comprises an east-west trending ridge located in the central part of the site with accompanying broad north/south trending spurs and gullies. The gully side slopes generally comprised moderately steep to steep, up to 21° to the horizontal (1V:2.6H), slopes.”

It is our opinion that, as the North Filling area is generally located at the crest of an east-west trending ridge feature, the site will not be adversely affected by ‘run-out’ associated with a landslide occurring uphill from the site.

3.1.2 Review of Available Landslide Data

A review of the existing data contained within the Natural Hazards Commission claims portal and the Earth Science New Zealand Landslide Database indicates that there are no documented natural hazards and/or landslides within the subject site.

As discussed in Section 2.0, no deep-seated slope instability features were observed in the northern part of the site at the time of the visual appraisal undertaken for the October 2024 report.

It is noted that the field investigation, completed for the October 2024 report, was undertaken after the significant Auckland rainfall events on 27 January and 14 February 2023, indicating that

the existing slopes in the northern part of the site were not adversely affected by events of these magnitudes, i.e. in excess of a 1 in 250 year event.

It is therefore our opinion that, based on our review of the available landslide data and visual appraisal, completed for the October 2024 report, the northern part of the site has not been subject to a deep-seated slope instability event in the last 1,000 years.

3.2 ASSESSMENT STAGE 2

3.2.1 Risk Assessment Method Selection

Appendix 24 of PC120 of the AUP provides two methodologies to assess the landslide risk; a semi-quantitative assessment, i.e. 'Method 1', and a combined semi-quantitative and quantitative assessment, i.e. 'Method 2'.

To determine the appropriate methodology to be adopted for the landslide hazard risk assessment, the proposed land use activity and mapped landslide susceptibility are compared in the reproduced Table 1.

TABLE 1: RISK ASSESSMENT METHODOLOGY TO BE USED TO ASSESS LANDSLIDE RISK

<i>Land Use Activity</i>	<i>Landslide Susceptibility Class from Auckland Council Published Landslide Susceptibility and Landslide Inventory Maps</i>				
	<i>Mapped Landslide</i>		<i>Very High</i>	<i>High</i>	<i>Moderate</i>
	<i>Recent¹</i>	<i>Ancient²</i>			
<i>Activities sensitive to natural hazards</i>	2	1	2	2	1
<i>Subdivision</i>	2	1	2	2	1
<i>Activities potentially sensitive to natural hazards</i>	2	1	1	1	1
<i>Activities less sensitive to natural hazards</i>	1	1	1	1	N/A
<i>On-site septic tanks, wastewater treatment and disposal systems, effluent disposal fields, underground storage tanks, water tanks (including rainwater tanks) or stormwater pipes or soakage fields, accessways and private roads</i>	2	1	2	2	1
<i>Re-building of materially damaged or destroyed buildings</i>	2	1	2	2	2
<i>Storage of hazardous substances</i>	2	1	1	1	1
<i>Earthworks</i>	1	1	1	1	1
<i>Vegetation alteration or removal</i>	1	1	1	1	1
<i>Discharge of stormwater and/or wastewater directly to ground</i>	1	1	1	1	1

Notes: 1 Likely active landslide within the last 1,000 years
 2 Likely not active landslide within the last 1,000 years
 N/A No further risk assessment is required and the risk can be taken as low

It is our opinion that the proposed development within the subject site falls into the foregoing "Earthworks" category. It is, therefore, concluded that 'Method 1' should be adopted for the landslide hazard risk assessment.

3.2.2 Engineering Geological Model

As discussed in Section 2.0, the field investigation, undertaken in the proposed North Filling area footprint for the October 2024 report, generally encountered a surficial layer of topsoil overlying residual soils of the Waipapa Group, which are in turn underlain by highly to slightly weathered argillite and sandstone of the Waipapa Group from depths ranging between approximately 5.8 m and 6.6 m below the existing ground surface.

It is noted that, as discussed in Section 3.1, Cross Section BB, presented in the October 2024 report, is located in the north-eastern corner of the site, i.e. within the area defined as “Moderate to High Susceptibility”, as indicated by the Level A Shallow Landslide Susceptibility Assessment.

We have therefore adopted the existing ground and geological profiles presented in Cross Section BB to generate the engineering geological model which will be used for the following landslide hazard risk assessment.

3.3 ASSESSMENT STAGE 3

3.3.1 Semi-Quantitative Assessment (Method 1)

3.3.1.1 General

Based on our review of the available information and adopted engineering geological model, three potential landslide hazards were defined; a high likelihood (H1), median likelihood (H2) and the maximum credible event (H3), which could adversely affect the existing gully side slope in the north-eastern corner of the site. The landslide hazards are shown on the appended annotated Engineering Geological Model drawing.

Hazards H1, H2 and H3 are described in Table 2 and detailed in Tables 3, 4 and 5, respectively.

TABLE 2: LANDSLIDE HAZARD DESCRIPTIONS

Hazard No.	Brief Description of Slope Stability Hazard
H1	Surficial soil creep movement, affecting the upper 0.5 m of the gully side slope. Failure would not be noticeable and may lead to an accumulation of topsoil material at the base of the gully, i.e. recent alluvium, over a prolonged time period.
H2	A rotational or translational landslide within the residual soils, affecting the lower part of the gully side slope. Failure would likely be slow moving and landslide debris would accumulate in the base of the gully.
H3	A rotational or translational landslide within the residual soils, extending to the underlying bedrock, affecting the whole gully side slope. Failure would likely be slow moving and landslide debris would accumulate in the base of the gully.

TABLE 3: DETAILS OF HAZARD H1

Hazard H1	Description of Landslide	Comment on Uncertainty and Assumptions
Landslide Type	Surficial soil creep movement, affecting the upper 0.5 m of the gully side slope.	Low – Observed during the visual appraisal.
Subsurface Conditions	Generally within the topsoil material and upper circa 300 mm of residual soils of the Waipapa Group.	Low – Hand augered boreholes across the North Filling area are consistent.
Inferred depth of failure and Failure Mechanism	Up to 0.5 m below the existing ground surface, elevated pore water pressures within the subsoils.	Low – Generally accepted depth and mechanism of shallow seated, surficial soil creep.
Inferred Trigger Mechanisms	Periods of wet weather or a series of heavy rainfall events.	N/A
Summary of Land/Assets above Landslide	N/A	N/A
Summary of Land/Assets below Landslide	N/A	N/A

TABLE 4: DETAILS OF HAZARD H2

Hazard H2	Description of Landslide	Comment on Uncertainty and Assumptions
Landslide Type	A rotational or translational landslide within the residual soils, affecting the lower part of the gully side slope.	Low – Common landslide typology within residual soils of the Waipapa Group.
Subsurface Conditions	Residual soils of the Waipapa Group.	Low – Hand augered boreholes across the North Filling area are consistent.
Inferred depth of failure and Failure Mechanism	Up to 2.5 m below the existing ground surface, elevated pore water pressures within the subsoils.	Low to moderate – depth of potential failure based on slope geometry.
Inferred Trigger Mechanisms	A significant rainfall event, larger than the 27 January and 14 February 2023 storm events.	Low – The gully side slope was not adversely affected by the 27 January and 14 February 2023 storm events.
Summary of Land/Assets above Landslide	N/A	N/A
Summary of Land/Assets below Landslide	N/A	N/A

TABLE 5: DETAILS OF HAZARD H3

Hazard H3	Description of Landslide	Comment on Uncertainty and Assumptions
Landslide Type	A rotational or translational landslide within the residual soils, extending to the underlying bedrock, affecting the whole gully side slope.	Low – Common landslide typology within residual soils of the Waipapa Group.
Subsurface Conditions	Residual soils of the Waipapa Group.	Low – Hand augered boreholes across the North Filling area are consistent.
Inferred depth of failure and Failure Mechanism	Up to 6.0 m below the existing ground surface, elevated pore water pressures within the subsoils.	Low to moderate – depth of potential failure based on slope geometry.
Inferred Trigger Mechanisms	A significant rainfall event, larger than the 27 January and 14 February 2023 storm events.	Low – The gully side slope was not adversely affected by the 27 January and 14 February 2023 storm events.
Summary of Land/Assets above Landslide	N/A	N/A
Summary of Land/Assets below Landslide	N/A	N/A

3.3.1.2 Features at Risk from Slope Stability Hazards

It is noted that there are no potentially vulnerable features, i.e. peoples, structures, assets etc, within the zones of depletion or accumulation associated with Hazard H1, H2 and H3.

3.3.1.3 Results

In accordance with PC120 of the AUP, we have undertaken a semi-quantitative landslide hazard risk assessment for the North Filling area of the proposed fill facility development. The landslide hazard consequence and likelihood of occurrence has been assessed by means of the overall risk matrix, as reproduced and shown in Table 6, with the risk classifications for Hazards H1, H2 and H3 defined in Table 7.

TABLE 6: RISK CLASSIFICATION TABLE, ADOPTED FROM APPENDIX 24 OF PC120

		Consequence category				
		Insignificant	Minor	Medium	Major	Catastrophic
Likelihood category	Almost Certain	Medium (tolerable)	High (significant)	High (significant)	High (significant)	High (significant)
	Likely	Low (acceptable)	Medium (tolerable)	High (significant)	High (significant)	High (significant)
	Possible	Low (acceptable)	Low (acceptable)	Medium (tolerable)	High (significant)	High (significant)
	Unlikely	Low (acceptable)	Low (acceptable)	Low (acceptable)	Medium (tolerable)	High (significant)
	Rare	Low (acceptable)	Low (acceptable)	Low (acceptable)	Low (acceptable)	Medium (tolerable)
	Barely Credible	Low (acceptable)	Low (acceptable)	Low (acceptable)	Low (acceptable)	Low (acceptable)

TABLE 7: LANDSLIDE HAZARD RISK ASSESSMENT SUMMARY

Hazard No.	Likelihood Category	Consequence Category	Risk Classification
H1	Likely	Insignificant	Low (acceptable)
H2	Unlikely	Insignificant	Low (acceptable)
H3	Barely Credible	Minor	Low (acceptable)

3.4 ASSESSMENT STAGE 4

We have reviewed the results of the landslide hazard risk assessment and proposed activity against Table E36.4.1B of Chapter E36 of the AUP, in order to identify the activity status for the North Filling area at 362 Jones Road, Hunua.

The results of our review of Table E36.4.1B of the AUP, indicate that the proposed development falls under 'A114' Activity *"New structures [i.e. proposed fill bund] ... associated with activities potentially sensitive and less sensitive to natural hazards in low (acceptable) landslide hazard risk areas"*. When compared against the 'Low' (acceptable) risk classification, derived in Section 3.5, the proposed development is a Permitted Activity.

3.5 CONCLUSION

It is our opinion that, based on the results of the investigation and appraisal reported herein, and as indicated in Table 7, the landslide hazard risk assessment indicates that the North Filling area has a 'Low' risk of being adversely affected by slope instability events.

As discussed in Section 2.0, the results of the slope stability analyses show that the proposed cleanfill end slopes and natural ground profile, constructed in accordance with the conclusions and recommendations presented in the October 2024 report, achieve adequate factors of safety with respect to slope stability, as outlined in Chapter 2 of the Auckland Council Code of Practice for Land Development and Subdivision, Version 2.0, dated May 2023.

It is therefore concluded that the North Filling area is unlikely to be adversely affected by future landslides/slope instability events and is a Permitted Activity under E36 of the AUP.

The professional opinion expressed herein has been prepared solely for, and is furnished to Auckland Council and our client, Scarbro Civil Limited, for their purposes only with respect to the particular brief given to us, on the express condition that it will not be relied upon by any other person or for any other purposes without our prior written agreement.

No liability is accepted by this firm or by any principal, or director, or any servant or agent of this firm, in respect of its use by any other person, and any other person who relies upon any matter contained in this report does so entirely at its own risk

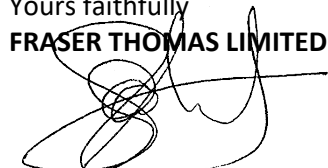
Notwithstanding the foregoing, if the circumstances at the subject site change with respect to topography or the proposed development concept, or if a period of more than three years has elapsed since the date of this report, this report should not be used without our prior review and written agreement.

Notwithstanding the foregoing conclusions and recommendations, the proposed building development should be designed to satisfy the relevant requirements of the Building Code, so as to ensure compliance with the Building Act.

These conclusions and recommendations should be read in conjunction with the remainder of this Landslide Hazard Risk Assessment Report and the Fraser Thomas Ltd, Geotechnical Investigation Report, Project No. G00417, dated 14 October 2024, and should not be referred to out of context with the remainder of this report.

Yours faithfully

FRASER THOMAS LIMITED

A handwritten signature in black ink, appearing to read 'A G J STUART', is written over the company name.

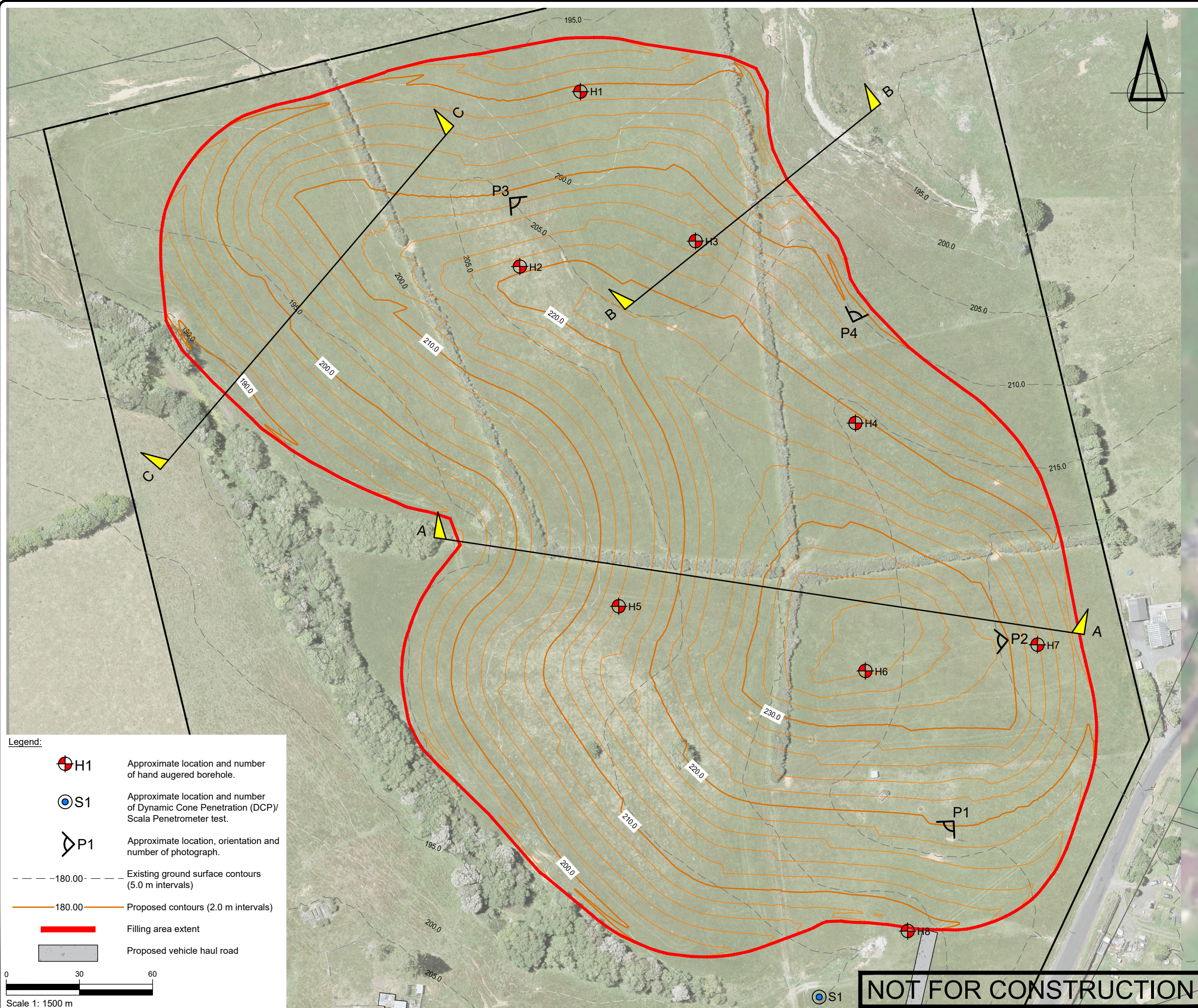
A G J STUART

Director – Geotechnical Engineering

Chartered Professional Engineering Geologist

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P:\000 G Series\G00417\03 Drawings\G00417-2.dwg, cwebster, 14/10/2024 11:02 am



Legend:

- H1 Approximate location and number of hand augered borehole.
- S1 Approximate location and number of Dynamic Cone Penetration (DCP)/Scala Penetrometer test.
- P1 Approximate location, orientation and number of photograph.
- 180.00 Existing ground surface contours (5.0 m intervals)
- 180.00 Proposed contours (2.0 m intervals)
- Filling area extent
- Proposed vehicle haul road

0 30 60
Scale 1: 1500 m

SURVEYED	CW	APRIL 2024	APPROVED	DATE
DESIGNED	CJR	APRIL 2024	AGJS	SEPT 2024
DRAWN				
CHECKED				
REVISION	CHANGES		CHECKED	DATE

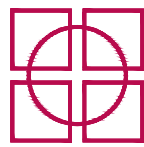
NOTES

PROJECT DATUMS:
LEVEL: Auckland Vertical Datum 1946
COORDINATE: NZGD2000 / Mount Eden 2000

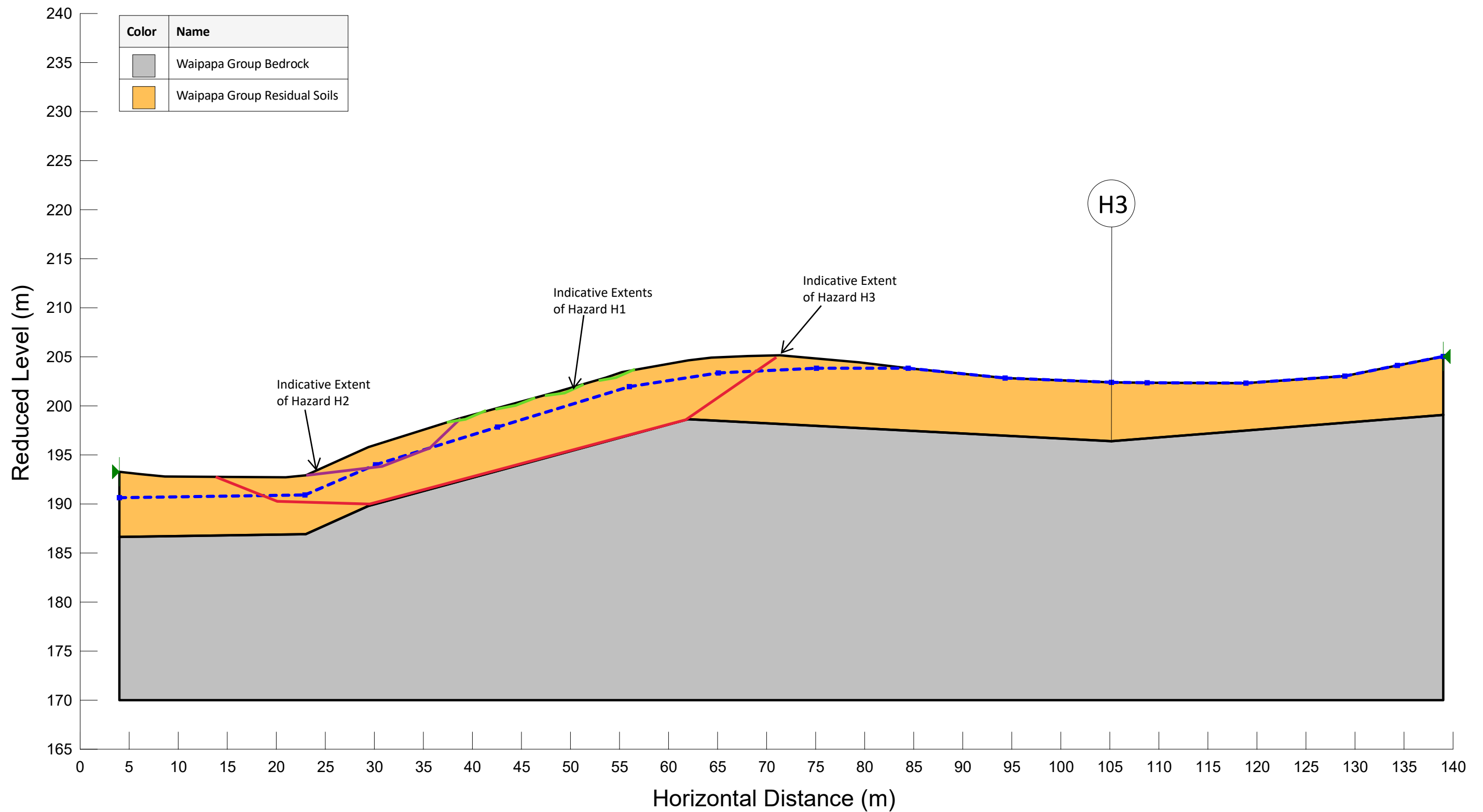
CLIENT
SCARBRO ENVIRONMENTAL LTD

PROJECT
PROPOSED FILL FACILITY
DEVELOPMENT AT
362 JONES ROAD, HUNUA

TITLE
PROPOSED
NORTH FILLING AREA
SITE PLAN

 **Fraser Thomas**
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TAURANGA 020 4118 9465
www.fraserthomas.co.nz
The copyright of this design and drawing is vested in Fraser Thomas Ltd, unless otherwise indicated.

STATUS	
Construction works shall commence only on receipt of and in accordance with the Council or Council organisation stamped approved drawings, unless otherwise indicated.	
SCALE 1:1500	(A3)
DRAWING No G00417/2	REVISION -



362 Jones Road, Hunua

CROSS SECTION BB - ENGINEERING GEOLOGICAL MODEL AND INDICATIVE HAZARDS SECTIONS



ENGINEERS • RESOURCE MANAGERS • SURVEYORS

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PROJECT NO: G00417
ANALYSED BY: C. Webster
SCALE: 1:400 (A3)
DATE: 01/12/2025