THOMSON SURVEY LIMITED

SURVEYORS AND RESOURCE PLANNERS

Our Reference: 10085.1 (FNDC)

24 June 2025

Resource Consents Department
Far North District Council
JB Centre
KERIKERI

Dear Sir/Madam

RE: Proposed Variation to RC 2240376-RMASUB, a subdivision at Waiotemarama Gorge Road, Opononi – Jason and Penelope Bill Family Trustees Limited

I am pleased to submit application on behalf of Jason and Penelope Bill Family Trustees Limited, for a proposed variation to subdivision consent RC 2240376-RMASUB. The application is a discretionary activity.

The application fee of $1,232 has been paid separately via direct credit.

Regards

Lynley Newport
Senior Planner
THOMSON SURVEY LTD

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After Hours: Office Manager: Sam Lee 021 1370060

Te Kaunihera o Te Hiku o te Ika
Far North District Council

Office Use Only
Application Number:

Application for change or cancellation of resource consent condition (S.127)

(Or Associated Consent Pursuant to the Resource Management Act 1991 (RMA)) Prior to, and during, completion of this application form, please refer to Resource Consent Guidance Notes and Schedule of Fees and Charges — both available on the Council's web page.

1. Pre-Lodgement Meeting

Have you met with a council Resource Consent representative to discuss this application prior to lodgement?
◯ **Yes** ✓ **No**

If yes, who have you spoken with? _____

2. Type of Consent being applied for

◉ **Change of conditions (s.127)**

3. Consultation:

Have you consulted with Iwi/Hapū? ◯ **Yes** ◉ **No**

If yes, which groups have you consulted with?

Who else have you consulted with?

For any questions or information regarding iwi/hapū consultation, please contact Te Hono at Far North District Council tehonosupport@fndc.govt.nz

4. Applicant Details:

Name/s: Jason and Penelope Bill Family Trustees Limited

Email: [redacted]

Phone number:

Postal address:
(or alternative method of service under section 352 of the act)

Office Use Only
Application Number:

5. Address for Correspondence

Name and address for service and correspondence (if using an Agent write their details here)

Name/s: Lynley Newport

Email: [redacted]

Phone number:

Postal address:
(or alternative method of service under section 352 of the act)

All correspondence will be sent by email in the first instance. Please advise us if you would prefer an alternative means of communication.

6. Details of Property Owner/s and Occupier/s

Name and Address of the Owner/Occupiers of the land to which this application relates (where there are multiple owners or occupiers please list on a separate sheet if required)

Name/s: As above

Property Address/ Location: as above

Postcode

7. Application Site Details

Location and/or property street address of the proposed activity:

Name/s: As above

Site Address/ Location: 546 Waiotemarama Gorge Road
OPONONI

Postcode

Legal Description: Sec 54 & 55 Blk VII Hokianga SD **Val Number:**

Certificate of title: NA75B/84

Please remember to attach a copy of your Certificate of Title to the application, along with relevant consent notices and/or easements and encumbrances (search copy must be less than 6 months old)

Site visit requirements:

Is there a locked gate or security system restricting access by Council staff? ◯ **Yes** ✓ **No**

Is there a dog on the property? ◯ **Yes** ✓ **No**

7. Application Site Details (continued)

Please provide details of any other entry restrictions that Council staff should be aware of, e.g. health and safety, caretaker's details.
This is important to avoid a wasted trip and having to re-arrange a second visit.

8. Detailed description of the proposal:

This application relates to the following resource consent: RC 2240376-RMASUB

Specific conditions to which this application relates:

Change condition 1 to refer to new scheme plan(s); change condition 4(c), 4(d) and 4(f) to refer to updated Engineering Report.

Describe the proposed changes:

The consent holders seek to change lot boundaries. This has resulted in a need for their consultant engineers to update their Site Suitability Report.

9. Would you like to request Public Notification?

◯ **Yes** ✓ **No**

10. Other Consent required/being applied for under different legislation

(more than one circle can be ticked):

◯ **Building Consent** Enter BC ref # here (if known)
◯ **Regional Council Consent (ref # if known)** Ref # here (if known)
◯ **National Environmental Standard consent** Consent here (if known)
◯ **Other (please specify)** Specify 'other' here

11. Assessment of Environmental Effects:

Every application for resource consent must be accompanied by an Assessment of Environmental Effects (AEE). This is a requirement of Schedule 4 of the Resource Management Act 1991 and an application can be rejected if an adequate AEE is not provided. The information in an AEE must be specified in sufficient detail to satisfy the purpose for which it is required. Your AEE may include additional information such as Written Approvals from adjoining property owners, or affected parties (including consultation from iwi/hapū).

Your AEE is attached to this application ✓ **Yes**

12. Draft Conditions:

Do you wish to see the draft conditions prior to the release of the resource consent decision? ◯ **Yes** ◉ **No**

If yes, do you agree to extend the processing timeframe pursuant to Section 37 of the Resource Management Act by 5 working days? ◯ **Yes** ◯ **No**

13. Billing Details:

This identifies the person or entity that will be responsible for paying any invoices or receiving any refunds associated with processing this resource consent. Please also refer to Council's Fees and Charges Schedule.

Name/s: (please write in full) Jason & Penelope Bill Family Trustees Limited

Email:

Phone number:

Postal address:
(or alternative method of service under section 352 of the act)

[redacted]

Fees Information:
An instalment fee for processing this application is payable at the time of lodgement and must accompany your application in order for it to be lodged. Please note that if the instalment fee is insufficient to cover the actual and reasonable costs of work undertaken to process the application you will be required to pay any additional costs. Invoiced amounts are payable by the 20th of the month following invoice date. You may also be required to make additional payments if your application requires notification.

Declaration concerning Payment of Fees:
I/we understand that the Council may charge me/us for all costs actually and reasonably incurred in processing this application. Subject to my/our rights under Sections 357B and 358 of the RMA, to object to any costs, I/we undertake to pay all and future processing costs incurred by the Council. Without limiting the Far North District Council's legal rights if any steps (including the use of debt collection agencies) are necessary to recover unpaid processing costs I/we agree to pay all costs of recovering those processing costs. If this application is made on behalf of a trust (private or family), a society (incorporated or unincorporated) or a company in signing this application I/we are binding the trust, society or company to pay all the above costs and guaranteeing to pay all the above costs in my/our personal capacity.

Name: (please write in full) Penny Bill

Signature: (signature of bill payer) [redacted] Date 23-Jun-2025

MANDATORY

14. Important Information:

Note to applicant
You must include all information required by this form. The information must be specified in sufficient detail to satisfy the purpose for which it is required.
You must pay the charge payable to the consent authority for the resource consent application under the Resource Management Act 1991.

PrivacyInformation:
Once this application is lodged with the Council it becomes public information. Please advise Council if there is sensitive
information in the proposal. The information you have provided on this form is required so that your application for consent pursuant to the Resource Management Act 1991 can be processed under that Act. The information will be stored on a public register and held by the Far North District Council. The details of your application may also be made available to the public on the Council's website, www.fndc.govt.nz. These details are collected to inform the general public and community groups about all consents which have been issued through the Far North District Council.

Declaration
The information I have supplied withthis application is true and complete to the best of my knowledge.

Name: (please write in full) Penni Bill

Signature: [redacted] Date 23-Jun-2025

A signature is not required if the application is made by electronic means

Checklist (please tick if information is provided)

- ◯ Payment (cheques payable to Far North District Council)
- ◯ Details of your consultation with Iwi and hapū
- ◯ A current Certificate of Title (Search Copy not more than 6 months old)
- ◯ Copies of any listed encumbrances, easements and/or consent notices relevant to the application
- ◯ Applicant / Agent / Property Owner / Bill Payer details provided
- ◯ Location of property and description of proposal
- ◯ Assessment of Environmental Effects
- ◯ Written Approvals / correspondence from consulted parties
- ◯ Reports from technical experts (if required)
- ◯ Copies of other relevant consents associated with this application
- ◯ Location and Site plans (land use) AND/OR
- ◯ Location and Scheme Plan (subdivision)
- ◯ Elevations / Floor plans
- ◯ Topographical / contour plans

Please refer to chapter 4 (Standard Provisions) of the Operative District Plan for details of the information that must be provided with an application. This contains more helpful hints as to what information needs to be shown on plans.

Jason and Penelope Bill Family Trustees Limited

APPLICATION FOR A VARIATION TO RC 2240376-RMASUB

PURSUANT TO s127 OF RMA

546 Waiotemarama Gorge Road, Opononi

Thomson Survey Ltd
Kerikeri

1.0 INTRODUCTION

1.1 Background

RC 2240376-RMASUB was originally issued on 27th August 2024, and gave consent for the creation of a total of three new titles (two additional). The application was a discretionary activity. The consent holder now seeks to change lot boundaries of the two additional titles proposed to be created, essentially reducing the area of both.

1.2 Reason for this Variation

The original consent creates Lots 1 and 2 of 2.72ha and 1.52ha respectively. The consent holders had already determined the fencing alignment to enable a large portion of the underlying title to be leased to long term forestry planting. The fencing alignment does not match the current Lot 1 and 2 boundaries and the consent holders seek to reduce the area of Lots 1 and 2 down to 1.53ha and 8800m^2 respectively.

This variation application is supported by an updated Site Suitability Report by Geologix Consultant Engineers, to show feasibility of altered indicative building sites and future residential use on Lots 1 & 2.

The second change being sought it to defer the formation of vehicle crossings to each lot until such time as building consent is applied for, i.e. at time of development of each lot. A consent notice condition is suggested.

1.3 Scope of this Report

This assessment and report accompanies the application for a change to conditions (s127) and is regarded as a **discretionary** activity. The information provided in this assessment and report is considered commensurate with the scale and intensity of the activity for which consent is being sought. I regard the changes to be minor.

2.0 PROPERTY DETAILS

Location:	Waiotemarama Gorge Road, Opononi
Title & Legal description:	NA75B/84; Sections 54 & 55 Blk VII Hokianga SD – see Appendix 3.

3.0 SITE DESCRIPTION

The site remains as described in the original application.

4.0 CHANGES REQUESTED & EXPLANATION

Amend Condition 1 as follows:

1. *The subdivision shall be carried out in accordance with the approved plan of subdivision prepared by Thomson Survey, referenced "PROPOSED SUBDIVISION OF SECTIONS 54 & 55 BLK VII HOKIANGA SD", revised ~~17/05/2023~~ 03/12/2024, surveyors reference number 10085, and attached to this consent with the Council's "Approved Stamp" affixed to it.*

Explanation:

Areas of Lots 1 & 2 amended as described in sections 1.1 and 1.2 of this application.

Delete condition 3(a) and defer to a consent notice under condition 4:

~~*Upgrade the existing vehicle crossing serving Lots 1 & 2. The construction of the vehicle crossing must be in accordance with FNDC Engineering Standard 2023 Sheet 21/22 Type 1A crossing for a single lot in the new standards. It must include water table drains and culverts as required to direct and control stormwater runoff.*~~

Add new condition 4(i) as follows:

The construction / upgrade of vehicle crossings was not a requirement of subdivision consent in regard to land in Lots 1 and 2. Prior to the construction of any residential development on Lots 1 and 2, the lot owner is to upgrade the existing vehicle crossings, or construct new

crossings, serving Lots 1 & 2. The construction of the vehicle crossing must be in accordance with FNDC Engineering Standard 2023 Sheet 21/22 Type 1A crossing for a single lot in the new standards. It must include water table drains and culverts as required to direct and control stormwater runoff.

Explanation:

The amend to areas of Lots 1 & 2, and consequent house sites, means that the existing formed crossings may no longer be the most suitable crossing location. It is proposed to give a future lot owner the option of either upgrading existing crossings, as originally consent, or to construct new crossing at time of building consent, also to Council standard.

Amend Condition 4(c) as follows:

c) *At the time of lodging an application for building consent for a residential dwelling, the building applicant is to provide a report from a Chartered Professional Engineer with recognised competence in relevant geotechnical and structural matters, which addresses specific design of the building's foundations and references the report prepared by Geologix Consulting Engineers, referenced ~~C0021-S-03~~ C0021-S-04, Site Suitability Engineering Report for J & P Bill Family Trust, Revision 1, and dated ~~March 2024~~ April 2025.*
[Lots 1 & 2]

Amend Condition 4(d) as follows:

d) *In conjunction with the construction of any habitable buildings and other associated impermeable surfaces, the lot owner must install a stormwater retention tank/s with a flow-attenuated outlet/s, or other means of attenuation. The system must be designed such that the total stormwater discharged from the site, after development, is no greater than the predevelopment flow from the site for rainfall events up to a 10% AEP plus allowance for climate change, with overland/secondary flow paths able to accommodate a 1% AEP event. In regard to Lots 1 & 2, the stormwater management design shall reference the report by Geologix Consulting Engineers, referenced ~~C0021-S-03~~ C0021-S-04, Site Suitability Engineering Report for J & P Bill Family Trust, Revision 1, and dated ~~March 2024~~ April 2025.*
[Lots 1-4]

Amend Condition 4(f) as follows:

f. *In conjunction with the construction of any building that includes a wastewater treatment & effluent disposal system, the applicant must submit for Council approval a TP58 Report prepared by a Chartered Professional Engineer or an approved TP58 Report Writer. The report must identify a suitable method of wastewater treatment for the proposed development along with an identified effluent disposal area plus a 100% reserve disposal area. The report must confirm that all of the treatment & disposal systems can be fully contained within the lot boundary and comply with the Regional Plan Permitted Activity Standards. In regard to Lots 1 & 2, the wastewater treatment and effluent disposal system report shall make reference to the findings and recommendations in the report by Geologix Consulting Engineers, referenced*

~~C0021-S-03~~ C0021-S-04, *Site Suitability Engineering Report for J & P Bill Family Trust, Revision 1, and dated ~~March 2024~~ April 2025.*
[Lots 1-4]

Explanation:

All of the above consent notice clauses make reference to the original Site Suitability Report. Since this has not been superseded by a new Site Suitability Report, attached as Appendix 4 to this application, the consent notice clauses need to be updated to refer to the new report.

5.0 STATUTORY REQUIREMENTS

Applications for changes to consent conditions are lodged pursuant to s127. Pursuant to clause 127(3)(a), the application for a change to consent conditions is a **discretionary activity** application.

Sections 88 to 121 of the Act apply, and the following planners report and Assessment of Environmental Effects is offered pursuant to the requirements of those relevant sections of the Act.

6.0 s104 CONSIDERATIONS

S104 of the Act requires a consent authority to consider any actual and potential effects on the environment resulting from the change; and any relevant provisions of

(i) A national environmental standard;
(ii) Other regulations;
(iii) A national policy statement;
(iv) A NZ Coastal Policy Statement;
(v) A regional policy statement;
(vi) A plan or proposed plan.

6.1 Assessment of Environmental Effects

When considering the effects under a s127 application, it is only the effects of the changes being sought that need be assessed and considered. As such, this assessment of environmental effects does not re-visit or repeat that provided for the processing of the original application.

The proposed changes relate to reduced lot sizes and the continued feasibility of those lots to support future residential living. The Site Suitability Engineering Report in Appendix 4 supports and application and shows both Lots 1 & 2 to be suitable for future residential use.

Geotechnical Assessment and Ground Stability

Slope stability analysis carried out indicates both proposed revised building envelope areas to 'pass'. No failure planes under required Factors of Safety were observed and the proposed lots are not prone to slope instability issues to future buildings.

Wastewater Assessment

The Site Suitability Report confirms that future dwellings on Lots 1 & 2 (with reduced areas) are able to be serviced by on-site wastewater treatment and disposal, complying the Regional Plan's effluent discharge permitted activity standards.

Stormwater Management

Future on-site development on Lots 1 & 2 will comfortably meet the permitted 15% site coverage threshold. The Site Suitability Report shows attenuation and dispersion can appropriately manage increased stormwater runoff.

Natural Hazard Assessment

Table 12 in the Site Suitability Report provides a summary assessment of natural hazards. There is no reason, pursuant to s106 of the Act, that precludes the granting of this variation application.

Crossing formation / upgrade

The proposal is to defer crossing construction/upgrade until such time as Lots 1 & 2 are developed. There are existing crossing in place that the Council has accepted as being suitably located, and future owners of Lots 1 & 2 may choose to retain these and upgrade them to standard. Alternatively, with the new low layout, a crossing may be better located at alternative locations. The proposal is to provide a choice. Crossings will still be constructed to standard prior to establishing residential use of the lots. I do not believe the deferral of works creates any adverse environmental effects.

In summary, the reduction in lot area does not result in any additional adverse effects.

6.2 Relevant Provisions of planning instruments

Since the original application was processed there have been no changes to either the Operative District Plan or Proposed District Plan.

National Planning Instruments

There have been no new national planning instruments or standards enacted since the original application was granted.

7.0 CONSULTATION

Under Section 127(4) of the Act:

(4) For the purposes of determining who is adversely affected by the change or cancellation, the consent authority must consider, in particular, every person who—
(a) made a submission on the original application; and
(b) may be affected by the change or cancellation.

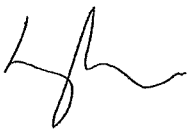
The original consent was issued under delegated authority, with no affected persons identified. The changes to not result in there being any additional affected persons.

8.0 CONCLUSION

It is considered the effects of the changes on the wider environment are less than minor. The proposal remains consistent with the relevant objectives and policies of the Operative and Proposed District Plan, the Regional Policy Statement, other national planning instruments, and Part 2 of the Resource Management Act.

There is no District Plan rule or national environmental standard that requires the proposal to change conditions to be publicly notified and no persons have been identified as adversely affected by the proposal. No special circumstances have been identified that would suggest notification is required.

It is therefore requested that the Council grant approval to the s.127 application on a non notified basis.



Lynley Newport
Senior Planner,
THOMSON SURVEY LTD

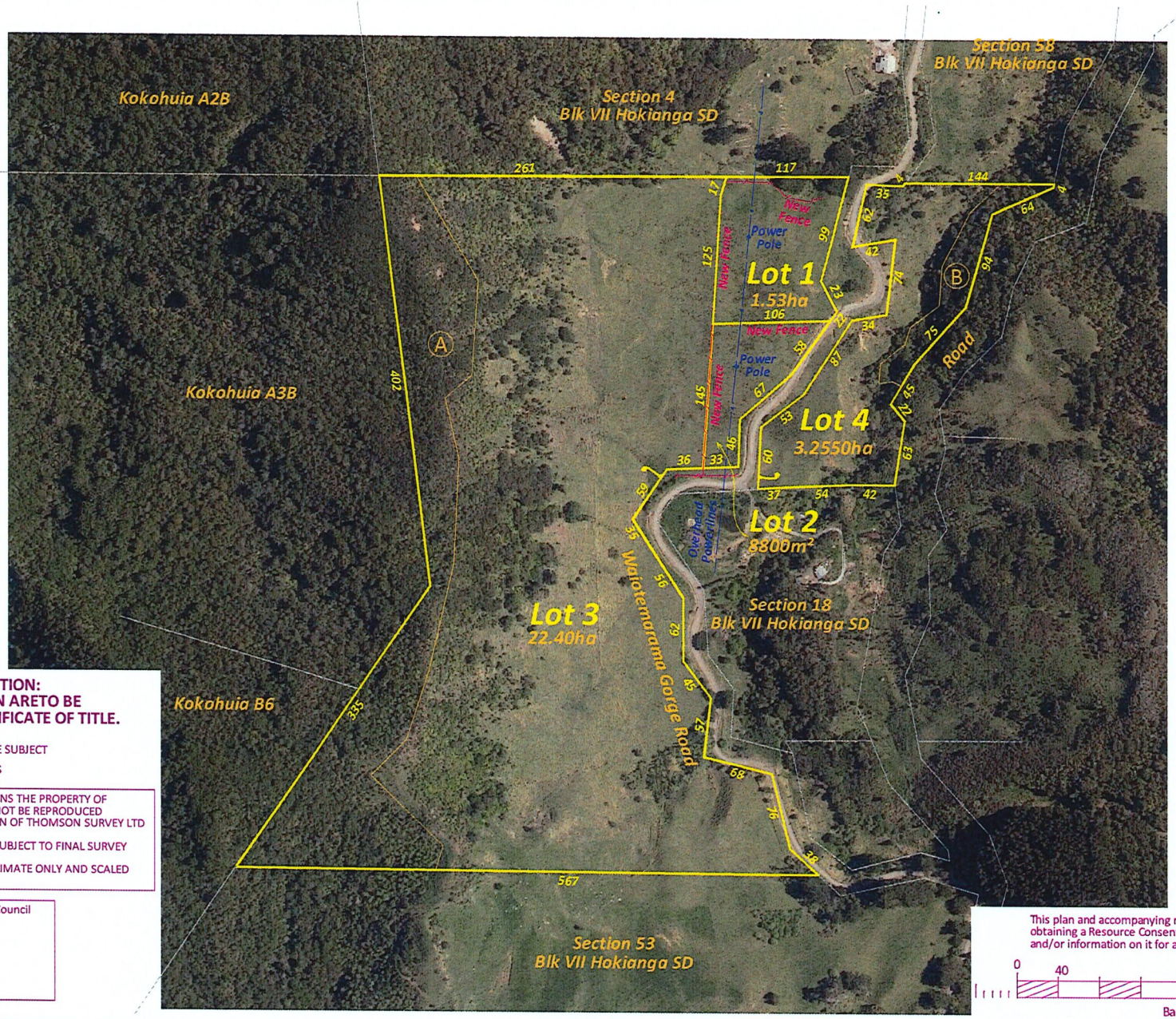
Date 24th June 2025

9.0 LIST OF APPENDICES

Appendix 1	Amended Scheme Plan(s)
Appendix 2	RC 2240376-RMASUB
Appendix 3	Record of Title & relevant instruments
Appendix 4	Site Suitability Engineering Report

Appendix 1

Amended Scheme Plan(s)



AMALGAMATION CONDITION:
THAT LOTS 3 & 4 HEREON ARETO BE HELD IN THE SAME CERTIFICATE OF TITLE.

AREAS MARKED (A) (B) TO BE SUBJECT TO BUSH PROTECTION COVENANTS

AREAS AND MEASUREMENTS ARE SUBJECT TO FINAL SURVEY

TOPOGRAPHICAL DETAIL IS APPROXIMATE ONLY AND SCALED FROM AERIAL PHOTOGRAPHY

Local Authority: Far North District Council
Comprised in: NA75B/84
Total Area: 28.0650ha
Zoning: Rural Production
Resource features: NIL

This plan and accompanying report(s) have been prepared for the purpose of obtaining a Resource Consent only and for no other purpose. Use of this plan and/or information on it for any other purpose is at the user's risk.

0 40 200 400m

Bar Scale 1:4000 @ A3

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www.tsurvey.co.nz
Registered Land Surveyors, Planners & Land Development Consultants

PROPOSED SUBDIVISION OF SECTIONS 54 & 55 BLK VII HOKIANGA SD

WAIOTEMARAMA GORGE ROAD, OMAPERE

PREPARED FOR: BILL

	Name	Date
Survey		
Design		
Drawn	KY	17.08.21
Approved		
Rev	SL/KY	03.12.24

ORIGINAL
SCALE 1:4000
SHEET SIZE A3

10085 Scheme 20241203 Scheme

Surveyors Ref. No: 10085

Sheet 1 of 1

Appendix 2

RC 2240376-RMASUB

Far North District Council

DECISION ON SUBDIVISION CONSENT APPLICATION UNDER THE RESOURCE MANAGEMENT ACT 1991

Decision

Pursuant to section 34(1) and sections 104, 104B 106, 108 and Part 2 of the Resource Management Act 1991 (the Act), the Far North District Council **grants** subdivision resource consent for a Discretionary activity, subject to the conditions listed below to:

Applicant:	Jason And Penelope Bill Family Trustees Limited
Council Reference:	2240376-RMASUB
Property Address:	546 Waiotemarama Gorge Road, Opononi
Legal Description:	Section 54-55 Block VII Hokianga Survey District (RT: NA75B/84)

The activity to which this consent relates is:

Activity A:
To subdivide in the Rural Production Zone creating two additional Lots.

Activity B:
To establish vehicle crossings off Lots 1 and 2, breaching the Vehicle Access rule.

Conditions

Pursuant to sections 108 and 220 of the Act, this consent is granted subject to the following conditions:

1. The subdivision shall be carried out in accordance with the approved plan of subdivision prepared by Thomson Survey, referenced "*PROPOSED SUBDIVISION OF SECTIONS 54 & 55 BLK VII HOKIANGA SD*", revised 17/05/2023, surveyors reference number 10085, and attached to this consent with the Council's "Approved Stamp" affixed to it.

Survey plan approval (s223) conditions

2. Prior to the approval of the survey plan pursuant to Section 223 of the Act the consent holder must:

    a. Submit for approval pursuant to Section 223 of the Act a survey plan showing:

        i. Bush Protection Covenant A and B

        ii. For any water bodies identified as qualifying water bodies to which esplanade provisions will apply (average width over 3m), an esplanade strip of 20 metres width.

        iii. The bed of the river that is required by Section 237A of the RMA to be shown on the survey plan, shall vest in the Crown pursuant to Section 239 of the Act.

b. The endorsement of the following conditional amalgamation, pursuant to Section 220(1)(b)(iii) of the Resource Management Act 1991;

That Lots 3 and 4 hereon be amalgamated and held in the one record of title.
See Request # 1900608

Section 224(c) compliance conditions

3. Prior to the issuing of a certificate pursuant to section 224(c) of the Act, the consent holder shall:

a. Upgrade the existing vehicle crossing serving Lots 1 and 2. The construction of the vehicle crossing must be in accordance with FNDC Engineering Standard 2023 Sheet 21/22 Type 1A crossing for a single lot in the new standards. It must include water table drains and culverts as required to direct and control stormwater runoff.

4. Secure the conditions below by way of a Consent Notice issued under section 221 of the Act, to be registered against the titles of the affected allotment. The costs of preparing, checking and executing the Notice shall be met by the consent holder:

a. The Lot is identified as being within a kiwi present zone. Any cats and/or dogs kept onsite must be kept inside and/or tied up at night to reduce the risk of predation of North Island brown kiwi by domestic cats and dogs.

[Lots 1 - 4]

b. No building that would require a building consent shall be erected or relocated onto the lot without the prior approval of the Council to specific designs for foundations, prepared by a Chartered Professional Engineer (CPEng) with geotechnical expertise.

[Lot 3]

c. At the time of lodging an application for building consent for a residential dwelling, the building applicant is to provide a report from a Chartered Professional Engineer with recognised competence in relevant geotechnical and structural matters, which addresses specific design of the building's foundations and references the report prepared by Geologix Consulting Engineers, referenced C0021-S-03, Site Suitability Engineering Report for J & P Bill Family Trust, Revision 1, and dated March 2024.

[Lots1 & 2]

d. In conjunction with the construction of any habitable buildings and other associated impermeable surfaces, the lot owner must install a stormwater retention tank/s with a flow-attenuated outlet/s, or other means of attenuation. The system must be designed such that the total stormwater discharged from the site, after development, is no greater than the predevelopment flow from the site for rainfall events up to a 10% AEP plus allowance for climate change, with overland/secondary flow paths able to accommodate a 1% AEP event. In regard to Lots 1 & 2, the stormwater management design shall reference the report by

Geologix Consulting Engineers, referenced C0021-S-03, Site Suitability Engineering Report for J & P Bill Family Trust, and dated March 2024.

[Lots 1-4]

e. In conjunction with the construction of any dwelling, and in addition to a potable water supply, a water collection system with sufficient supply for firefighting purposes is to be provided by way of a tank or other approved means and to be positioned so that it is safely accessible for this purpose. These provisions must be in accordance with the New Zealand Fire Fighting Water Supply Code of Practice SNZ PAS 4509.

[Lots 1-4]

f. In conjunction with the construction of any building that includes a wastewater treatment & effluent disposal system, the applicant must submit for Council approval a TP58 Report prepared by a Chartered Professional Engineer or an approved TP58 Report Writer. The report must identify a suitable method of wastewater treatment for the proposed development along with an identified effluent disposal area plus a 100% reserve disposal area. The report must confirm that all of the treatment & disposal systems can be fully contained within the lot boundary and comply with the Regional Plan Permitted Activity Standards. In regard to Lots 1 & 2, the wastewater treatment and effluent disposal system report shall make reference to the findings and recommendations in the report by Geologix Consulting Engineers, referenced C0021-S-03, Site Suitability Engineering Report for J & P Bill Family Trust, and dated March 2024.

[Lots 1-4]

g. The owner shall preserve the indigenous trees and bush, as indicated on the survey plan as areas A & B, and shall not without the prior written consent of the Council and then only in strict compliance with any conditions imposed by the Council, cut down, damage or destroy any of such trees or bush. The owner shall be deemed to be not in breach of this prohibition if any of such trees or bush shall die from natural causes not attributable to any act or default by or on behalf of the owner or for which the owner is responsible.

[Lots 3 & 4]

h. The construction of vehicle crossings was not a requirement of subdivision consent in regard to land in Lots 3 & 4. Prior to constructing any residential vehicle access point to any site, the lot owner must obtain a permit from the Council as to the siting (from a traffic safety point-of-view), earthworks, formation and drainage of such access in terms of the Council's Control of Vehicle Crossings Bylaw 2021. The formation works must be completed to the satisfaction of the Council's Roading Corridor Co-Ordinator or delegated representative prior to the Code Compliance Certificate being issued by Council for any new building.

[Lots 3 & 4]

i. Reticulated power supply or telecommunication services are not a requirement of this subdivision consent. The responsibility for providing both power supply and telecommunication services will remain the responsibility of the property owner.

[Lots 1-4]

Advice Notes

Lapsing of Consent

1. Pursuant to section 125 of the Act, this resource consent will lapse 5 years after the date of commencement of consent unless, before the consent lapses;
   a) A survey plan is submitted to Council for approval under section 223 of the RMA before the lapse date, and that plan is deposited within three years of the date of approval of the survey plan in accordance with section 224(h) of the RMA; or
   b) An application is made to the Council to extend the period of consent, and the council decides to grant an extension after taking into account the statutory considerations, set out in section 125(1)(b) of the Act.

Right of Objection

2. If you are dissatisfied with the decision or any part of it, you have the right (pursuant to section 357A of the Act) to object to the decision. The objection must be in writing, stating reasons for the objection and must be received by Council within 15 working days of the receipt of this decision.

Archaeological Sites

3. Archaeological sites are protected pursuant to the Heritage New Zealand Pouhere Taonga Act 2014. It is an offence, pursuant to the Act, to modify, damage or destroy an archaeological site without an archaeological authority issued pursuant to that Act. Should any site be inadvertently uncovered, the procedure is that work should cease, with the Trust and local iwi consulted immediately. The New Zealand Police should also be consulted if the discovery includes koiwi (human remains). A copy of Heritage New Zealand's Archaeological Discovery Protocol (ADP) is attached for your information. This should be made available to all person(s) working on site.

General Advice Notes

4. This consent has been granted on the basis of all the documents and information provided by the consent holder, demonstrating that the new lot(s) can be appropriately serviced (infrastructure and access).

5. The site is adjacent to an unsealed road. Unsealed roads have been shown to create a dust nuisance from vehicle usage. It is advised that the dwelling is either located as far as possible or at least 80m from the road, and/or boundary planting within the site is utilised to assist with this nuisance. Alternatively, the applicant may consider sealing their road frontage to remove the issue.

6. The consent holder is advised that TP58 Reports must be prepared by a person who is on a list of approved TP58 writers maintained by Far North District Council. Persons on the approved list must be either a Chartered Professional Engineer or a Registered Drainlayer who has attended and passed a TP 58 writers course approved by Far North District Council.

Reasons for the Decision

1. By way of an earlier report that is contained within the electronic file of this consent, it was determined that pursuant to sections 95A and 95B of the Act the proposed activity will not have, and is not likely to have, adverse effects on the environment that are more than minor, there are also no affected persons, and no special circumstances exist. Therefore, under delegated authority, it was determined that the application be processed without notification.

2. The application is for a Discretionary activity resource consent as such under section 104 the Council can consider all relevant matters. In particular the matters listed in section 13.10 of the Operative District Plan are of particular relevance.

section 9(3) – Land use

Rule Number and Name	Non Compliance Aspect	Activity Status
15.1.6C.1.5(a) Vehicle Crossing Standards in Rural and Coastal Zones	The proposed vehicle crossings off Lots 1 and 2 are unable to comply with the required sight distances for a road with an open posted speed. As the proposed vehicle crossings are not able comply with FNDC Engineering Standards, the proposal does not comply with (a).	Discretionary

section 11 – Subdivision

Rule Number and Name	Non Compliance Aspect	Activity Status
Table 13.7.2.1 Minimum Lot Sizes (viii) Rural Production Zone	The applicant proposes to subdivide, creating two additional lots - Lots 1 and 2. Proposed Lots 3 and 4 are to be amalgamated. Overall, the proposal is to create three new titles, compliant with the requirements of Restricted Discretionary activity classification (the parent title is dated 1989).	Restricted Discretionary

3. In regard to section 104(1)(a) of the Act the actual and potential effects of the proposal will be acceptable as:
   a. The allotment sizes and dimensions are compatible with the surrounding area
   b. The site is not prone to coastal or flood hazards.
   c. Although certain areas are identified by the Northland Regional Council as 'erosion prone', these areas do not fall within the boundaries of Lots 1 & 2, which are intended for residential/lifestyle development. Given that the amalgamated Lots 3 and 4 are 23.8ha in area, it is considered that there is abundant scope for a house site somewhere within that area.
   d. Adequate water supply can be provided through roof runoff collection.
   e. Appropriate stormwater management is achievable for all lots.
   f. Sanitary sewage disposal can be accommodated on each new lot.
   g. Energy supply and telecommunications are not required for rural subdivisions
   h. No easements are needed as each lot will have individual access
   i. Earthworks will be minor and follow erosion/sediment control guidelines
   j. Suitable building locations are available on the new lots

k. No heritage, vegetation, or landscape features are affected in such a way that it is more than minor.
l. The proposal does not impact highly productive soils
m. Land use is compatible with the surrounding rural and bush setting
n. The proposal is not near airports or within the coastal environment
o. The subdivision aligns with the low-density character of the area
p. Protected natural areas will be preserved through bush covenants
q. Potential impacts on kiwi habitat appear to be addressed
r. Lots 1 and 2 entrances will have suitable sightlines.

4. In regard to section 104(1)(ab) of the Act there are no offsetting or environmental compensation measures proposed or agreed to by the applicant for the activity.

5. The applicant agreed in principle to the draft conditions as adopted above.

6. In regard to section 104(1)(b) of the Act the following statutory documents are considered to be relevant to the application:
a. Operative Far North District Plan 2009,
b. Proposed Far North District Plan 2022

Operative Far North District Plan (ODP):

Subdivision:

Overall, the activity meets the Objectives and Policies of the Subdivision chapter of the Operative District Plan, as assessed below:

Objectives	Assessment
13.3.1	The subdivision aligns with sustainable management principles by maintaining the productive potential of the land. Further, the subdivision design ensures that each lot is still capable of supporting small-scale production activities in a rural setting, alongside residential development on each lot. As such, the activity is in line with this Objective.
13.3.2	The subdivision will not be affecting the life-supporting capacity of air, water, soil or ecosystems as the subdivision will be sustainably managed. The Site Suitability report attached with the application confirms that hazard risks for future development within the lots, with erosion overland flow paths, proposed flooding, and landslip identified as having less than minor effects and requiring no mitigation. Further, all earthworks will be conducted in accordance with the Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05). As such, the activity is in line with this Objective.
13.3.3	Lot 4 contains a minor portion of Outstanding Landscapes along its northeastern corner. However, this area is already under bush protection covenant. The site is not within the coastal environment. As such, the activity is in line with this Objective.
13.3.4	Not applicable as the site does not contain any scheduled heritage resources.
13.3.5	The activity includes measures for stormwater disposal, on-site wastewater management and potable water from on-site rainwater

	harvesting for each of the lots, as such, meeting this Objective.
13.3.6	Not applicable as this application is not for a development plan or integrated management.
13.3.7	The site is not within any Māori ancestral lands or sites. Further, there are no major earthworks, nor any indigenous vegetation clearance proposed. As such, the activity is in line with this Objective.
13.3.8	Power and telecommunication systems are not a requirement for rural subdivisions. This consent includes Council's standard consent notice wording regarding the provision of these systems, ensuring that future lot owners are responsible for their installation.
13.3.9	Future owners can choose to utilise renewable energy sources such as solar panels if they so wish.
13.3.10	The subdivision design includes provisions for property access, water supply, and stormwater disposal, ensuring the efficient and effective functioning of infrastructure. As such, the activity is in line with this Objective.
13.3.11	Not applicable as the application site is not within National Grid.
Policies	**Assessment**
13.4.1	No cumulative effects are anticipated on the matters listed within this Objective for the reasons discussed above. As such, the activity is in line with this Policy.
13.4.2	Safe and effective vehicular access for each lot will be provided for. As such, the activity is in line with this Policy.
13.4.3	The Site Suitability report attached with the application confirms that hazard risks for future development within the lots, with erosion overland flow paths, proposed flooding, and landslip identified as having less than minor effects and requiring no mitigation. As such, the activity is in line with this Policy.
13.4.4	Power and telecommunication systems are not a requirement for rural subdivisions. The proposal includes standard consent notice wording regarding the provision of these systems, ensuring that future lot owners are responsible for their installation.
13.4.5	Safe and effective vehicular access for each lot will be provided for. As such, the activity is in line with this Policy.
13.4.6	The activity includes bush protection on areas of the subject site Further, a condition has been imposed that requires any cats and/or dogs kept onsite will be kept inside and/or tied up at night to reduce the risk of predation of North Island brown kiwi by domestic cats and dogs. As such, significant ecological areas will be protected. As such, the activity is in line with this Policy.
13.4.7	No financial contribution is required as the activity does not include non-residential activities. An esplanade strip will be required for rivers and

	streams with 3m width or more, as identified in Condition 2(a)(i) above.
13.4.8	The subdivision design includes the provision water supply. As such, the activity is in line with this Policy.
13.4.9	Lot 4 contains a minor portion of Outstanding Landscapes along its northeastern corner. However, this area is already under bush protection covenant. Additionally, significant ecological areas will be protected, as discussed in 13.4.6 above. As such, the activity is in line with this Policy.
13.4.10	The site is not within the Conservation Zone.
13.4.11	As 13.3.7 above. The activity is in line with this Policy.
13.4.12	Not applicable as the application is not for a management plan.
13.4.13	No Section 6 matters are of particular relevance to the proposal. In addressing the techniques listed in this Policy: **a)** The activity is generally in line with this aspect. Lots 1 and 2 are situated between existing residential uses to the north and south, which could be seen as clustering development in an area of least impact on natural character. **b)** Given that Lots 1 and 2 are large (2.72ha and 1.52ha) and can accommodate 30m x 30m building envelopes, it is envisaged that that visual impacts can be minimised. The rural and bush setting also helps to mitigate visual impacts. Further, the site is not within the coastal marine area. The house sites can only be momentarily seen as road users pass by the property on the gravel road. **c)** This is not applicable as the site is not coastal. Additionally, An esplanade strip will be required for rivers and streams with 3m width or more, as identified in Condition 2(a)(i) above. **d)** There are no known sites of significance to Māori associated with the site. **e)** The proposal includes protection of existing bush areas through covenants, which aligns with this policy. **f)** The site does not contain any scheduled heritage resources, so this aspect is not directly applicable. **g)** The activity includes stormwater management plans designed to meet District and Regional Plan standards, with future impermeable surfaces to be attenuated to 80% of pre-development peak run-off. This suggests an effort towards hydraulic neutrality. The Site Suitability Engineering Report also assessed various natural hazards, finding most to have less than

	minor effects requiring no mitigation. As such, the activity meets this Policy.
13.4.14	The Objectives and Policies of the Rural Production Zone have been taken into account when considering the design/layout of this proposed subdivision.
13.4.15	No specific conditions are necessary to be imposed by Council regarding the matters listed in this Policy.
13.4.16	Not applicable as the application site is not within the National Grid Corridor.

The activity aligns with the Subdivision Objectives and Policies of the Operative District Plan. It promotes sustainable management of natural and physical resources while enabling social and economic well-being. The subdivision maintains rural character, provides for adequate on-site servicing, and protects areas of indigenous vegetation through covenants. It considers natural hazards and provides safe access. The proposal is consistent with policies regarding allotment sizes, infrastructure provision, and environmental protection. While some objectives and policies are not directly relevant (e.g., those related to heritage resources or coastal environments), overall, the activity demonstrates alignment with this chapter.

Transportation:

Overall, the activity meets the Objectives and Policies of the Transportation chapter of the Operative District Plan, as assessed below:

Objectives	Assessment
15.1.3.1	The proposal meets this Objective. It minimises adverse effects of traffic on the environment by utilising the existing Waiotemarama Gorge Road and providing only two new access points for the two new lots. The assessment confirms that these access points have adequate sight lines based on the operating speeds, minimising safety risks and potential traffic disruptions.
15.1.3.2	This Objective is not applicable to the proposal. The site is not a tourist destination, and the subdivision is for rural residential purposes.
15.1.3.3	While specific parking details aren't provided, the large sizes of Lots 1 and 2 for residential development (2.72ha and 1.52ha) will easily accommodate on-site parking for residential use.
15.1.3.4	This Objective relates to commercial activities, which the lots are not intended for. However, it is envisaged that the large lot sizes should provide ample space for appropriate loading and access for residential activities.
15.1.3.5	The activity can provide for safe vehicular movement by ensuring adequate sight lines for the new access points. There are no anticipated impacts on cycle, pedestrian traffic or people with disabilities as the subject site is not within an urban environment that benefits from

	footpaths and cycle lanes.
Policies	**Assessment**
15.1.4.1	Traffic effects have been evaluated as part of the application, particularly regarding sight lines and access points. The assessment includes consideration of the road's operating speed and the adequacy of sight distances. As such, the activity meets this policy.
15.1.4.2	The large lot sizes allow for parking to be accommodated without significant impact on the natural environment. The proposal also includes protection of bush areas through covenants, demonstrating recognition of natural features. As such, the activity meets this policy.
15.1.4.3	Parking will be provided within the large rural lots, which should enable efficient use and handling of traffic generation. The access points onto Waiotemarama Gorge Road have been assessed for safety and suitability. As such, the activity meets this policy.
15.1.4.4	This policy is not applicable to the activity. There are no existing parking spaces that need to be retained or replaced.
15.1.4.5	This policy is not directly applicable to the activity. The subdivision is for residential purposes, not commercial or industrial activities that would require specific loading spaces.
15.1.4.6	The access points for both lots have been regulated and assessed for safety. Sight lines have been evaluated and deemed adequate for the road's operating speed. As such, the activity meets this policy.
15.1.4.7	Same as assessment in 15.1.3.5 above. The activity meets this policy.
15.1.4.8	This policy is not applicable to the activity as there is no indication that alternative options for meeting parking requirements are necessary due to the large lot sizes providing ample space for parking.

In summary, the activity aligns with the applicable Transportation Objectives and Policies. It minimises adverse effects on the environment by utilising existing roads and providing only two new access points with adequate sight lines. The large lot sizes can easily accommodate on-site parking and loading for residential use without impacting natural features. Traffic effects, including sight lines and access safety, have been evaluated considering the road's operating speed. The proposal meets policies related to traffic safety, efficient use of parking spaces, and protection of natural features. Overall, the proposal demonstrates compliance with this chapter.

Proposed Far North District Plan (PDP):

Subdivision:

Overall, the activity meets the Objectives and Policies of the Subdivision chapter of the Proposed District Plan, as assessed below:

Objectives	Assessment
SUB-O1	The activity achieves the objectives of the Rural Production zone, overlays and district wide provisions.

SUB-O2	The site does not contain highly productive land under the PDP. It also does not contain any Outstanding Natural Features, Outstanding Natural Landscapes, Areas of High Natural Character, Outstanding Natural Character, Significant Natural Areas, Sites and Areas of Significance to Māori, nor is it known to have Natural Character of the Coastal Environment. As required by Condition 2(a)(i) above, an esplanade strip will be required for rivers and streams with 3m width or more. As such, the subdivision of the land will meet this Objective.
SUB-O3	Adequate on-site infrastructure can be provided, as identified in the site suitability report attached to the application.
SUB-O4	The activity provides for potential esplanade provision of the Pakanae Stream qualifies, to be determined at the s223 stage. As such, the activity will meet this Objective.
Policies	**Assessment**
SUB-P1	No boundary adjustment is proposed.
SUB-P2	The activity is not a subdivision for the purpose of public works, infrastructure, or access. Provision of esplanade strip will be determined at the s223 stage if the Pakanae Stream qualifies. As such, the activity will meet this Policy.
SUB-P3	The allotments are consistent with rural character and have adequate size for building platforms with legal and physical access. Although the activity will not comply with the minimum lot size for the Rural Production zone in the Proposed District Plan, it is not yet applicable is it does not have immediate legal effect.
SUB-P4	The activity considers district-wide matters, natural environment values (through bush covenants), and natural hazards as detailed in the site suitability report.
SUB-P5	Not applicable as the site is not within the General Residential, Mixed Use and Settlement zones. As such, this Policy is not relevant.
SUB-P6	The new allotments are capable of being appropriately serviced by onsite infrastructure. As such, the activity will meet this Policy.
SUB-P7	The activity allows for esplanade provision if the Pakanae Stream qualifies, to be determined at the s223 stage.
SUB-P8	The activity involves the creation of rural lifestyle allotments. As such, the subdivision of the land will result in the activity not meeting this Policy.
SUB-P9	The activity involves the creation of rural lifestyle allotments. As such, the subdivision of the land will result in the activity not meeting this Policy.
SUB-P10	Not applicable as the subdivided lots do not include any minor residential units.

SUB-P11	Taking into account the assessment above, the activity is consistent with this Policy. The subdivision considers scale and character of the environment, infrastructure capacity, natural hazards, and effects on natural values. Additionally, the subject site does not contain Sites and Areas of Significance to Māori.

In summary, the activity largely aligns with the Objectives and Policies of the Subdivision chapter. It adequately addresses infrastructure needs, environmental considerations, and maintains rural character. The site lacks highly productive land or significant natural areas as defined in the PDP. The activity allows for potential esplanade provision and considers district-wide matters, natural environment values, and natural hazards. However, it falls short in meeting policies SUB-P8 and SUB-P9, which aim to avoid rural lifestyle subdivisions in this zone. These non-compliances primarily stem from creating rural lifestyle allotments in the Rural Production zone, which the PDP discourages.

For this resource consent application, the relevant provisions of both an operative and any proposed plan must be considered. Weighting is relevant if different outcomes arise from assessments of objectives and policies under both the operative and proposed plans.

As assessed above the outcomes sought are different under the operative and proposed plan frameworks. Therefore, it is necessary to consider the weight to be given to each framework and which outcome should prevail. In this instance, as the PDP does not yet have full legal effect, the significance of these non-compliances is somewhat mitigated. As such despite the different outcomes anticipated by the PDP little weight is given to these provisions.

7. In regard to section 104(1)(c) of the Act there are no other matters relevant and reasonably necessary to determine the application.

8. In terms of s106 of the RMA the proposal is not considered to give rise to a significant risk from natural hazards, and sufficient provision has been made for legal and physical access to the proposed allotments. Accordingly, council is able to grant this subdivision consent subject to the conditions above.

9. Based on the assessment above the activity will be consistent with Part 2 of the Act. The activity will avoid, remedy or mitigate any potential adverse effects on the environment while providing for the sustainable management of natural and physical resources and is therefore in keeping with the Purpose and Principles of the Act. A There are no matters under section 6 that are relevant to the application. While there is a breach in vehicle access rule, the vehicle access for Lots 1 and 2 have suitable sightlines and Council's Roading team have no further concerns regarding sightlines. In addition, the activity is an efficient use and development of the site that will maintain existing amenity values without compromising the quality of the environment. The activity is not considered to raise any issues in regard to Te Tiriti o Waitangi.

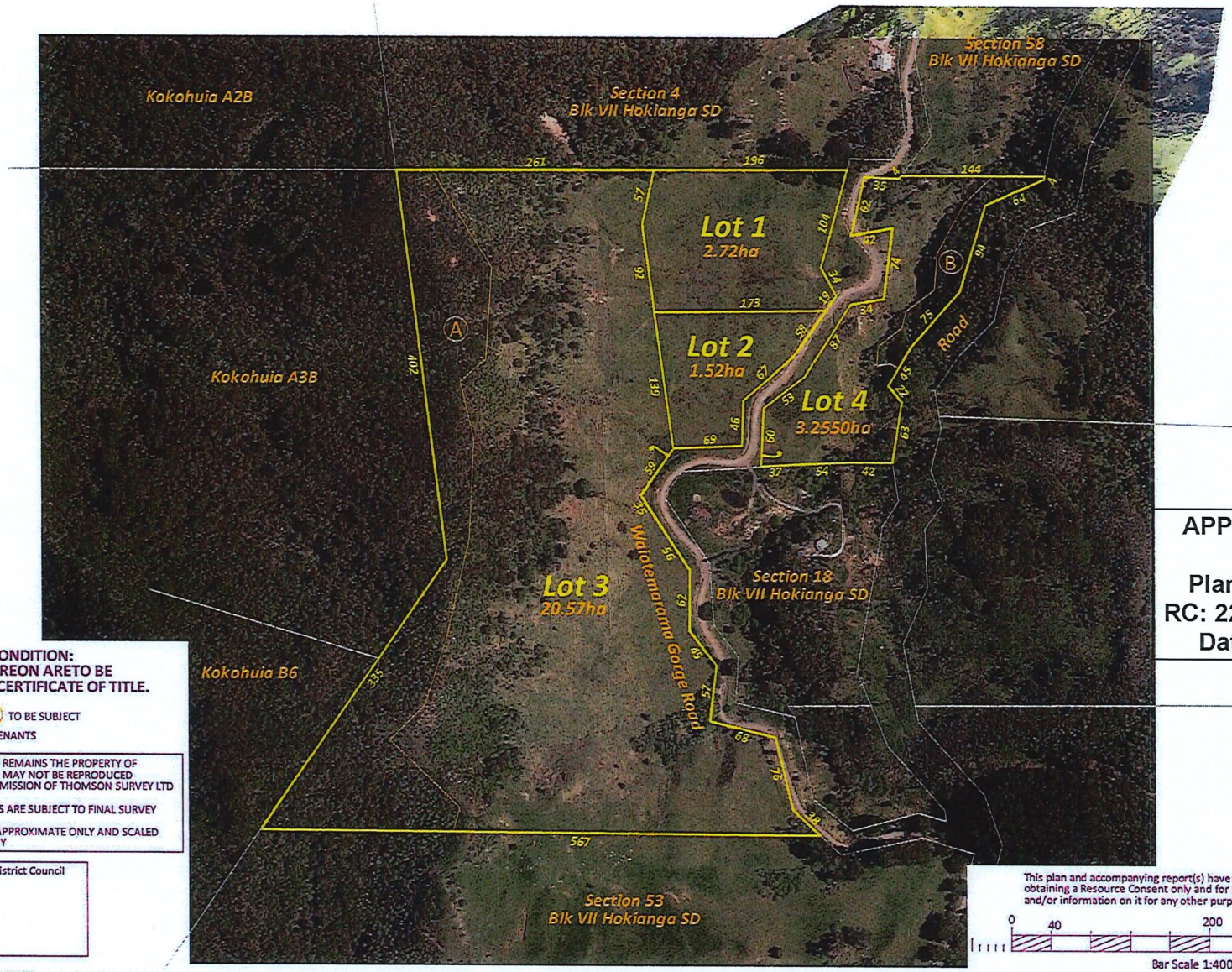
10. Overall, for the reasons above it is appropriate for consent to be granted subject to the imposed conditions.

Approval

This resource consent has been prepared by Gio Alagao, Resource Planner. I have reviewed this and the associated information (including the application and electronic file material) and for the reasons and subject to the conditions above, and under delegated authority, grant this resource consent.

Nick Williamson **Date:** 27/08/2024

Team Leader Resource Consents



APPROVED PLAN

Planner: GAlagao
RC: 2240376-RMASUB
Date: 27/08/2024

AMALGAMATION CONDITION:
THAT LOTS 3 & 4 HEREON ARETO BE HELD IN THE SAME CERTIFICATE OF TITLE.

AREAS MARKED (A) (B) TO BE SUBJECT TO BUSH PROTECTION COVENANTS

AREAS AND MEASUREMENTS ARE SUBJECT TO FINAL SURVEY

TOPOGRAPHICAL DETAIL IS APPROXIMATE ONLY AND SCALED FROM AERIAL PHOTOGRAPHY

Local Authority:	Far North District Council
Comprised in:	NA75B/84
Total Area:	28.0650ha
Zoning:	Rural Production
Resource features:	NIL

0 40 200 400m

Bar Scale 1:4000 @ A3

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Registered Land Surveyors, Planners & Land Development Consultants

PROPOSED SUBDIVISION OF SECTIONS 54 & 55 BLK VII HOKIANGA SD

WAIOTEMARAMA GORGE ROAD, OMAPERE

PREPARED FOR: BILL

	Name	Date
Survey		
Design		
Drawn	KY	17.08.21
Approved		
Rev	KY	17.05.23

10085 Scheme 20230517

ORIGINAL
SCALE 1:4000
SHEET SIZE A3

Surveyors Ref. No: 10085

Sheet 1 of 1

Appendix 3

Record of Title & relevant instruments

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**NA75B/84**
Land Registration District	**North Auckland**
Date Issued	03 February 1989

Prior References
NAPR79/35

Estate	Fee Simple
Area	28.0650 hectares more or less
Legal Description	Section 54-55 Block VII Hokianga Survey District

Registered Owners
Jason and Penelope Bill Family Trustees Limited

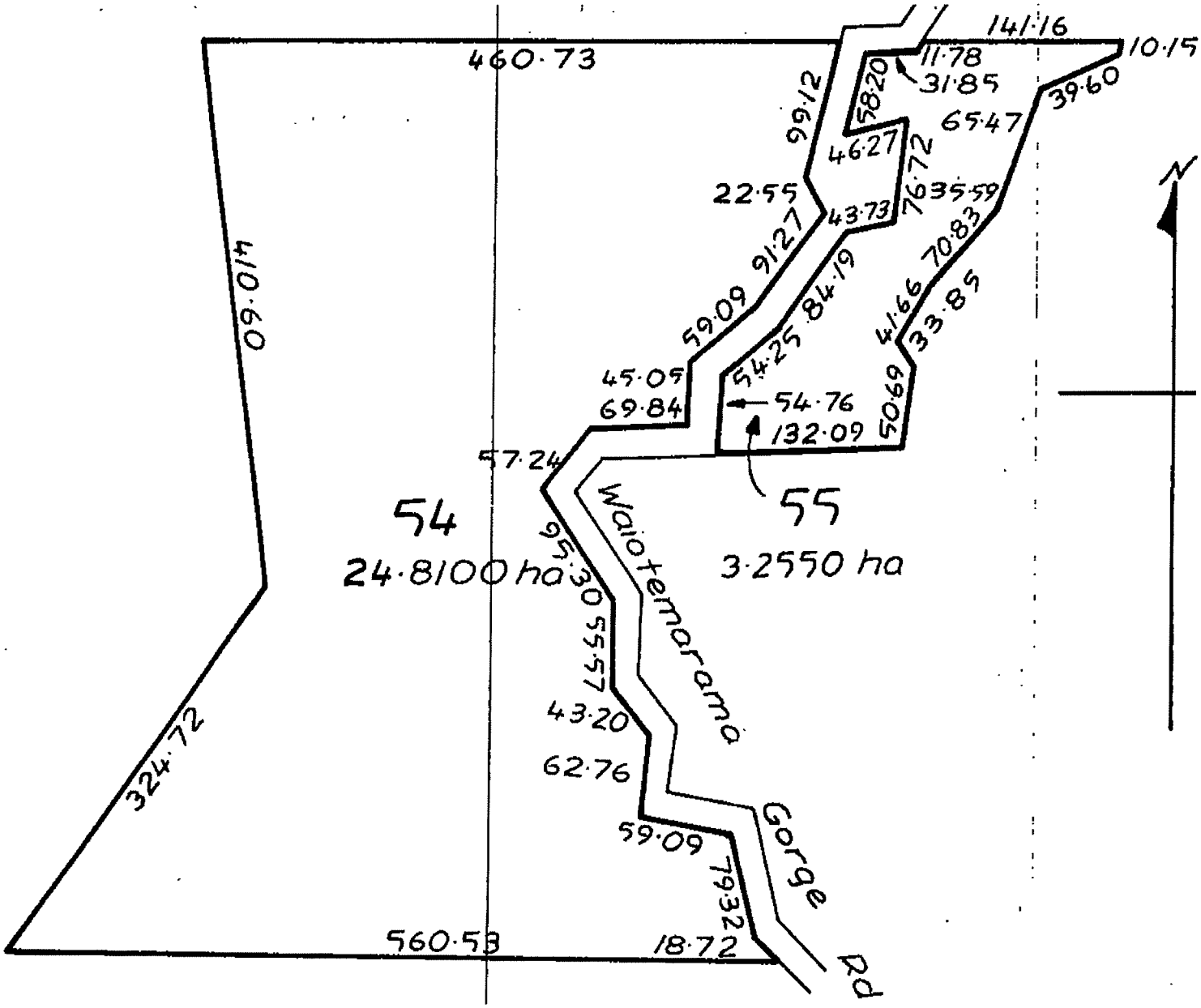
Interests

Subject to Section 8 Mining Act 1971

Subject to Section 5 Coal Mines Act 1979

12119664.5 Mortgage to ASB Bank Limited - 2.6.2021 at 2:09 pm

12472524.1 Lease Term From 27.5.2022 to 30.6.2039 Record of Title 1076634 issued - 15.6.2022 at 7:11 am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Gorge
Rd
95·30
55·57
43·20
62·76
59·09
79·32
18·72
560·53
324·72
N

Appendix 4

Site Suitability Engineering Report

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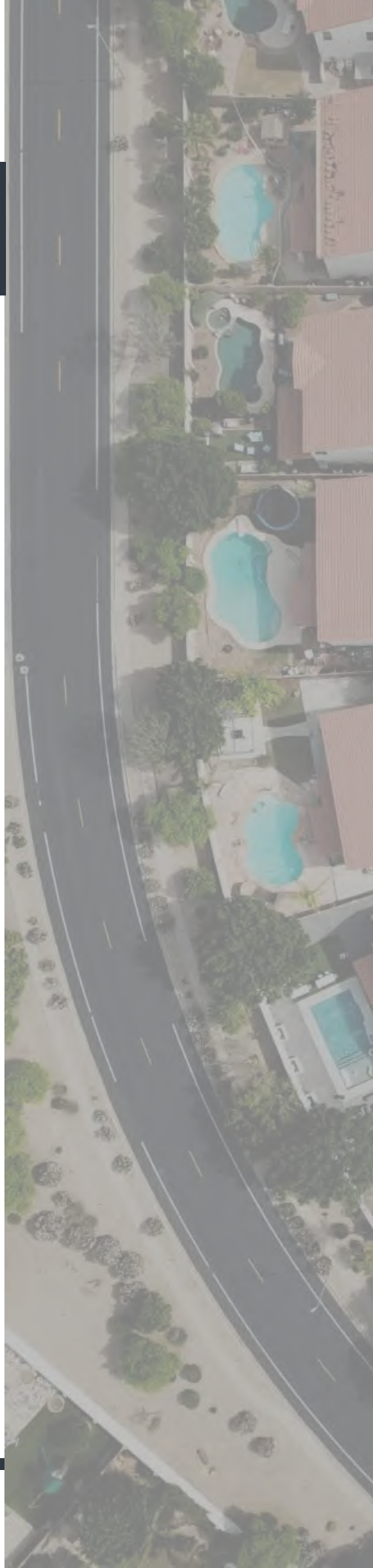
SITE SUITABILITY ENGINEERING REPORT

LAND OFF WAIOTEMARAMA GORGE ROAD, OMAPERE (SECTION 54 BLK VII HOKIANGA SD & SECTION 55 BLK VII HOKIANGA SD)

J & P BILL FAMILY TRUST

C0021-S-04
APRIL 2025
REVISION 1



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DOCUMENT MANAGEMENT

Document Title	Site Suitability Engineering Report
Site Reference	Land off Waiotemarama Gorge Road, Omapere
Client	J & P Bill Family Trust
Geologix Reference	C0021-S-04
Issue Date	17 April 2025
Revision	04
Prepared by (Geotechnical)	Luke Williams Intermediate Geotechnical Engineer, BEngTech (Civil). NZDipEng (Civil). MEngNZ
Prepared by (Civil)	Gerard Mchardy Civil Design Engineer
Reviewed by	Andre Whyte Principal Geotechnical Engineer, CPEng. CMEngNZ
Approved by	Edward Collings Managing Director, CEnvP, CPEng. CMEngNZ, MPhys (Hons)
File Reference	Z:\Geologix Files\Projects\C0000-C0099\Waiotemarama Gorge Road, Opononi - C0021\06 - Reports\Suitability Report for Thomson Survey\Newest report - With HA13 - HA17\C0021-S-04-R01.docx

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REVISION HISTORY

Date	Issue	Prepared	Reviewed	Approved
October 2023	First Issue	EC	GM	EC
January 2024	Second Issue	GC, RL	EC	EC
March 2024	Third Issue - Following comments	GC, RL	EC	EC
April 2025	Fourth Issue – Revised building platforms	LW, GM	AW	EC

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1 INTRODUCTION

This Site Suitability Engineering Report has been prepared by Geologix Consulting Engineers Ltd (Geologix) for J & P Bill Family Trust as our Client in accordance with our standard short form agreement and general terms and conditions of engagement.

Our scope of works has been undertaken to assist with Resource Consent application in relation to the proposed subdivision and amalgamation of rural properties off Waiotemarama Gorge Road, Omapere, legally described as Section 54 Blk VII Hokianga SD & Section 55 Blk VII Hokianga SD, the 'site'. Specifically, this assessment addresses engineering elements of natural hazards, geotechnical, wastewater and stormwater requirements to provide safe and stable building platforms with less than minor effects on the environment as a result of the proposed activities outlined below.

We have previously provided the following reports for the other proposed lots from the initial proposed subdivision:

- Site Suitability Engineering Report, Land Off Waiotemarama Gorge Road, Omapere (SECTION 20 BLK VII HOKIANGA SD), dated October 2023, Rev 1, Ref No. C0021-S-02.
- Wastewater Site Suitability Engineering Report, Six Sites Along Waiotemarama Gorge Road, Omapere, dated October 2021, Rev 1, Ref No. C0021-S-01-R01.

1.1 Proposal

A proposed scheme plan was presented to Geologix at the time of writing, prepared by Thomson Survey Ltd[1] and reproduced as Drawing No. 100 within Appendix A. It is understood the Client proposes to subdivide the site to create two new rural residential lots and amalgamate the existing lot and the balance lot into one certificate of title as outlined in Table 1. Amendments to the referenced scheme plan may require an update to the recommendations of this report which are based on conservative, typical rural residential development concepts.

Table 1: Summary of Proposed Scheme

Proposed Lots	Size Range	Purpose
1	1.53 ha	New residential
2	0.88 ha	New residential
3	3.2550 ha	Amalgamation of balance lot and existing lot
4	22.40 ha	Amalgamation of balance lot and existing lot

[1] *Thomson Survey Ltd, Scheme Plan, Ref. 10085, dated 03.12.24.*

Sites can be accessed from Waiotemarama Gorge Road. A specific traffic engineering assessment is outside the scope of this report.

2 DESKTOP APPRAISAL

The sites are located to the east of Omapere Township, formed over two different parent titles legally described as Section 54 Block VII Hokianga SD, covering 24.81 ha and Section 55 Block VII Hokianga SD, covering 3.255 ha. The sites are mostly utilised as rural pasture and dense bush with no existing structures.

The proposed residential Lot 1 and Lot 2 subject to this assessment, which eastern boundaries roughly follow Waiotemarama Gorge Road. The western boundary of proposed Lot 1 and Lot 2, adjoins the proposed balance lot, Lot 3, which raises steeply over a 100 to 200m high hill slope, between approximately to 18° to 45°. The ground at the proposed Lot 1 and Lot 2 building platforms slopes gently to moderately up to the west between approximately 10° to 15°.

In the surrounding local area, similar large rural residential and farming properties occupy the landscape with occasional single dwelling developments.

2.1 Existing Reticulated Networks

Far North District Council (FNDC) GIS mapping[2] indicates that no existing 3 water infrastructure or reticulated networks are present within Waiotemarama Gorge Road at this location or the site boundaries. This report has been prepared with the goal of the subdivision being self-sufficient for the purpose of wastewater, stormwater, and potable water management.

2.2 Geological Setting

Available geological mapping[3] undifferentiated Tangihua Complex geology of the Northland Allochthon Formation parent rock. The Northland Allochthon parent rock is described as mainly basalt pillow lava, with subvolcanic intrusives of basalt, dolerite, and gabbro. Greenschist metamorphism close to intrusives and with extensive zeolitisation. The strata is typical of the steep and hilly land terrain and is delineated on all sides by the Maungataniwha Thrust fault which has lifted the local hilly terrain through seismic activity.

Proposed building envelopes are expected to generally include northland allochthon residual soils which commonly include a relatively thin clayey soil mantle overlying mostly impermeable weathered parent rock resulting in the wetter surface horizon. Typically, these

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[2] *Source: FNDC Water Services GIS, https://fndc.maps.arcgis.com/apps/webappviewer/index.html?id=9b351ce681e34ec29443ae1a6468cc2c*

[3] *Geological & Nuclear Science, 1:250,000 scale Geological Map, Sheet 2, Whangarei, 2009.*

soils are known for poor drainage performance for wastewater disposal evident across the majority of proposed residential sites during our fieldworks.

2.3 Existing Geotechnical Information

Existing subdivision and/ or Building Consent ground investigations were not made available to Geologix at the time of writing. Additionally, a review of available GIS databases, including the New Zealand Geotechnical Database[4] (NZGD) did not indicate borehole records within 500 m of the site.

3 SURFACE WATER FEATURES AND OVERLAND FLOWPATHS

During our site walkover and desktop appraisal of the supplied topographic data, Geologix have developed an understanding of the surface water features and overland flow paths influencing the site. The developed understanding summarised in the following sections is shown schematically on Drawing No. 100 with associated off-set requirements. Surface Water Features.

Surface water features are detailed below. The CMA is not identified within 500 m of the property.

3.1 Springs

The local geology to the site is a complex metamorphosed unit and it is generally expected that most of the steep erosion gullies and overland flow paths source from springs within or close to the site boundaries.

3.2 Ponds

The walkover survey confirmed that there is a small farm pond within the boundary of proposed lot 2.

3.3 Rivers and Streams

In general, Waiotemarama Gorge Road follows a small valley containing the Pakanae Stream. Adjacent to the site the stream is contained within a steep sided erosion gully. The stream is attributed from the east and west by many small streams from the surrounding hills and flows to the north where it discharges to the Awapokanui Stream in the lower reaches of Waiotemarama Gorge Road.

3.4 Overland Flow Paths

From the available LiDAR survey, clearly defined overland flow paths are present within the site boundaries. Many overland flow paths are present across the sites with the proposed lots

[4] https://www.nzgd.org.nz/

formed upon flatter areas, spur ridgelines and higher ground delineated by surrounding overland flow paths. Overland flow paths are indicated on drawings within Appendix A and mitigated against, where applicable in our concept designs.

3.5 Sensitive Receptors

No evidence of sensitive receptors such as wetlands were recorded during our site walkover survey. However, this may require confirmation by a suitably qualified expert. The site is not located within 500 m of the CMA.

4 SITE WALKOVER SURVEY

Two walkover surveys were undertaken across lots 1 and 2, the first during our original site investigation on 26 – 27 September 2023, and the second after the building platform locations have been relocated on 17 February 2025. Our first visual walkover survey confirmed:

- Topography is in generally in accordance with that outlined in Section 2 and the available LiDAR dataset.
- Proposed Lots 1 and 2 are west of Waiotemarama Gorge Road and bound in all other directions by similar pasture and bush.
- Both lots were vegetated with short grass at the time of the investigation.
- Parts of Lot 1 and Lot 2 ground surfaces were sodden during our walkover survey undertaken in wintertime.
- No existing structures area present across the site, including retaining walls.

Our second site walkover survey on 17 February 2025 confirmed the following:

- There have been pine trees planted across the steep land to the west of the proposed lot boundaries. The addition of vegetation to the slope will increase the stability of the land as vegetation will lower the groundwater level in the area.
- There is a new boundary fence put in along the western boundary of both proposed lots.
- There is a new boundary fence in a west-east orientation between proposed lots 1 and 2.

5 GROUND INVESTIGATION

Site-specific walkover surveys and intrusive ground investigation was undertaken by Geologix between 26th and 27th September 2023 and on 17 February 2025 after relocation of the building platforms. The ground investigation was scoped to confirm the findings of the above information and to provide parameters for wastewater and geotechnical assessment. The ground investigation comprised:

- 11 hand augured boreholes designated HA07 and HA17 within Lot 1 and Lot 2, to depths ranging from 1.2m (target depth) and 4.3m (refusal depth).
- Dynamic Cone Penetrometer (DCP) or Scala tests were carried out at bases of hand augers to determine harder materials at depth down to 4.9m to 5.0m below existing ground level.
- On the day of each site investigation, groundwater was measured in our boreholes at the end of the day. Groundwater depths refer to investigation summary table below.

Arisings recovered from the exploratory boreholes were logged by a suitably qualified geotechnical engineering professional in general accordance with New Zealand Geotechnical Society guidelines[5]. Engineering borehole logs are presented as Appendix B to this report and approximate borehole positions recorded on Drawing No. 200 within Appendix A.

Strata identified during the ground investigation can be summarised as follows:

- **Topsoil to depths of 0.2 - 0.4 m bgl.** The overlying topsoil was described as a grassed topsoil comprising organic silt, dark brownish black and moist with low plasticity, with some traces of rootlets.
- **Northland Allochthon Residual Soil to depths to > 5.0 m bgl.** Under the topsoil layer, Northland Allochthon residual soils were present which comprised a mixed stratum of mostly clayey silt and silty clay, with minor mixtures of sand and occasional gravel. These residual soils are generally low in plasticity, with some areas of high plasticity. The Northland allochthon strata was a blend of colours including brown, orange, dark brown and grey. The soils were generally stiff to very stiff, grading to hard soils at depth.

  A total of sixty-six in-situ field vane tests recorded the Northland Allochthon residual soils at 53 kPa - 202+ kPa, indicative of a stiff to hard soil.

  Characteristic unit vane shear strength has been determined to be 140 kPa at 95% confidence throughout the entire Northland allochthon residual strata that was tested.

  DCP probing was undertaken in the base of the hand auger tests after dense strata was encountered which prevented further investigation. Generally, DCP testing confirmed 5 – 16 blows per 100mm to the termination of the DCP tests, confirming a medium dense – dense material. The DCP test undertaken at the base of HA13 confirmed 23 blows per 100mm before termination at 5.3 m bgl, confirming a very dense material.

A summary of ground investigation data is presented below as Table 2.

[5] *New Zealand Geotechnical Society, Field Description of Soil and Rock, 2005.*

Table 2: Summary of Ground Investigation

Hole ID	Lot	Hole Depth	Topsoil Depth	Refusal Depth	Ground water[6] Depth	Depth to Hard Residual Soil	Depth to CW Parent Rock[7]	Wastewater Category
HA07	1	4.9 m	0.3 m	1.75 m	1.5 m	1.8 m	NE	6 – slow draining
HA08	1	5.0 m	0.3 m	2.4 m	1.6 m	2.4 m	NE	6 – slow draining
HA09	1	5.0 m	0.3 m	2.1 m	0.2 m	2.1 m	NE	6 – slow draining
HA10	2	5.0 m	0.3 m	3.0 m	NE	3.7 m	NE	6 – slow draining
HA11	2	5.0 m	0.3 m	1.5 m	0.5 m	2.1 m	NE	6 – slow draining
HA12	2	5.0 m	0.5 m	2.1 m	NE	2.1 m	NE	6 – slow draining
HA13	1	5.3 m	0.3 m	2.4 m	NE	2.4 m	5.2 m	6 – slow draining
HA14	1	1.2 m	0.2 m	1.2 m	NE	NE	NE	6 – slow draining*
HA15	2	5.9 m	0.2 m	4.3 m	NE	3.3 m	NE	6 – slow draining
HA16	2	1.2 m	0.4 m	NE	NE	NE	NE	6 – slow draining*
HA17	2	1.2 m	0.2 m	NE	NE	NE	NE	6 – slow draining*

1. *All depths recorded in m bgl unless stated.*
2. *Groundwater measurements taken on day of drilling only.*
3. *NE – Not Encountered*
4. ** = Wastewater Boreholes*

6 GEOTECHNICAL ASSESSMENT

Geotechnical design parameters are presented in Table 3 below. They have been developed based on our ground investigation, the results of in-situ testing and experience with similar materials.

Table 3: Geotechnical Effective Stress Parameters

Geological Unit	Unit Weight, kN/m^3	Effective Friction Angle, °	Effective Cohesion, kPa	Undrained Shear Strength, kPa
Northland Allochthon Residual Soils (Stiff - Very Stiff)	18	28	5	84*
Northland Allochthon Hard Residual Soils	18	34	5	119*

** Adopting Bjerrum correction factor of 0.6 from characteristic vane shear strength.*

[6] *Groundwater measurements taken on day of drilling.*

[7] *Taken as 20+ blows per 100mm DCP penetration*

6.1 Seismic Hazard

New Zealand Standard NZS1170.5:2004 Clause 2.1.4 specifies that to meet the requirements of the New Zealand Building Code, design of structures is to allow for two earthquake scenarios:

1. *Ultimate Limit State (ULS) shall provide for… "avoidance of collapse of the structural system…or loss of support to parts… damage to non-structural systems necessary for emergency building evacuation that renders them inoperable".*

2. *Serviceability Limit State (SLS) are to avoid damage to… "the structure and non-structural components that would prevent the structure from being used as originally intended without repair after the SLS earthquake…".*

The seismic hazard in terms of Peak Ground Acceleration (PGA) has been assessed based on the NZGS Module 1[9].

Table 4 presents the return periods for earthquakes with ULS and SLS 'unweighted' PGAs and design earthquake loads for the corresponding magnitude. The PGAs were determined using building Importance Level (IL) 2, defined by NZS1170.5:2004. Reference should be made to the structural designer's assessment for the final determination of building importance level.

Table 4: Summary of Seismic Hazard Parameters

Limit State	Effective Magnitude	Return Period (years)	Unweighted PGA	Horizontal Coefficient[1], K_h
ULS	6.5	500	0.19 g	0.1273 g
SLS	5.8	25	0.03 g	

K_h = PGA × 0.67 for slope stability analysis to represent pseudo static conditions.

6.2 Site Stability

At the time of writing, no obvious indications of major deep-seated instability were identified over the proposed lots and the risk of such deep-seated instability developing as a result of the development proposal is low. We have carried out desktop study of historical aerial photos on Retrolens and have not found obvious signs of major landslides in the area. Additionally, no buried topsoil was encountered in any of our hand augered holes. No evident dislodged large rocks or boulders have been observed.

The steep hill is covered with moderate vegetation, with local minor exposed soil faces. These exposed soil faces along with terraced and hummocky grounds across the proposed building

[9] *New Zealand Geotechnical Society, Earthquake Geotechnical Engineering Practice, Module 1, November 2021, Appendix A, Table A1.*

platforms and surrounding land, indicating evident shallow instability risks and long-term soil creep.

Figure 1: Lot 1 – view looking northwest.

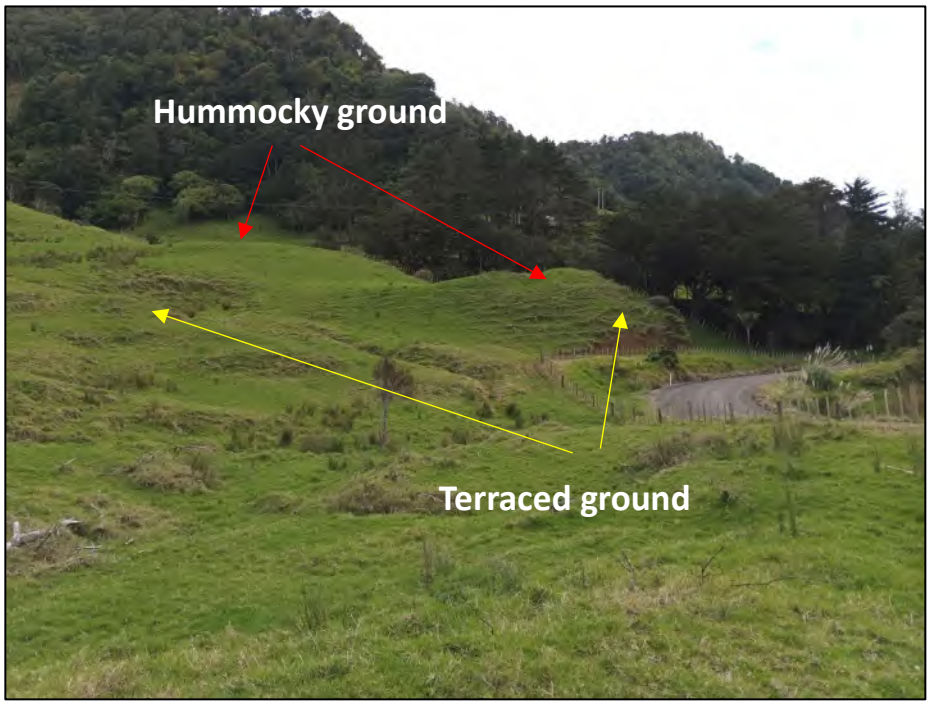
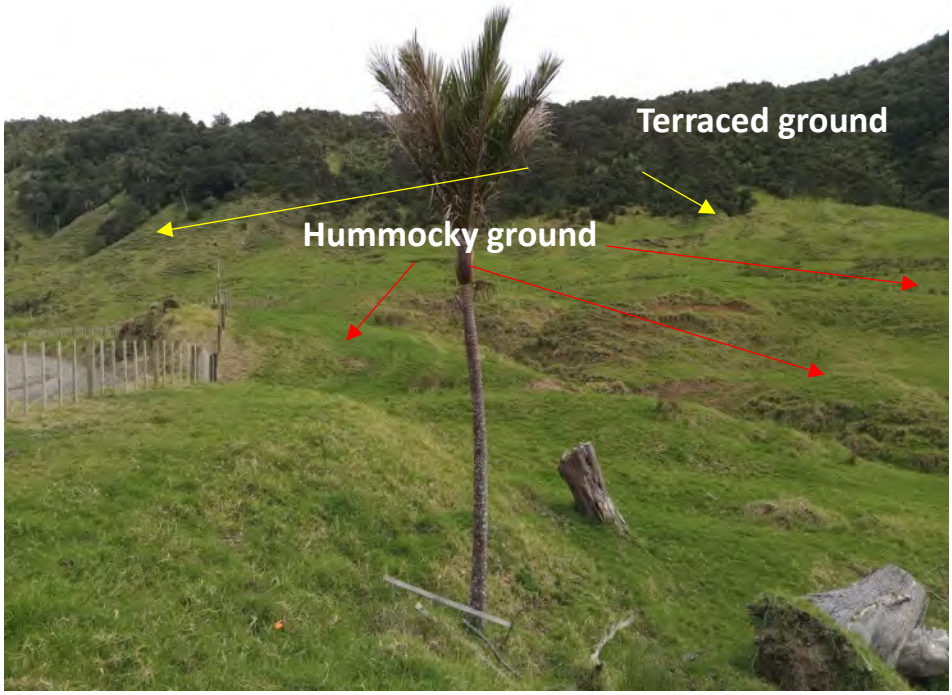


Figure 2: Lot 2 – view looking uphill to the west.



Within the scope of this ground investigation Geologix have undertaken computer modelled slope stability analysis through two critical sections axis of the site topography through the proposed house locations listed below.

- **Section A** aligned through the proposed lot 1 new house site and adjacent steep slope.
- **Section B** aligned through the proposed lot 2 new house site and adjacent steep slope.

The slope was analysed within propriety software Slide 2 Version 9.02, developed by RocScience Inc. Fitting this scenario, non-circular surface options with GLE/Morgenstern-Price method was selected.

The purpose of the stability assessment was to:

- Ensure the proposed development concepts are feasible.
- Provide a working, accurate ground model in relation to site stability refined according to observed conditions and the results of this ground investigation.
- Develop a concept development engineering solution with any specific geotechnical stability requirements or building restriction lines.

The stability analysis process was undertaken by calibrating the model to observed conditions, refining the ground investigation data to develop the soil parameters presented in Table 3 and applying them to the proposed condition.

Limit equilibrium stability analysis was adopted in the analysis to express the results as a Factor of Safety (FS). When FS = 1.0, the represented mechanism is in equilibrium with the disturbing, active forces equal to the resisting, stabilising forces. A lower FS indicates that instability could occur under the modelled scenario whereas a higher FS demonstrates a margin of safety in respect of stability. Minimum FS criteria have been developed for use in residential development by Auckland Council[8] which are widely adopted in the Far North region. Modelling three separate event scenarios the accepted minimum FS are summarised as follows:

- Minimum FS = 1.5 for static, normal groundwater conditions.
- Minimum FS = 1.3 for elevated groundwater conditions (storm events).
- Minimum FS = 1.0 for dynamic, seismic events.

6.2.1 *Stability Analysis Results*

Slope stability analysis results are presented in the appendices and summarised below as Table 5.

Table 5: Summary of Stability Analysis Results

Profile	Scenario	Global Min FoS	Development Footprint (min FoS)	Result within Development Footprint
Lot 1 Existing	Static, normal groundwater[1]	1.553	> 1.5	Pass – slip surfaces not entering Proposed Building Platform
	Static, elevated groundwater[2]	1.248	> 1.3	
	Seismic ULS[3]	0.952	> 1.0	
Lot 1 Proposed	Static, normal groundwater	1.551	> 1.5	Pass– slip surfaces not entering Proposed Building Platform
	Static, elevated groundwater	1.251	> 1.3	
	Seismic ULS	0.952	>1.0	
Lot 2 Existing	Static, normal groundwater	2.026	>1.5	Pass
	Static, elevated groundwater	2.026	>1.3	Pass
	Seismic ULS	1.217	>1.0	Pass
Lot 2 Proposed	Static, normal groundwater	2.026	>1.5	Pass
	Static, elevated groundwater	2.026	>1.3	Pass
	Seismic	1.218	>1.0	Pass

1. Static, normal groundwater minimum FS = 1.5
2. Static, elevated groundwater minimum FS = 1.3
3. Dynamic, seismic conditions minimum FS = 1.0

6.2.2 *Stability Analysis Conclusions*

The developed slope stability model is considered to be a reasonable representation of the observed conditions on site.

The expected effects of subdivision and future residential dwellings to the existing slope stability are minor, subject to review of earthworks during Building Consent stage.

No ground investigation data is available for the steep hill. We have assumed the strata profile based on our site observations of exposed soil faces in the local area with a potential thin veneer of shallow residual and/ or colluvial material. Thicker colluvial or residual soils, i.e. >0.5 to 1.0 m is unlikely to remain on such steep slope angles. However, it must be appreciated that ground conditions may differ from those assumed and further specific geotechnical investigation is required at the Building Consent stage.

From the above analysis, we consider deep seated instability risks within less weathered rock layers are less likely, whereas shallow slips through the upper residual soil layers are possible.

Natural hazards of slippage and falling debris is defined by the Building Act 2004 and as such, protection of a future dwelling is required which may be analysed and designed at the Building Consent stage.

Proposed Lot 1 and Lot 2

No failure planes under required Factors of Safety were observed through the proposed building platform under the analysed scenarios and are therefore the proposed lots are not prone to slope instability issues to future buildings.

6.2.3 Stability Controls

The proposed Lot 1 and Lot 2 house sites are approximately 100m – 140m away from the foot of the steep hill. It is expected the majority of the kinetic energy of any smaller dislodged rock/boulders would be dissipated through bush vegetation over the flatter sections at the base of hill before reaching the proposed house sites. Residential development is considered suitable provided the following recommendations and options are adopted to mitigate the above-mentioned land instability and debris inundation risks during detailed design at Building Consent stage:

- **Installation of debris fences.** Above the building location, it is recommended that a specifically engineered debris fence is installed to catch or slow down dislodged rock/boulders before reaching the proposed dwelling location.

6.3 Soil Expansivity

Clay soil may undergo appreciable volume change in response to changes in moisture content and be classed as expansive. The reactivity and the typical range of movement that can be expected from potentially expansive soils underlying any given building site depends on the amount of clay present, the clay mineral type, and the proportion, depth, and distribution of clay throughout the soil profile. Clay soils typically have a high porosity and low permeability causing moisture changes to occur slowly and produce swelling upon wetting and shrinkage upon drying. Apart from seasonal moisture changes (wet winters and dry summers) other factors that can influence soil moisture content include:

- Influence of garden watering and site drainage.
- The presence of mature vegetation.
- Initial soil moisture conditions at the time of construction.

Based on our experience and lab results of similar soils, for design of residential dwelling foundation, site subsoil shall design for minimum Highly Expansive, or Expansive Soil Class H,

as per New Zealand Building Code. In accordance with New Zealand Building Code[11], Class H or Highly Expansive soils typically have a soil stability index (I_{SS}) range of 3.8 to 6.5% and a 500-year design characteristic surface movement return (y_s) of 78 mm. A quantification of the expansive soil class assumptions can be made by geotechnical laboratory analysis.

6.4 Liquefaction Potential

Liquefaction occurs when excess pore pressures are generated within loose, saturated, and generally cohesionless soils (typically sands and silty sands with <30 % fines content) during earthquake shaking. The resulting high pore pressures can cause the soils to undergo a partial to complete loss of strength. This can result in settlement and/ or horizontal movement (lateral spread) of the soil mass.

The Geologix ground investigation indicates the site to be predominantly underlain by fine-grained and non-dilative Northland Allochthon residual soils. Based on the materials strength and consistency, and our experience with these materials, there is no liquefaction potential/ risk in a design level earthquake event.

6.5 Settlement Risk

The underlaying stiff to hard natural residual soils and rocks are not overly sensitive to settlement from minor change of overburden pressure. Settlement risks are to be reassessed once detailed architectural or earthworks plans are available.

6.6 Conceptual Foundations

It is considered that a timber pole foundation is suitable for the proposed lots 1 and 2 for future dwellings adopting bored and cast-in-place piles.

All piles should be taken down to Northland Allochthon very stiff to hard residual soils to terminate a minimum of 3B (3x pile diameter into the strata) and designed for soil creep over the depth of residual soils. It is recommended that the foundation solution is subject to specific engineering design by a professional structural engineer, adopting the parameters outlined in Table 7 for deep end-bearing piles and ignoring skin friction within the residual Northland Allochthon soil strata.

Table 6 Deep Piled Foundation Geotechnical Parameters

Strata	Geotechnical Design Parameters	
Northland Allochthon Residual Soils	Ultimate end-bearing capacity[1]	450 kPa
	ULS design end-bearing capacity[2]	225 kPa
	SLS design end-bearing capacity	150 kPa
	Ultimate skin friction[1,3]	35 kPa

[11] *https://www.building.govt.nz/assets/Uploads/building-code-compliance/b-stability/b1-structure/asvm/b1-structure-1st-edition-amendment-21.pdf*

	ULS design skin friction[2]	17 kPa
	SLS design skin friction	11 kPa

1. *Based conservatively on lowest result S_u = 50 kPa from available data.*
2. *Adopting a geotechnical strength reduction factor of 0.5.*
3. *Adopting S_u * α. With α determined from Figure 5 of NZBC B1/ VM4.*
4. *α = 0.7 for undrained shear strength of 50kPa.*

If groundwater is encountered within the pile holes, tremie concrete pour methodology will most likely be required to displace groundwater and an allowance should be made for this by the Contractor.

6.7 Conceptual Earthworks and Methodology

It is recommended that all proposed excavations and fills at the site are retained by specifically engineered retaining walls subject to design at the building consent stage. Any permanent earthworks and batter slopes shall be subject to specific engineering assessment at Building Consent stage.

6.7.1 Temporary Works

To reduce the risk of temporary excavation instability, it is recommended that unsupported excavations have a maximum vertical height of 1.0 m. Temporary unsupported excavations above this height shall be battered at 1V:1H or 45 °. It is expected that the above temporary works can be undertaken within the property boundaries.

Temporary excavations should not be left unsupported for a long period of time. Poles must be installed and backfilled against the excavated face immediately to ensure the slopes are not left unsupported.

Temporary batters should be covered with polythene sheets secured to the surface with pins or batons to prevent saturation. All works within proximity to excavations should be undertaken in accordance with Occupational Health and Safety regulations. In addition, it is recommended that all earthworks are conducted in periods of fine weather within the typical October to April earthwork season. Consent conditions commonly prescribe working restrictions.

6.7.2 Fills

Due to the steep slope and the instability risks analysed, fill should be kept to a minimum. It is recommended that suitable selected GAP hard fill or certified earth filling is adopted at the site with fill batter slopes not exceeding 1V:3H or 18 °.

It is recommended that proposed fills are subject to a specific engineering specification including compaction standards and construction monitoring at regular lift intervals (maximum 0.5 m).

In addition, any unsuitable and/ or deleterious materials such as organic pockets, nonengineered fill, relic foundations and/ or concrete hard standing and locally weaker spots (S_u <60 kPa) shall be cut to waste and not adopted for filling.

7 WASTEWATER ASSESSMENT

The scope of this wastewater assessment comprises a ground investigation and concept design of a suitable system to cater for probable future rural residential development. Relevant design guideline documents adopted include:

- Auckland Council, Technical Publication 58, On-site Wastewater Systems: Design and Management Manual, 2004.
- NZS1547:2012, On-site Domestic Wastewater Management.

7.1 Existing Wastewater Systems

No existing on-site wastewater systems were observed during our walkover survey and are not expected within the proposed lot boundaries.

7.2 Concept Future Development and Wastewater Generation Volume

The concept rural residential developments within this report assume that the proposed new lot may comprise up to a five-bedroom dwelling with a peak occupancy of eight people[14]. This considers the uncertainty of potential future Building Consent design. The number of usable bedrooms within a residential dwelling must consider that proposed offices, studies, gyms, or other similar spaces may be considered a potential bedroom by the Consent Authority.

In lieu of potable water infrastructure servicing the site, roof rainwater collection within on-lot tanks has been assumed for this assessment. The design water volume for roof water tank supply is estimated at 160 litres/ person/ day[15]. This assumes standard water saving fixtures[16] being installed within the proposed future developments. This should be reviewed for each proposed lot at the Building Consent stage within a development specific wastewater design by a suitably qualified professional.

For the concept wastewater design a total daily wastewater generation of 1,280 litres/ day is anticipated per proposed lot.

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[14] TP58 Table 6.1.
[15] TP58 Table 6.2, AS/ NZS 1547:2012 Table H3.
[16] Low water consumption dishwashers and no garbage grinders.

7.3 Treatment Standard and System

Selection of a wastewater treatment system will be provided by future developers at Building Consent stage. This will be a function of a refined design peak occupancy according to final development plans. No specific treatment system design restrictions and manufacturers are currently in place. Future developers will be required to elect a treatment system and provide system specifications at Building Consent.

It is recommended that to meet suitable minimum treated effluent output quality, secondary treatment systems are accounted for within future developments. Secondary treatment has been elected to provide compliance as a permitted activity of the proposed Northland Regional Plan considering the site topography.

In Building Consent design, considering final disposal field topography and proximity to controlling site features, a higher treated effluent output standard such as UV disinfection to tertiary quality may be required.

7.4 Soil Loading Rate

Based on the results of the ground investigation, conservatively the shallow soils are inferred to meet the drainage characteristics of TP58 Category 6, sandy clay, non-swelling clay and silty clay – slowly draining. This correlates to NZS1547 Category 5, poorly drained described as light clays. For a typical PCDI system, a Soil Loading Rate (SLR) of 3 mm/ day is recommended within NZS1547 Table 5.2 and TP58 Table 9.2.

To achieve the above SLR, technical guidance documents require the following compliance within the final design.

- 100 to 150 mm minimum depth of good quality topsoil (NZS1547 Table M1, note 1) to slow the soakage and assist with nutrient reduction.
- Minimum 50 % reserve disposal field area (TP58 Table 9.2, note 3) to enact 3 mm/ day over 2 mm/ day SLR.

7.5 Concept Land Disposal System

To provide even distribution, evapotranspiration assistance and to minimise effluent runoff it is recommended that suitably treated effluent is conveyed to land disposal via Pressure Compensating Dripper Irrigation (PCDI) systems, a commonplace method of wastewater disposal.

The proposed PCDI systems may be surface laid, covered with minimum 150 mm mulch and planted with specific evapotranspiration species to provide a minimum of 80 % species canopy cover. Alternatively, lines could be subsurface laid to topsoil with minimum 200 mm thickness and planted with lawn grass. Clean, inert site-won topsoil sourced during

development from building and/ or driveways footprints may be used in the land disposal system to increase minimum thicknesses.

Specific requirements of a concept land disposal system to be confirmed during Building Consent include the following.

Table 7: Disposal Field Design Criteria

Design Criteria	Site Conditions and Compliance
Topography at the disposal areas shall not exceed 25 °. Exceedances will require a Discharge Consent.	Concept design complies, refer Drawing No 400.
On shallower slopes >10 ° compliance with Northland Regional Plan (NRP) rule C.6.1.3(6) is required.	Concept design complies, proposed wastewater disposal fields are proposed on land > 10 ° and include cut-off drains.
On all terrain irrigation lines should be laid along contours.	Concept design complies, refer Drawing No 400.
Disposal system situated no closer than 600 mm (vertically) from the winter groundwater table for secondary treated effluent.	Concept design complies, final design may require a slight raising of the disposal fields to achieve offset.
Separation from surface water features such as stormwater flow paths (including road and kerb channels), rivers, lakes, ponds, dams, and natural wetlands according to Table 9, Appendix B of the NRP.	Concept design complies. Wastewater disposal fields can be designed to accommodate setbacks from on-site and adjacent surface water features.

7.5.1 Concept Disposal Field Sizing

The sizing of wastewater system disposal areas is a function of the design peak flow volumes, the SLR and topographic relief. For each proposed lot a concept primary and reserve disposal field is required as follows, to be refined at the Building Consent stage. The recommendations below are presented on Drawing No. 400.

- **Concept Primary Disposal Field.** A minimum PCDI primary disposal field of 427 m^2 laid parallel to the natural contours.
- **Concept Reserve Disposal Field.** A minimum reserve disposal field equivalent to 30 % of the primary disposal field is required under NRP rule C.6.1.3(9)(b) for secondary or tertiary treatment systems. The concept design has been increased to 50 % to accommodate note 3 of TP58 Table 9.2. It is recommended each proposed lot provides a 214 m^2 reserve disposal area to be laid parallel to the natural contours.

Concept disposal field locations require the provision of surface water cut-off drains to meet the provisions of NRP rule C.6.1.3.

Disposal fields discharging secondary treated effluent are to be set at the 20-year ARI (5 % AEP) flood inundation height to comply with the above NRP rule. Flood hazard potential has not been identified within the site boundaries and as such the site can provide freeboard above the 1 % AEP flood height to comply with this rule.

7.6 Summary of Concept Wastewater Design

Based on the above concept design assumptions a summary of the concept wastewater design is presented as Table 8 and presented schematically upon Drawing No. 400 within Appendix A. It is recommended that each lot is subject to Building Consent specific review and design amendment according to final development plans by a suitably qualified professional.

The concept design has been prepared with no Discharge Consent requirement. These requirements should be reviewed at the Building Consent stage and may be subject to an alternative solution.

Table 8: Concept Wastewater Design Summary

Design Element	Specification
Concept development	Five-bedroom, peak occupancy of 8 (per lot)
Concept Design generation volume	160 litres/ person/ day – 1,280 litres/ day/ lot
Water saving measures	Standard. Combined use of 11 litre flush cisterns, automatic washing machine & dishwasher, no garbage grinder[1]
Water meter required?	No
Min. Treatment Quality	Secondary
Soil Drainage Category	TP58 Category 6, NZS1547 Category 5
Soil Loading Rate	3 mm/ day
Concept primary disposal field size	Surface/ subsurface laid PCDI, min. 427 m^2
Concept reserve disposal field size	Surface/ subsurface laid PCDI, min. 50 %, or 214 m^2
Concept Disposal Field Level	Sited above 5 % AEP event. Raising to achieve 600 mm offset to groundwater.
Dosing Method	Pump with high water level visual and audible alarm. Minimum 24-hour emergency storage volume.
Concept Stormwater Control	Divert surface/ stormwater drains away from disposal fields. Contour drains not required. Stormwater management discharges away from all disposal fields.

1. Unless further water saving measures are included.

7.7 Assessment of Environmental Effects

An Assessment of Environmental Effects (AEE) is required to address two aspects of wastewater disposal. These include the effect of treated wastewater disposal for an individual lot and the cumulative or combined effect of multiple lots discharging treated wastewater to land as a result of subdivision.

The scale of final development is unknown at the time of writing and building areas, impervious areas including driveways, ancillary buildings, landscaped gardens, and swimming pools may reduce the overall area for on-site wastewater disposal. For the purpose of this report the above features are likely to be included within a designated 30 x 30 m square building site area as required by FNDC District Plan Rule 13.7.2.2.

It is recommended that the AEE is reviewed at the time of Building Consent once specific development plans, final disposal field locations and treatment systems are established. The TP58 guideline document provides a detailed AEE for Building Consent application. Based on the proposed scheme plan, ground investigation, walkover inspection and Drawing No. 400, a site-specific AEE is presented as Appendix C to demonstrate the proposed wastewater disposal concept will have a less than minor effect on the environment.

8 STORMWATER ASSESSMENT

Increased storm water runoff occurs as pervious surfaces such as pasture are converted to impervious features such as future roof, driveway and/ or internal Right of Ways.

8.1 Regulatory Requirements

Stormwater management for the proposed activity is controlled by the FNDC Operative District Plan[17] and NRC Proposed Regional Plan[18]. The requirement for subdivision and probable future development under these legislations is summarised below.

8.1.1 Regional Provisions

The Proposed Regional Plan states the diversion and discharge of stormwater into water or onto or into land where it may enter water from an impervious area or by way of a stormwater collection system, is a permitted activity, provided the criteria of Rule C.6.4.2(1) to (8) are met. The proposed activity is considered to meet the requirements of a Permitted Activity. Assessment of the consent status is summarised in Section 8.7.2 and in full within Appendix C.

8.1.2 District Wide Provisions

Subdivision activity and provisions for probable future development within both urban and rural environments is controlled by District Plan Rule 13.7.3.4.

8.1.3 Environmental Zone Provisions

Permitted activity status within the rural production zone is determined by Rule 8.6.5.1.3 which is presented below.

> *The maximum proportion of the gross site area covered by buildings and other impermeable surfaces shall be 15 %.*

[17] *https://www.fndc.govt.nz/Your-Council/District-Plan/Operative-plan*
[18] *Proposed Regional Plan for Northland July 2021 – Appeals Version*

8.2 Impervious Surfaces and Activity Status

The proposed activity has been assessed as a Permitted Activity in accordance with rules outlined by Sections 8.1.1 to 8.1.3. A summary of this is provided as Table 9 below which have been developed from our observations and AutoCAD drawings in lieu of specific survey. For the proposed lot, this has been taken as conceptual, maximum probable development of typical rural residential scenarios. Refer Section 8.3.

Table 9: Summary of Impervious Surfaces

Surface	Proposed Lot 1		Proposed Lot 2		Proposed Lot 3 & 4	
Existing Condition	**NA**				**(280,650 m²)**	
Roof					0 m²	0 %
Driveway					0 m²	0 %
Right of Way					0 m²	0 %
Total impervious					0 m²	0 %
Proposed Condition	**(15,300 m²)**		**(8,800 m²)**		**(256,550 m²)**	
Roof (Concept)	300 m²	1.96 %	300 m²	3.41 %	0 m²	0 %
Driveway (Concept)	200 m²	1.31 %	200 m²	2.27 %	0 m²	0 %
Right of Way	0 m²	0 %	0 m²	0 %	0 m²	0 %
Total	500 m²	3.27 %	500 m²	5.68 %	0 m²	0 %
Activity Status	Permitted		Permitted		Permitted	

8.3 Stormwater Management Concept

Based on the assessment within Table 9, the proposed development meets the provisions of a Permitted Activity. The stormwater management concept considered in this report has been prepared to meet the requirements of the local and regional consent authorities considering the design storm event as follows:

- **Probable Future Development (Lots 1 and 2).** The proposed application includes subdivision formation only and not lot specific residential development at this stage. As such a conservative model of probable future on-lot development has been developed for this assessment considering variation of scale in typical rural residential development. The probable future on-lot development concept includes up to 300 m² potential roof area and up to 200 m² potential driveway or parking areas. No RoW areas are expected to be accounted for within the application.

  To comply with the NRC Proposed Regional Plan Rule C6.4.2(2) and FNDC Engineering Standards Table 4-1 for a site with no immediate flood control, it is recommended future impermeable surfaces are attenuated to 80 % of the pre-development peak run-off condition for the design storm event which has been designated as the 50 and 20 % Annual Exceedance Probability (AEP) scenarios. Control to the 10 % AEP event is considered less conservative than the above.

- **Subdivision Development.** No additional impervious surfaces are expected to form the subdivision outside of new vehicle crossings. Increased runoff from subdivision

development is not expected and additional attenuation is not proposed to avoid an adverse environmental effect.

8.4 Design Storm Event

This assessment has been modelled to provide stormwater attenuation up to and including 80 % of the pre-development condition for the 50 and 20 % AEP storm events which is recommended for the site including any future activities to comply with FNDC Engineering Standard Table 4-1. This provides additional conservatism over the 10% AEP predevelopment model to comply with NRP Rule C6.4.2(2). Attenuation modelling under this scenario avoids exacerbating downstream flooding.

Correctly sized discharge devices have adopted the 1 % AEP event to reduce scour and erosion at discharge locations which may otherwise result in concentrated discharge.

Relevant design rainfall intensity and depths have been ascertained for the site location from the NIWA HIRDS meteorological model[19]. NIWA provides guidelines for modelling the effects of potential climate change effects of rainfall intensity increase by applying a potential change factor to historical data. This report has adopted potential change factors to account for a 2.1°c climate change increase scenario. NIWA HIRDS and climate change factor data is presented in full within Appendix D.

8.5 Concept Attenuation Model

As detailed above, it is recommended that future residential developments provide on-lot stormwater attenuation for all impervious surface areas to the pre-development peak runoff condition. This is achievable by installing specifically sized low-flow orifices into the roof runoff attenuation tank. A typical schematic retention/ detention tank arrangement detail is presented as Drawing No. 410 within Appendix A.

The concept design presented in this report should be subject to verification and an updated design at Building Consent stage once final development plans are available. This is typically applied as a notice to the applicable titles.

The rational method has been adopted by Geologix with run-off coefficients as published by Auckland Council TP108[20] and FNDC Engineering Standards[21] to provide a suitable attenuation design to limit post development peak flows to 80 % of pre-development conditions.

---

[19] NIWA High Intensity Rainfall Data System, https://hirds.niwa.co.nz.

[20] Auckland Regional Council Technical Publication 108, Guidelines for stormwater runoff modelling in the Auckland Region, April 1999.

[21] FNDC Engineering Standards 2021, Version 0.6, Issued May 2023.

Calculations to support the concept design are presented as Appendix D to this report. A summary of the concept stormwater attenuation design is presented as Table 10.

Table 10: Probable Future Development Attenuation Concept

Design Parameter	50 % AEP	20 % AEP	10 % AEP	1 % AEP
Proposed Lots 1 & 2				
Regulatory Compliance	FNDC Engineering Standards		NRC Proposed Regional Plan	NA – Not considered for this application
Pre-development peak flow	6.56 l/s	8.57 l/s	10.05 l/s	
80 % pre-development peak flow	5.25 l/s	6.86 l/s	NA	
Post-development peak flow	8.89 l/s	11.62 l/s	13.62 l/s	
Total Storage Volume Required	5445 litres	7140 litres	5378 litres	
Concept	Adopt attenuation to 80 % of pre-development condition for 20 % AEP storm as critical condition. Assuming 1 x 25,000 litre tank, install 10 mm orifice 0.74 m below overflow.			

8.5.1 *On-Lot Discharge*

The direct discharge of water tank overflow in a concentrated manner can cause scour and erosion in addition to excessive saturation of shallow soils. It is recommended that overflow from future rainwater detention tanks is conveyed in sealed pipes to a designated discharge point downslope of proposed building footprints and wastewater disposal fields. A concept design accommodating this is presented within Appendix A on Drawing No. 400.

It is recommended that conceptually sized dispersion devices are subject to specific assessment at the Building Consent stage once final development plans are available. Typical rural residential developments construct either above or below ground discharge dispersion pipes. Feeding pipes can be either buried or pinned to the surface as desired. It is recommended that all pipes are designed to accommodate the 1 % AEP storm event peak flows from the attenuation tank and including minimum 100 mm dia. PVC piping.

Concept sizing of future dispersion pipe or trench is presented as Table 11. Calculations to derive this are presented within Appendix D, based on the NIWA HIRDS Depth-Duration data. Typical details of these options are presented within Appendix A as Drawing No. 411.

Table 11: Summary of Concept Dispersion Devices

Concept Impervious Area to Tank	Dispersion Pipe/ Trench Length	Concept
Proposed Lot 1 & 2		
500 m^2	8.4 m	Above ground dispersion device or in-ground dispersion trench.

8.6 Stormwater Quality

The proposed application is for a rural residential subdivision. The key contaminant risks in this setting include:

- Sediments and minor contaminants washed from impervious surfaces.
- Leaf matter, grass, and other organic debris.

Stormwater treatment requirements are minor to maintain good quality stormwater discharge. Stormwater quality will be provided by:

- Leaf guards on roof guttering/ first flush devices on roof guttering and downpipes.
- Rainwater tank for potable use onsite only to be filled by roof runoff.
- Room for sedimentation (minimum 150 mm according to Auckland Council GD01) within the base of the stormwater attenuation pond and roof runoff tanks as dead storage volume.
- Stormwater discharges directed towards roading swale drains where possible.
- Grassed swale drains from rainwater inception (road surfaces) to discharge point.

The risk of other contaminants being discharged out of the site boundaries (hydrocarbons, metals etc.) as a result of the proposed activities once stormwater has been processed through the above measures that will affect the downstream water quality is considered low.

8.7 Assessment Criteria and Consent Status

8.7.1 District Plan

The proposed activity has been assessed as a **Restricted Discretionary Activity** according to District Plan Chapter 13.7.2.

8.7.2 Regional Plan

The proposed activity is determined to meet the requirements of a **Permitted Activity** according to the provisions of Proposed Regional Plan Rule C.6.4.2. Assessment criteria are presented in full within Appendix C.

9 POTABLE WATER & FIRE FIGHTING

In the absence of reticulated potable water infrastructure, it is recommended that roof runoff water tanks are adopted for potable water supply with appropriate filtration and UV disinfection at point of use. The volume of potable water supply on each lot should consider the required stormwater detention volume identified within the concept design and refined

during Building Consent. A second tank may be required for sufficient potable water volumes and is commonly adopted in rural residential development.

The absence of potable water infrastructure and fire hydrants requires provision of the on-lot roof water supply tanks to be used for firefighting purposes. Specific analysis and calculation for firefighting is outside the scope of this report and may require specialist input. Supply for firefighting should be made in accordance with SNZ PAS4509:2008 at the Building Consent stage.

10 NATURAL HAZARD ASSESSMENT

To satisfy the Resource Management Act, 1991 the proposed subdivision must plan for and manage the risk from natural hazards to reduce the potential adverse effects to less than minor. Regulatory assessment of natural hazards at the site location are managed under the jurisdiction of the FNDC District Plan[22], Northland Regional Council (NRC) Proposed Regional Plan for Northland[23] and Regional Water and Soil Plan for Northland. Following our ground investigation, the Geologix GIR and considering the measures presented in this report, a summary of the proposed activities against defined natural hazards is presented as Table 12.

Table 12: Summary of Natural Hazards

Natural Hazard	Applicability	Mitigation & Effect on Environment
Erosion	NA	No mitigation required, less than minor.
Overland flow paths, flooding, inundation	NA	No mitigation required, less than minor, proposed building envelopes are well above the flood hazard potential.
Landslip	NA	Less than minor provided measures identified by this report are adopted and subject to Building Consent assessment.
Rockfall	NA	Less than minor provided measures identified by this report are adopted and subject to Building Consent assessment.
Alluvion	NA	No mitigation required, less than minor.
Avulsion	NA	No mitigation required, less than minor.
Unconsolidated fill	NA	No mitigation required, less than minor.
Soil contamination	NA	No mitigation required, less than minor.
Subsidence	NA	No mitigation required, less than minor.
Fire hazard	NA	No mitigation required, less than minor.
Sea level rise	NA	No mitigation required, less than minor.

NA – Not Applicable.

[22] *Operative District Plan Rule 13.7.3.2.*

[23] *Proposed Regional Plan for Northland, Appeals Version, July 2021, Chapter D.6.*

11 LIMITATIONS

This report has been prepared for J & P Bill Family Trust as our Client. It may be relied upon by our Client and their appointed Consultants, Contractors and for the purpose of Consent as outlined by the specific objectives in this report. This report and associated recommendations, conclusions or intellectual property is not to be relied upon by any other party for any purpose unless agreed in writing by Geologix Consulting Engineers Ltd and our Client. In any case the reliance by any other party for any other purpose shall be at such parties' sole risk and no reliability is provided by Geologix Consulting Engineers Ltd.

The opinions and recommendations of this report are based on plans, specifications and reports provided to us at the time of writing, as referenced. Any changes, additions or amendments to the project scope and referenced documents may require an amendment to this report and Geologix Consulting Engineers should be consulted. Geologix Consulting Engineers Ltd reserve the right to review this report and accompanying plans.

The recommendations and opinions in this report are based on arisings extracted from exploratory boreholes at discrete locations and any available existing borehole records. The nature and continuity of subsurface conditions, interpretation of ground condition and models away from these specific ground investigation locations are inferred. It must be appreciated that the actual conditions may vary from the assumed ground model. Differences from the encountered ground conditions during subdivision construction may require an amendment to the recommendations of this report.

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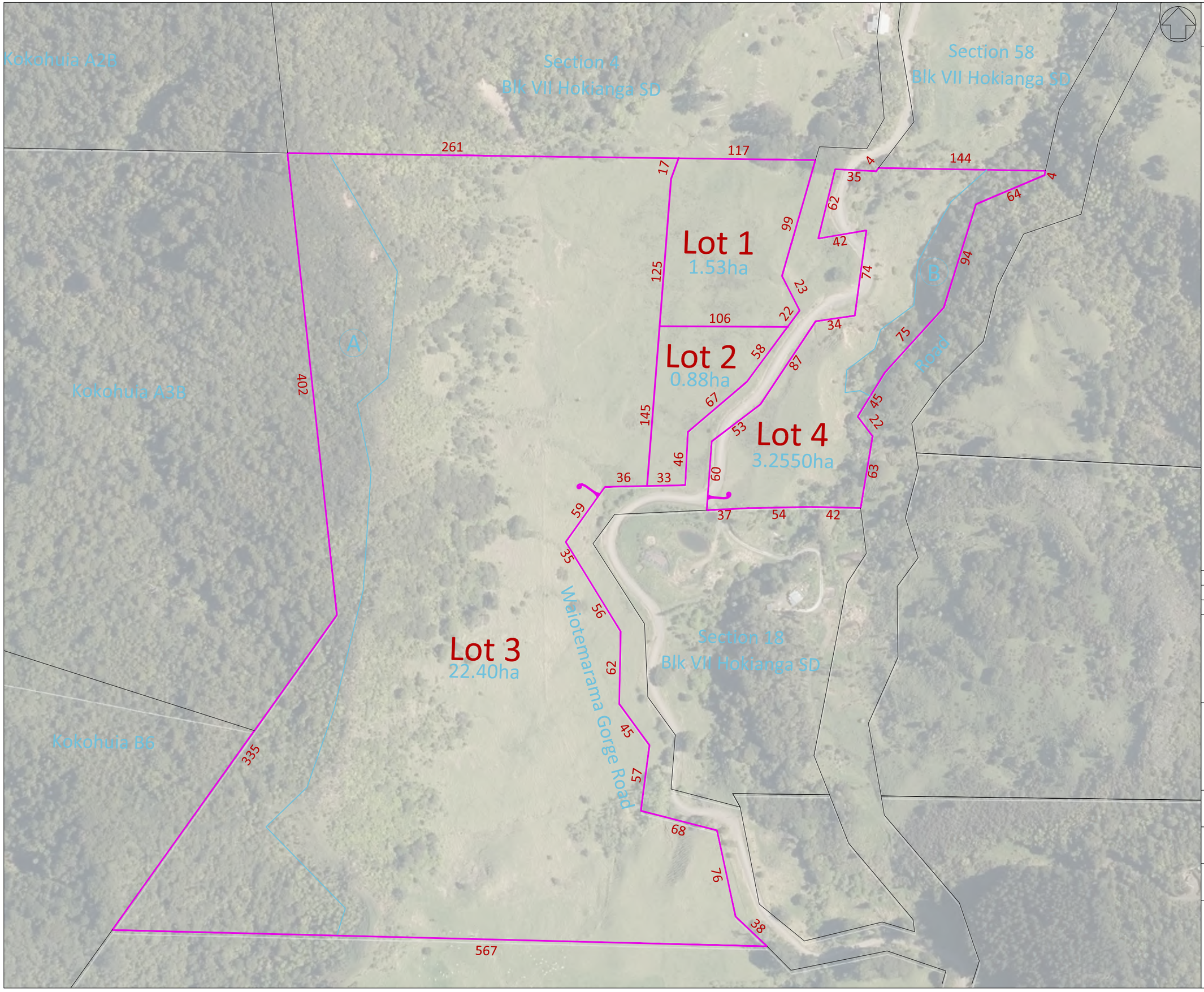
APPENDIX A

Drawings



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Meters
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Revision	Issue	Date
B	CONSENT	03/03/2025
C	CONSENT	11/04/2025

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AUCKLAND | NORTHLAND

Project Name and Address
WAIOTEMARAMA GORGE ROAD, OMAPERE
SECTION 54 BLOCK VII HOKIANGA SD

Project	Drawn By
C0021	GC/GM

Client
JASON AND PENNY BILL

Sheet Title
PROPOSED SCHEME PLAN

Sheet
100

FILE PATH: Z:\Geologix Files\Projects\C0000-C0099\Waiotemarama Gorge Road, Opononi - C0021\07 - Technical & Drawings\For Thomson Survey\C0021-S-03-2025.dwg

PLOTTED: 13/10/2023

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PROPOSED BUILDING SHAPE FACTOR

Lot 1
1.53ha

Lot 2
0.88ha

Lot 4
3.2550ha

HA14
HA12
HA17
HA15
HA16

PROPOSED VEHICLE CROSSING TO FNDC ENGINEERING STANDARDS TYPE 1A - LIGHT VEHICLE

PROPOSED VEHICLE CROSSING TO FNDC ENGINEERING STANDARDS TYPE 1A - LIGHT VEHICLE

Meters
12.5 0 12.5 25
1:1250

Revision	Issue	Date
B	CONSENT	18/03/2025
C	CONSENT	11/04/2025

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Client
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Sheet Title
PROPOSED ACCESSWAY PLAN

Sheet
101

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PROPOSED BUILDING SHAPE FACTOR

HA01 GEOLOGIX HAND AUGER & DYNAMIC CONE PENETROMETER - JULY 2023

HA01 GEOLOGIX HAND AUGER - SEPTEMBER 2023

HA01 GEOLOGIX HAND AUGER & DYNAMIC CONE PENETROMETER - SEPTEMBER 2025

Lot 1
1.53ha

Lot 2
0.88ha

Lot 4
3.2550ha

A 201

B 202

HA07 HA08 HA09 HA10 HA11 HA12 HA13 HA14 HA15 HA16 HA17

Meters
12.5 0 12.5 25
1:1250

Revision	Issue	Date
C	CONSENT	18/03/2025
D	CONSENT	11/04/2025

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Sheet Title
GEOTECHNICAL SITE PLAN

Sheet
200

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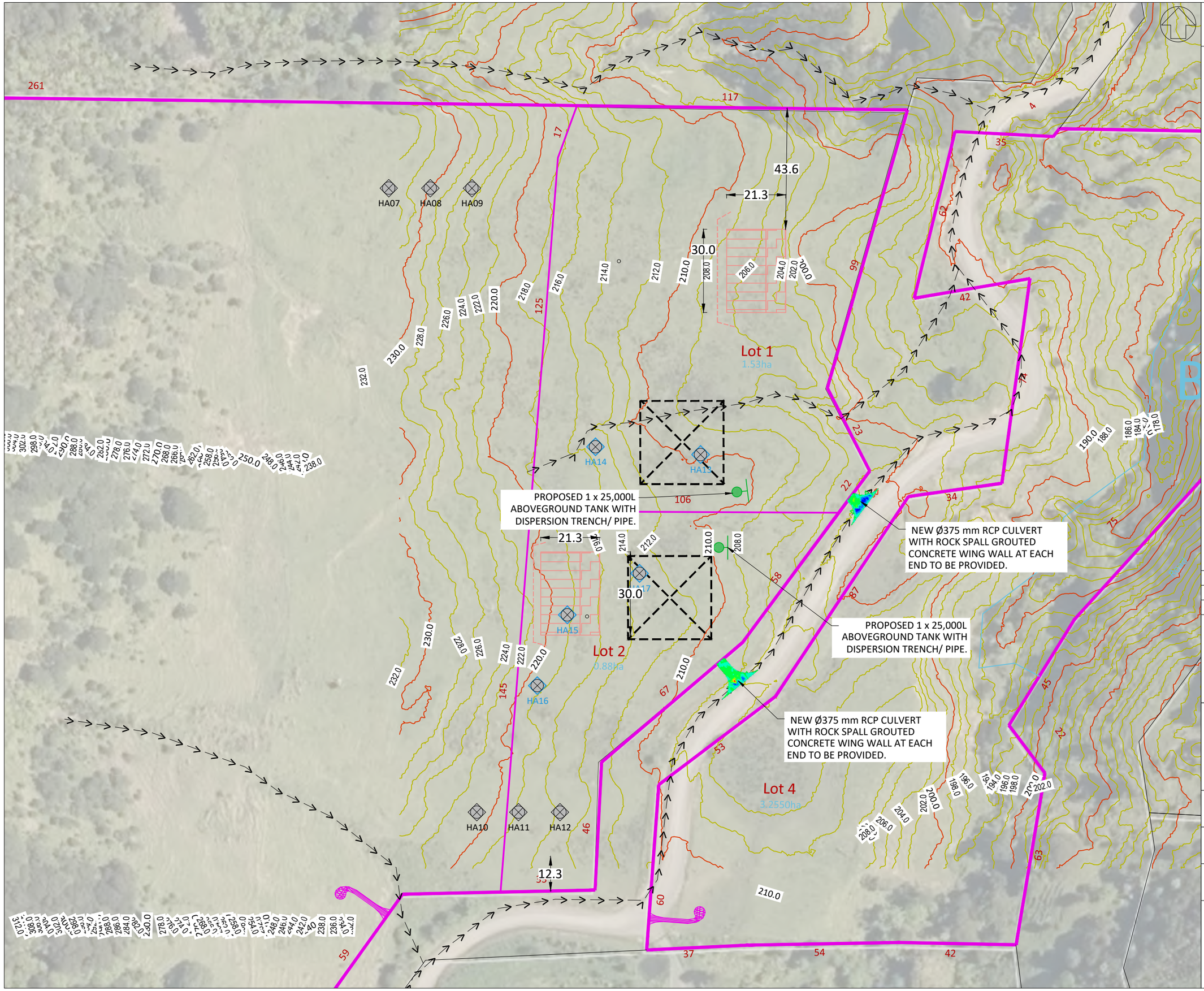

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PROPOSED BUILDING SHAPE FACTOR

BH01 — GEOLOGIX HAND AUGER & DYNAMIC CONE PENETROMETER - JULY 2023

BH01 — GEOLOGIX HAND AUGER - SEPTEMBER 2021

EXISTING OVERLAND FLOW PATH

PROPOSED TANK WITH DISPERSION DEVICE

CONCEPT WASTEWATER PRIMARY DISPOSAL FIELD 427m²

CONCEPT WASTEWATER RESERVE DISPOSAL FIELD 214 m² (50%)

WASTEWATER FIELD CUT OFF DRAIN

Meters 12.5 0 12.5 25
1:1250

Revision	Issue	Date
B	CONSENT	18/03/2025
C	CONSENT	11/04/2025

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Sheet Title
3 WATERS PLAN

Sheet
400

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PROPOSED TANK PLAN VIEW

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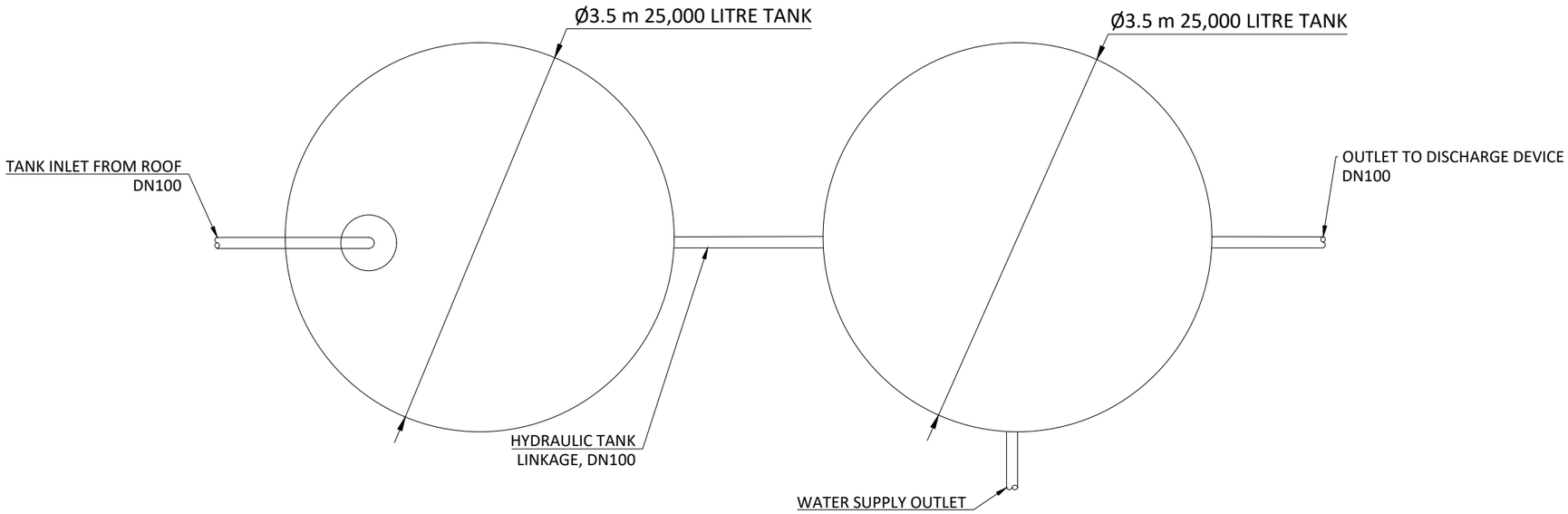
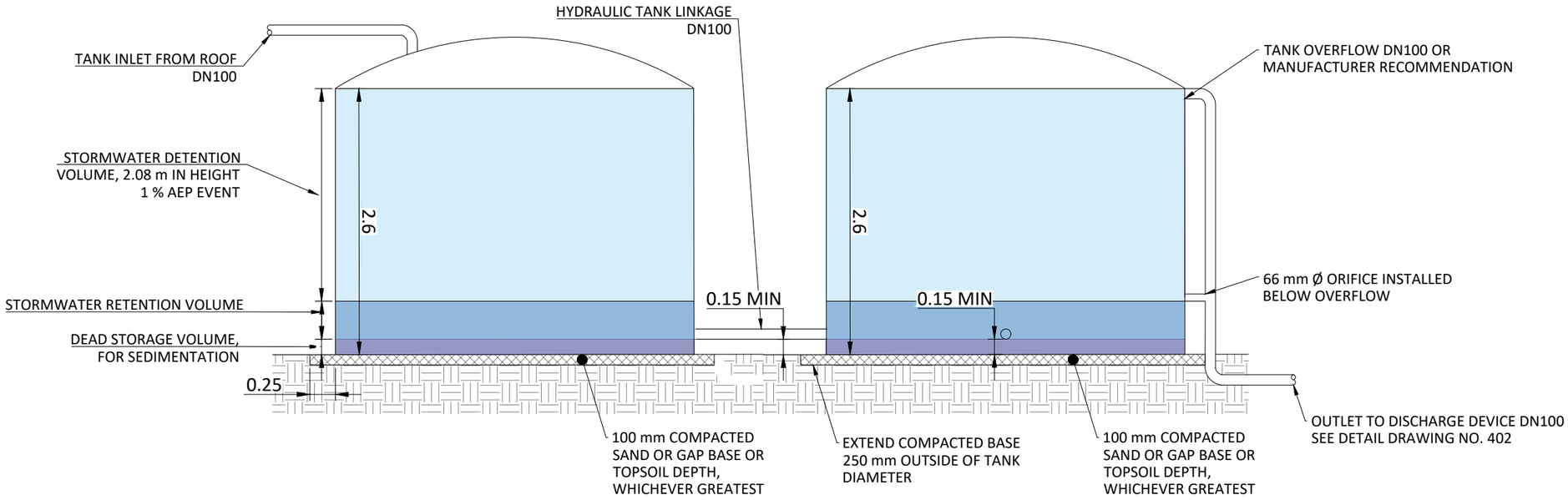


PROPOSED TANK SIDE VIEW

1:50, A3



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TYPICAL WATER TANK DETIAL

Sheet

410

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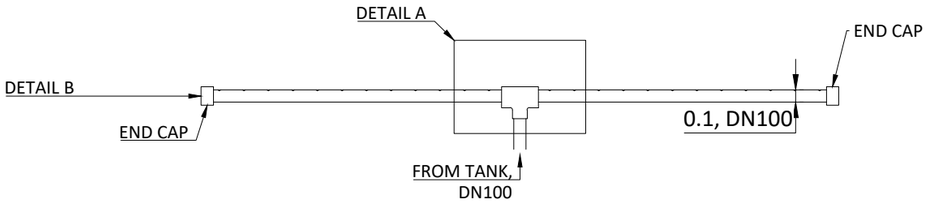
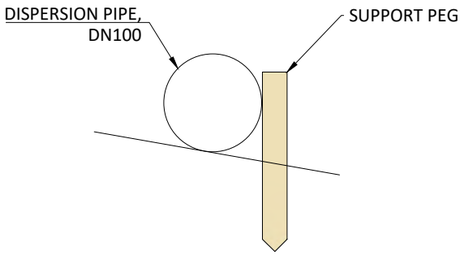
OPTION 1: DISPERSION VIA ABOVE GROUND PIPE

NOT TO SCALE



DETAIL B - SIDE VIEW

NOT TO SCALE



DETAIL A - T JUNCTION AND PERFORATIONS

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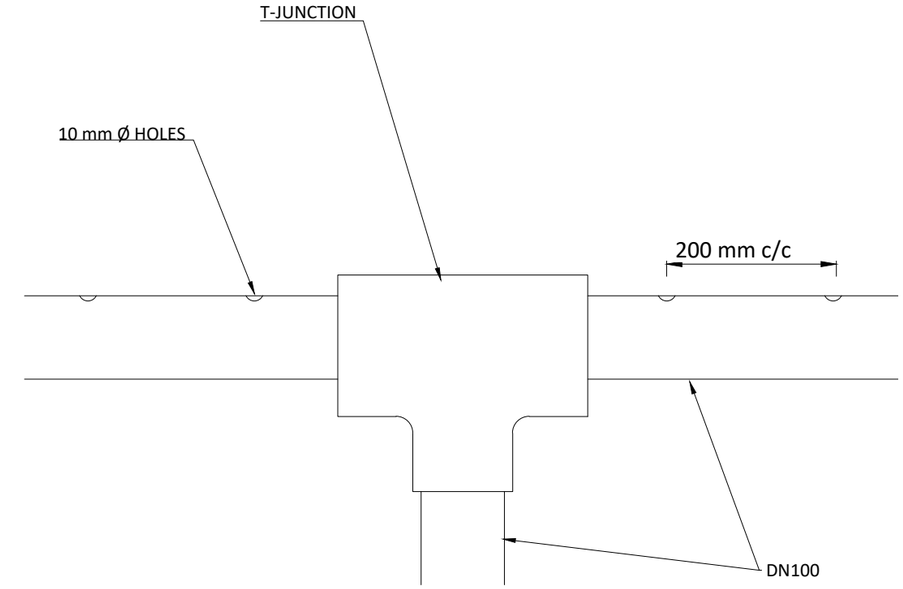
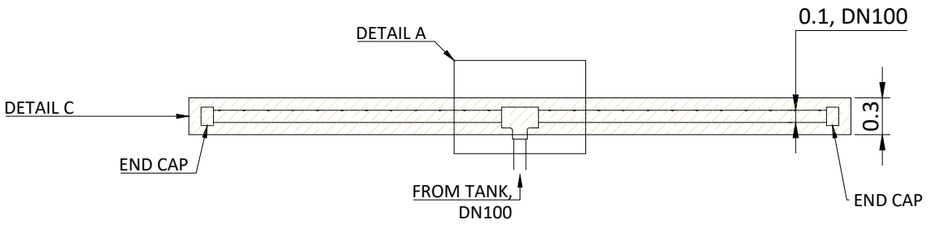


OPTION 2: DISPERSION VIA BELOW GROUND TRENCH

NOT TO SCALE



DETAIL C - SIDE VIEW

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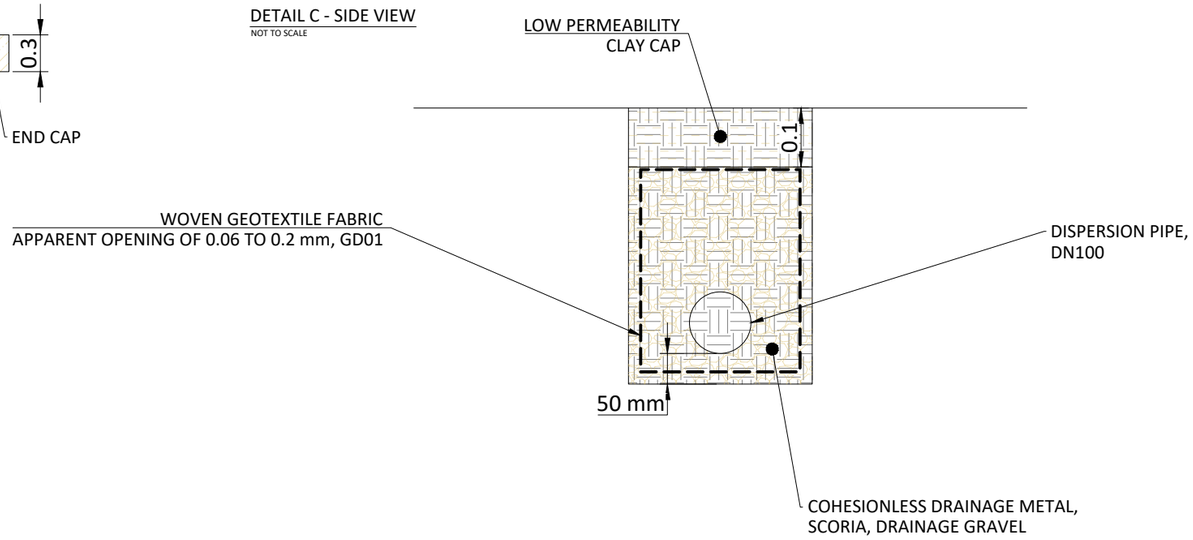

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TYPICAL DISPERSION TRENCH DETAIL

Sheet

411

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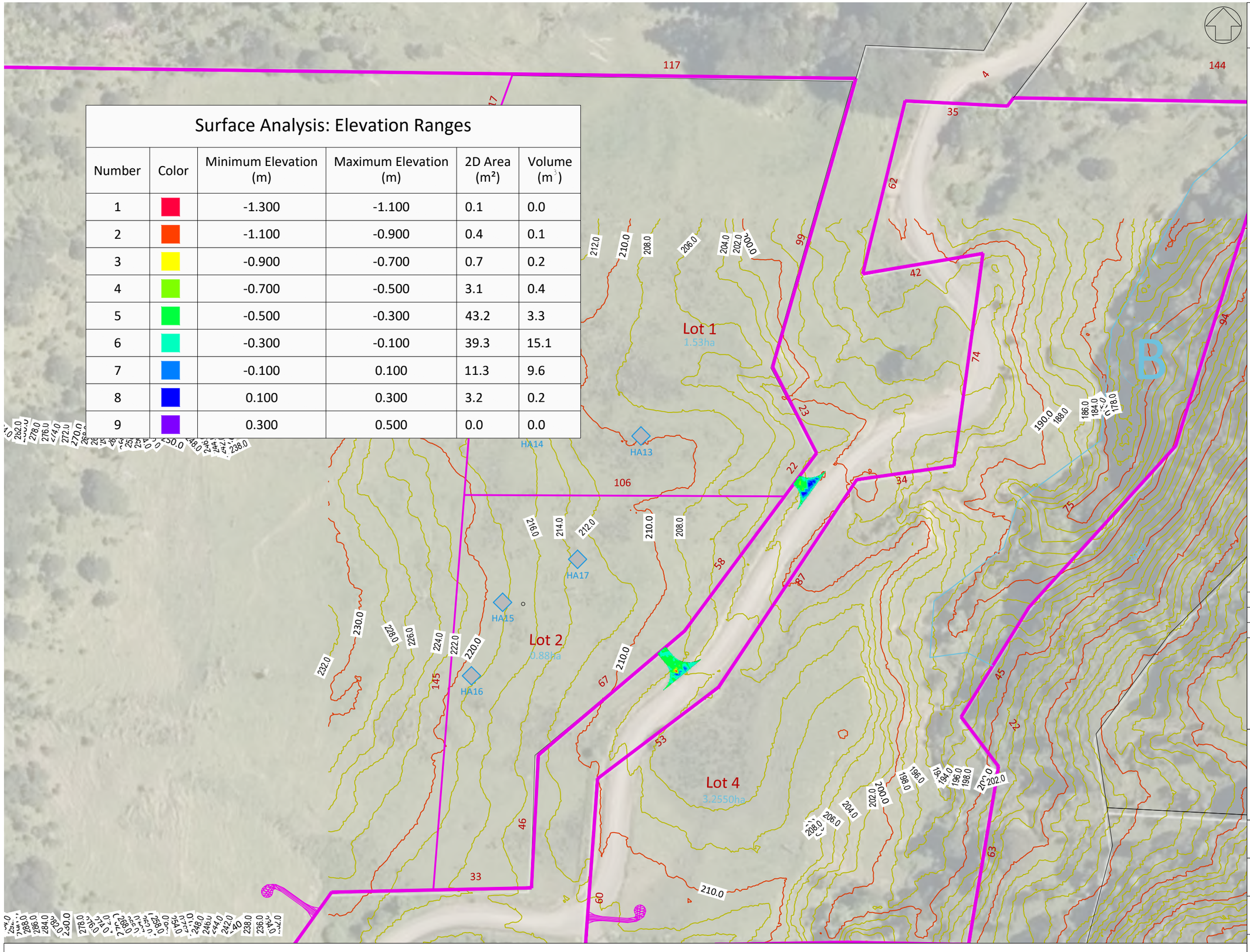
Surface Analysis: Elevation Ranges

Number	Color	Minimum Elevation (m)	Maximum Elevation (m)	2D Area (m^2)	Volume (m^3)
1		-1.300	-1.100	0.1	0.0
2		-1.100	-0.900	0.4	0.1
3		-0.900	-0.700	0.7	0.2
4		-0.700	-0.500	3.1	0.4
5		-0.500	-0.300	43.2	3.3
6		-0.300	-0.100	39.3	15.1
7		-0.100	0.100	11.3	9.6
8		0.100	0.300	3.2	0.2
9		0.300	0.500	0.0	0.0



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
EARTHWORKS VOLUME	1.000	1.000	101.38sq.m	28.10 Cu. M.	0.72 Cu. M.	27.38 Cu. M.<Cut>
Totals			101.38sq.m	28.10 Cu. M.	0.72 Cu. M.	27.38 Cu. M.<Cut>

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Meters
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A	CONSENT	13/10/2023

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Sheet Title
EARTHWORKS PLAN

Sheet
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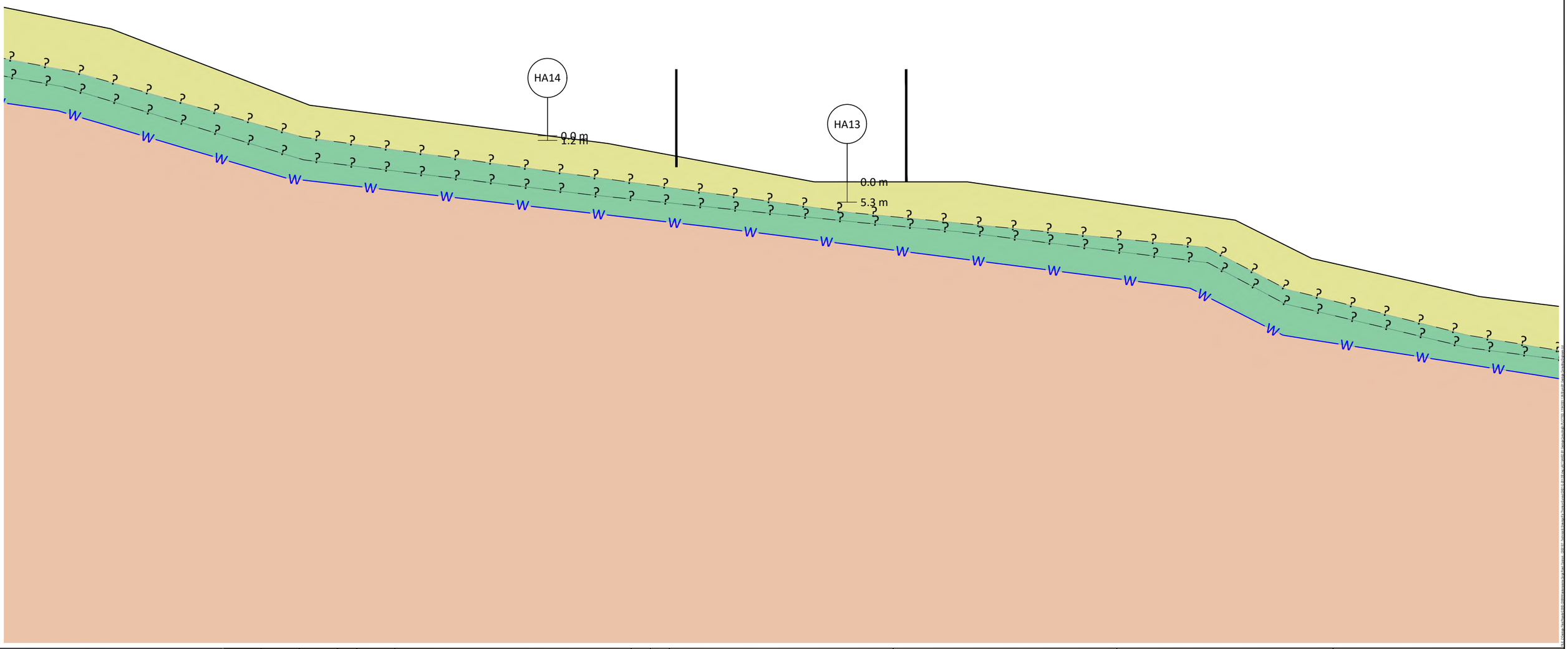
PLOTTED: 13/10/2023

LEGEND:

- STRATA BOUNDARY
- WATER TABLE
- NA RESIDUAL SOIL
- NA HARD RESIDUAL SOIL
- NA CW PARENT

PROPOSED LOT 1

PROPOSED
BUILDING PLATFORM



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DRAWN	SIGNED	DATE					
BN	BN	18/03/25					
VERIFIED	SIGNED	DATE					
LW	LW	18/03/25					
APPROVED	SIGNED	DATE					
EC	EC	18/03/25	A	18/03/25	FIRST ISSUE - CONSENT	BN	LW
			REV.	DATE	REVISION DETAILS	BY	APP.

CLIENT.
JASON & PENNY BILL

PROJECT.
WAIOTEMARAMA GORGE ROAD,
OMAPERE
NORTHLAND
SECTION 54 BLOCK VII HOKIANGA SD

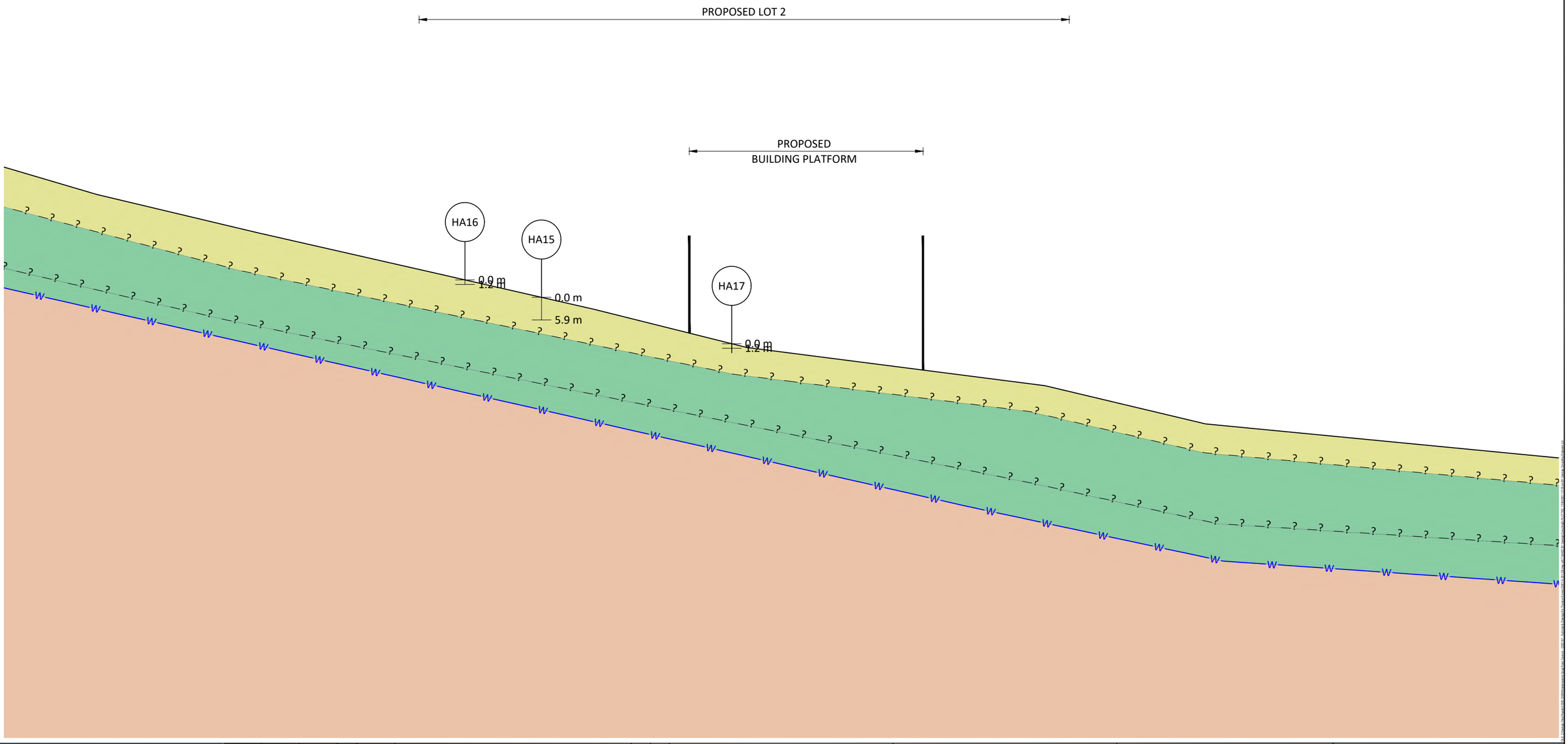
DRAWING TITLE.
GEOTECHNICAL SECTION A
FOR
RESIDENTIAL
BUILDING CONSENT

STATUS.
FINAL
NOT FOR CONSTRUCTION

SCALE	SHEET SIZE.				
1:1000	A3				
PROJECT NO.	TYPE.	CLASS.	SHEET NO.	REV.	
C0021	BC	G	201	A	

LEGEND:

- STRATA BOUNDARY
- WATER TABLE
- NA RESIDUAL SOIL
- NA HARD RESIDUAL SOIL
- NA CW PARENT



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DRAWN	SIGNED	DATE
BN	BN	18/03/25
VERIFIED	SIGNED	DATE
LW	LW	18/03/25
APPROVED	SIGNED	DATE
EC	EC	18/03/25

REV.	DATE	REVISION DETAILS	BY	APP.
A	18/03/25	FIRST ISSUE - CONSENT	BN	LW

CLIENT.
JASON & PENNY BILL

PROJECT.
WAIOTEMARAMA GORGE ROAD,
OMAPERE
NORTHLAND
SECTION 54 BLOCK VII HOKIANGA SD

DRAWING TITLE.
GEOTECHNICAL SECTION B
FOR
RESIDENTIAL
BUILDING CONSENT

STATUS. FINAL
NOT FOR CONSTRUCTION

SCALE	SHEET SIZE.
1:1000	A3

PROJECT NO.	TYPE.	CLASS.	SHEET NO.	REV.
C0021	BC	G	202	A

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APPENDIX B

Engineering Borehole Records

INVESTIGATION LOG

HOLE NO.: HA07

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 26/09/2023

CO-ORDINATES:

ELEVATION: Ground

END DATE: 26/09/2023

CONTRACTOR: Internal

RIG: 50 mm auger + DCP

DRILLER: TW LW

LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	Values	WATER
TOPSOIL comprising organic SILT; trace rootlets; dark brown; moist; low plasticity.		0.2	TS			99 / 45	
Silty CLAY; brown mottled orange and grey. Stiff; moist; low plasticity; [Northland Allochthon].		0.4 / 0.6				65 / 45	
SILT, with trace sand; brown and grey. Very stiff; moist; low plasticity; [Northland Allochthon].		0.8 / 1.0 / 1.2 / 1.4 / 1.6				198+ / - / 198+ / - / 198+ / -	▼ 27/09/2023
1.3m: With minor silt, with trace gravel. Gravel, fine.							
1.5m: Minor gravels present.							
1.8m: Becoming hard.		1.8				UTP / -	
End Of Hole: 1.75m		2.0 – 5.0		10, 12, 15, 11, 8, 6, 7, 9, 9, 8, 8, 11, 13, 10, 7, 6, 5, 5, 8, 9, 7, 10, 13, 15, 9, 7, 8, 9, 12, 11, 10			

PHOTO(S)

REMARKS

1. Hand auger terminated at 1.75m bgl due to dense strata.
2. Continued with DCP to target depth of 5.0m bgl.
3. Groundwater encountered at 1.48m bgl at the time of drilling.

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

INVESTIGATION LOG

HOLE NO.: HA08

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 26/09/2023

CO-ORDINATES:

ELEVATION: Ground

END DATE: 26/09/2023

CONTRACTOR: Internal

RIG: 50 mm auger + DCP

DRILLER: TW LW

LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	VANE SHEAR STRENGTH (kPa) Vane: 3282	Values	WATER
TOPSOIL comprising organic SILT; dark brown; moist; low plasticity.		0.0	TS				
Clayey SILT; brown mottled orange. Very stiff; moist to wet; low plasticity; [Northland Allochthon].		0.4				117 / 50	
		0.6				123 / 34	
		0.8				161 / 34	
Silty CLAY; grey and brown mottled orange. Very stiff; moist to wet; high plasticity; [Northland Allochthon].		1.0				154 / 39	
		1.2					
Clayey SILT, with minor sand; brown and orange. Very stiff; wet; low plasticity; [Northland Allochthon].		1.4				140 / 45	▼ 26/09/2023
		1.6					
		1.8				147 / 39	
		2.0				154 / 39	
		2.2					
End Of Hole: 2.40m		2.4		13		UTP / -	
		2.6		15 11			
		2.8		10 8			
		3.0		9 7			
		3.2		12 9			
		3.4		7 6			
		3.6		8 6			
		3.8		5 7			
		4.0		8 12			
		4.2		14 13			
		4.4		11 10			
		4.6		8 13			
		4.8		15 16			
		5.0		14			

PHOTO(S)

REMARKS

1. Hand auger terminated at 2.4m bgl due to dense strata.
2. Continued with DCP to target depth of 5.0m bgl.
3. Groundwater encountered at 1.56m bgl at the time of drilling.

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

INVESTIGATION LOG

HOLE NO.: HA09

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 26/09/2023

CO-ORDINATES:

ELEVATION: Ground

END DATE: 26/09/2023

CONTRACTOR: Internal

RIG: 50 mm auger + DCP

DRILLER: TW LW

LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	DEPTH (m)
TOPSOIL comprising organic SILT; dark brown; moist; low plasticity.	0.0
Clayey SILT; brown and grey. Hard; moist; low plasticity; [Northland Allochthon].	0.4
SILT, with trace sand; brown. Hard; moist to wet; low plasticity; [Northland Allochthon]. 1.1m: Wet.	0.8
SILT, with trace clay and sand; brown . Very stiff; wet; [Northland Allochthon]. 1.6m: With trace gravel. Gravel, angular. 1.8m: Wet to saturated. 2.1m: Becoming hard.	1.6
End Of Hole: 2.10m	2.1

SAMPLES

LEGEND

SCALA PENETROMETER (Blows / 100mm)

Depth (m)	Blows / 100mm
2.2	10, 15
2.4	8, 7
2.6	7, 6
2.8	8, 6
3.0	5, 6
3.2	5, 7
3.4	7, 9
3.6	10, 12
3.8	11, 10
4.0	8, 7
4.2	8, 9
4.4	12, 13
4.6	10, 8
4.8	9, 12
5.0	13

VANE SHEAR STRENGTH (kPa)
Vane: 3467

Depth (m)	Values
0.2	198+ -
0.6	198+ -
1.0	198+ -
1.2	156 50
1.6	111 40
1.8	153 50
2.2	198+ -

WATER

26/09/2023

PHOTO(S)

REMARKS

1. Hand auger terminated at 2.1m bgl due to dense strata.
2. Continued with DCP to target depth of 5.0m bgl.
3. Groundwater encountered at 0.2m bgl at the time of drilling.

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

INVESTIGATION LOG

HOLE NO.: HA10

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 27/09/2023

CO-ORDINATES:

ELEVATION: Ground

END DATE: 27/09/2023

CONTRACTOR: Internal

RIG: 50 mm auger + DCP

DRILLER: TW LW

LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	WATER
TOPSOIL comprising organic SILT; trace rootlets; dark brown; moist; low plasticity.		0.0 – 0.2	TS		126 / 52	Groundwater Not Encountered
Clayey SILT; brown and grey mottled orange. Very stiff; moist; low plasticity; [Northland Allochthon].		0.2 – 0.4			UTP / -	
0.5m: With trace gravel. Gravel, fine, angular.		0.4 – 0.6			115 / 43	
0.8m: Becoming brown and grey, gravels absent.		0.6 – 0.8			135 / 35	
1.3m: Minor sand present.		0.8 – 1.0			106 / 34	
1.5m: Becoming wet.		1.0 – 1.2			128 / 43	
SILT; brown . Very stiff; wet to saturated; low plasticity; [Northland Allochthon].		1.2 – 1.4			156 / 30	
		1.4 – 1.6				
		1.6 – 1.8				
		1.8 – 2.0				
		2.0 – 2.2				
Sandy SILT, with minor gravel; greyish blue. Very stiff to hard; wet; low plasticity; gravel, fine; [Northland Allochthon].		2.2 – 2.4			177 / 43	
		2.4 – 2.6				
		2.6 – 2.8			UTP / -	
		2.8 – 3.0			UTP / -	
End Of Hole: 3.00m		3.0 – 3.2		3, 3		
		3.2 – 3.4		2, 3		
		3.4 – 3.6		3, 3		
		3.6 – 3.8		3, 5		
		3.8 – 4.0		11, 12		
		4.0 – 4.2		8, 9		
		4.2 – 4.4		9, 7		
		4.4 – 4.6		8, 9		
		4.6 – 4.8		8, 9		
		4.8 – 5.0		9, 8		

PHOTO(S)

REMARKS

1. Hand auger completed at target depth 3.0m bgl.
2. Continued with DCP to target depth of 5.0m bgl.
3. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

HOLE NO.: HA11

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 27/09/2023

CO-ORDINATES:

ELEVATION: Ground

END DATE: 27/09/2023

CONTRACTOR: Internal

RIG: 50 mm auger + DCP

DRILLER: TW LW

LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	VANE SHEAR STRENGTH (kPa) Vane: 3282	Values	WATER
TOPSOIL comprising organic SILT; dark brown; moist; low plasticity.		0.0	TS			103	
Clayey SILT, with trace gravel; brown mottled orange. Very stiff; moist; low plasticity; gravel, fine to medium, poorly graded; [Northland Allochthon].		0.4				34	▼ 27/09/2023
		0.6				112	
		0.8				39	
Silty CLAY; dark grey and brown mottled orange. Very stiff; moist; high plasticity; [Northland Allochthon].		1.0				106	
1.2m: Becoming stiff.		1.2				36	
		1.4				95	
End Of Hole: 1.50m		1.6				31	
		1.8				154	
		2.0				31	
		2.2					
		2.4					
		2.6					
		2.8					
		3.0					
		3.2					
		3.4					
		3.6					
		3.8					
		4.0					
		4.2					
		4.4					
		4.6					
		4.8					
		5.0					

PHOTO(S)

REMARKS

1. Hand auger terminated at 1.5m bgl due to no recovery.
2. Continued with DCP to target depth of 5.0m bgl.
3. Groundwater encountered at 0.5m bgl at the time of drilling.

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

INVESTIGATION LOG

HOLE NO.: HA12

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 27/09/2023

CO-ORDINATES:

ELEVATION: Ground

END DATE: 27/09/2023

CONTRACTOR: Internal

RIG: 50 mm auger + DCP

DRILLER: TW LW

LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	Values	WATER
TOPSOIL comprising organic SILT; trace rootlets; dark brown; moist; low plasticity.		0.0–0.4	TS			108 / 50	Groundwater Not Encountered
Clayey SILT; brown. Stiff; moist; low plasticity; [Northland Allochthon].		0.4–0.6				96 / 43	
Silty CLAY; brown. Stiff to very stiff; moist to wet; high plasticity; [Northland Allochthon]. 0.9m: Wet to saturated. 1.3m: Saturated. 1.5m: With trace gravel. 1.9m: With minor gravel.		0.6–2.0				67 / 35 82 / 18 128 / 24 177 / 21 UTP / -	
End Of Hole: 2.10m		2.0–5.0		12, 14, 8, 7, 5, 8, 10, 11, 9, 12, 8, 7, 9, 10, 7, 6, 9, 5, 10, 8, 7, 6, 9, 12, 14, 11, 10, 15, 9			

PHOTO(S)

REMARKS

1. Hand auger terminated at 2.1m bgl due to dense strata.
2. Continued with DCP to target depth of 5.0m bgl.
3. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

HOLE NO.: HA13

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road - Lot 1 and 2

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 17/02/2025

CO-ORDINATES: 1638618mE, 6069003mN

ELEVATION: Ground

END DATE: 17/02/2025

CONTRACTOR: Internal

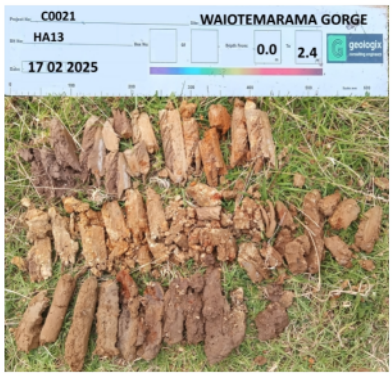
RIG: 50 mm auger + DCP

DRILLER: GB/TW

LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	VANE SHEAR STRENGTH (kPa) Vane: 3282	Values	WATER
TOPSOIL comprising of organic SILT with trace rootlets; dark brown. Moist; low plasticity.		0.2	TS			148 / 35	Groundwater Not Encountered
Clayey SILT; brown with dark orange mottles. Very stiff; moist; low plasticity; [Northland Allochthon]		0.4				157 / 29	
0.7m - 0.8m: Becoming dark orange.		0.6				160 / 41	
SILT, with some clay, with trace gravel; light brown with orange mottles. Very stiff; moist; low plasticity; gravel, medium; [Northland Allochthon].		0.8				174 / 38	
		1.0				119 / 35	
		1.2				102 / 29	
Silty CLAY; brown with orange mottles. Very stiff to hard; moist; high plasticity; [Northland Allochthon].		1.4				161 / 44	
		1.6				UTP / -	
		1.8					
		2.0					
		2.2					
End Of Hole: 2.40m		2.4		3			
		2.6		4 4			
		2.8		3 5			
		3.0		3 4			
		3.2		5 3			
		3.4		3 6			
		3.6		7 9			
		3.8		8 6			
		4.0		7 6			
		4.2		7 10			
		4.4		11 10			
		4.6		10 14			
		4.8		12 16			
		5.0		13 12			
		5.2		16 23 >>			
		5.4					

PHOTO(S)



REMARKS

1. Hand Auger refused at 2.4 m bgl due to dense strata encountered.
2. Continued with DCP from 2.4 m bgl until refusal at 5.3 m bgl.
3. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

HOLE NO.: HA14

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road - Lot 1 and 2

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 17/02/2025

CO-ORDINATES: 1638595mE, 6069001mN

ELEVATION: Ground

END DATE: 17/02/2025

CONTRACTOR: Internal

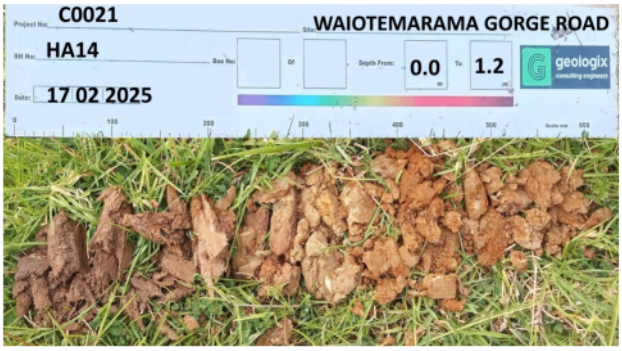
RIG: 50 mm Auger

DRILLER: GB/TW

LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm) 2 4 6 8 10 12 14 16 18	VANE SHEAR STRENGTH (kPa) Vane: 50 100 150 200 Values	WATER
TOPSOIL comprising of organic SILT with trace rootlets; dark brown. Moist; low plasticity.		0.2	TS			Groundwater Not Encountered
Clayey SILT; brown with orange and black specks. Moist; low plasticity; [Northland Allochthon].		0.4				
Silty CLAY; brown with orange brown mottles. Moist; high plasticity; [Northland Allochthon].		0.6				
Clayey SILT; brown with orange mottles. Moist; low plasticity; [Northland Allochthon].		0.8				
		1.0				
End Of Hole: 1.20m		1.2				
		1.4				
		1.6				
		1.8				
		2.0				
		2.2				
		2.4				
		2.6				
		2.8				

PHOTO(S)



REMARKS

1. Hand auger drilled to target depth of 1.2 m bgl.
2. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

HOLE NO.: HA15

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road - Lot 1 and 2

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 17/02/2025

CO-ORDINATES: 1638588mE, 6068942mN

ELEVATION: Ground

END DATE: 17/02/2025

CONTRACTOR: Internal

RIG: 50 mm Auger

DRILLER: GB/TW

LOGGED BY: GB

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	Values	WATER
TOPSOIL comprising of organic SILT with some clay, trace rootlets; dark brown. Moist; low plasticity.		0.0	TS				
SILT, with some clay, with minor sand and gravel; brown with orange and dark orange mottles. Stiff to very stiff; moist; low plasticity; sand, fine, gravel, fine to medium; [Northland Allochthon].		0.2 – 2.6				53 12 / 104 20 / 152 51 / 173 38 / 202+ - / 133 29 / 123 43 / 130 58 / 114 64 / 113 64 / 202+ - / 168 87 / 202+ - / 202+ UTP -	Groundwater Not Encountered
1.5m: Becoming hard.							
Clayey SILT, with some sand and gravel; dark bluish grey. Very stiff; moist to wet; low plasticity; sand, fine, gravel, fine to medium; [Northland Allochthon].							
Silty CLAY, with minor sand and gravel; dark bluish grey. Very stiff to hard; wet; high plasticity; sand, fine, gravel, fine; [Northland Allochthon].							
3.3m: Becoming hard.							
End Of Hole: 4.30m		4.4 – 5.8		3, 3, 4, 4, 5, 5, 6, 7, 7, 10, 9, 9, 9, 10, 10, 12			

PHOTO(S)

REMARKS

1. Hand Auger refused at 4.3 m bgl due to dense strata encountered.
2. Continued with DCP from 4.3 m bgl to 5.9 m bgl.
3. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

HOLE NO.: HA16

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road - Lot 1 and 2

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 17/02/2025

CO-ORDINATES: 1638573mE, 6068929mN

ELEVATION: Ground

END DATE: 17/02/2025

CONTRACTOR: Internal

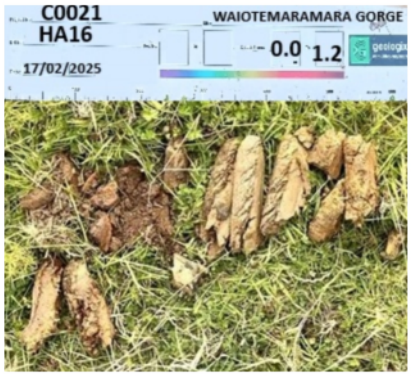
RIG: 50 mm Auger

DRILLER: GB/TW

LOGGED BY: GB

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa)	WATER
TOPSOIL comprising of organic SILT, trace rootlets; dark brown with dark orange limonite inclusions. Dry; friable.		0.0 – 0.4	TS	2 4 6 8 10 12 14 16 18	Vane: 50 100 150 200 Values	Groundwater Not Encountered
Clayey SILT; greyish brown with orange mottles. Moist; low plasticity; [Northland Allochthon].		0.4 – 1.2				
0.8m - 1.2m: Becoming orange brown with dark orange mottles; trace fine sand and gravels.						
1.2m - 1.2m: Trace wood inclusions.						
End Of Hole: 1.20m		1.2 – 2.8				

PHOTO(S)



REMARKS

1. Hand auger drilled to target depth of 1.2 m bgl.
2. Groundwater not encountered at the time of drilling.

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

INVESTIGATION LOG

HOLE NO.: HA17

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road - Lot 1 and 2

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 17/02/2025

CO-ORDINATES: 1638600mE, 6068955mN

ELEVATION: Ground

END DATE: 17/02/2025

CONTRACTOR: Internal

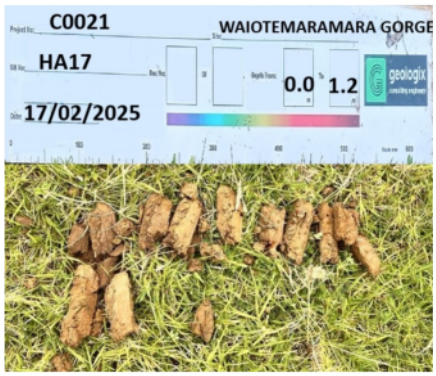
RIG: 50 mm Auger

DRILLER: GB/TW

LOGGED BY: GB

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa)	WATER
TOPSOIL comprising of organic SILT with some clay, trace rootlets; dark brown. Moist; low plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	Vane: 50 100 150 200 Values	Groundwater Not Encountered
Clayey SILT, with trace gravel; greyish brown with orange and dark orange mottles. Moist; low plasticity; gravel, fine to medium; [Northland Allochthon].		0.2				
		0.4				
		0.6				
		0.8				
		1.0				
End Of Hole: 1.20m		1.2				
		1.4				
		1.6				
		1.8				
		2.0				
		2.2				
		2.4				
		2.6				
		2.8				

PHOTO(S)



REMARKS

1. Hand auger drilled to target depth of 1.2 m bgl.
2. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

geologix
consulting engineers

APPENDIX C

Assessment of Environmental Effects and Assessment Criteria

Table 13: Wastewater Assessment of Environmental Effects

Item	NRC Separation Requirement[2]	FNDC Separation Requirement	Site Assessment[3]
-Individual System Effects			
Flood plains	Above 5 % AEP	NR	Complies. Disposal field well above mapped flood hazard.
Stormwater flowpath[4]	5 m	NR	Complies.
Surface water feature[5]	15 m	15 m, increased to 30 m in certain conditions	Complies.
Coastal Marine Area	15 m	30 m	Complies.
Existing water supply bore.	20 m	NR	Complies.
Property boundary	1.5 m	1.5	Complies. Including proposed subdivision boundaries.
Winter groundwater table	0.6 m	0.6 m	Complies. Disposal fields may require raising by up to 400 mm.
Topography			Complies, >10 ° and <25 °.
Cut off drain required?			Yes. Provided on Drawing No. 400.
Discharge Consent Required?			No.
	TP58	**NZS1547**	
Cumulative Effects			
Biological Oxygen Demand		≤20 g/m^3	Complies – secondary treatment.
Total Suspended Solids		≤30 g/m^3	Complies – secondary treatment.
Total Nitrogen	10 – 30 g/m^3	15 – 75 g/m^3	Complies – secondary treatment.
Phosphorous	NR	4 – 10 g/m^3	Complies – secondary treatment.
Ammonia	NR	Negligible	Complies – secondary treatment.
Nitrites/ Nitrates	NR	15 – 45 g/m^3	Complies – secondary treatment.
Conclusion: Effects are less than minor on the environment.			

1. AEE based on proposed secondary treated effluent.
2. Northland Regional Plan Table 9.
3. Based on the recommendations of this report and Drawing No. 400.
4. Including any formed road with kerb and channel, and water-table drain that is down-slope of the disposal area.
5. River, lake, stream, pond, dam, or natural wetland.
AEP Annual Exceedance Probability.
NR No Requirement.

Table 14: Proposed Northland Regional Plan Stormwater Assessment Criteria, to rule C.6.4.2

Assessment Criteria	Comments
1) the discharge or diversion is not from: a) a public stormwater network, or b) a high-risk industrial or trade premises	Complies.
2) the diversion and discharge does not cause or increase flooding of land on another property in a storm event of up to and including a 10 percent annual exceedance probability, or flooding of buildings on another property in a storm event of up to and including a one percent annual exceedance probability	Complies, attenuation to 80 % of pre development level for 20 % AEP event more conservative than pre development of the 10 % AEP event.
3) where the diversion or discharge is from a hazardous substance storage or handling area: a) the stormwater collection system is designed and operated to prevent hazardous substances stored or used on the site from entering the stormwater system, or b) there is a secondary containment system in place to intercept any spillage of hazardous substances and either discharges that spillage to a trade waste system or stores it for removal and treatment, or c) if the stormwater contains oil contaminants, the stormwater is passed through a stormwater treatment system designed in accordance with the Environmental Guidelines for Water Discharges from Petroleum Industry Sites in New Zealand (Ministry for the Environment, 1998) prior to discharge	Complies. Site is residential.
4) where the diversion or discharge is from an industrial or trade premises: a) the stormwater collection system is designed and operated to prevent any contaminants stored or used on the site, other than those already controlled by condition 3) above, from entering stormwater unless the stormwater is discharged through a stormwater treatment system, and b) any process water or liquid waste stream on the site is bunded, or otherwise contained, within an area of sufficient capacity to provide secondary containment equivalent to 100 percent of the quantity of any process water or liquid waste that has the potential to spill into a stormwater collection system, in order to prevent trade waste entering the stormwater collection system	Complies. Site is residential.
5) the diversion or discharge is not into potentially contaminated land, or onto potentially contaminated land that is not covered by an impervious area	Complies.
6) the diversion and discharge does not cause permanent scouring or erosion of the bed of a water body at the point of discharge	Complies, specifically sized discharge devices are provided from all on-lot devices.
7) the discharge does not contain more than 15 milligrams per litre of total petroleum hydrocarbons	Complies. Site is residential.
8) the discharge does not cause any of the following effects in the receiving waters beyond the zone of reasonable mixing: a) the production of conspicuous oil or grease films, scums, or foams, of floatable or suspended materials, or b) a conspicuous change in the colour or visual clarity, or c) an emission of objectionable odour, or d) the rendering of fresh water unsuitable for consumption by farm animals, or 163	Complies.

e) the rendering of fresh water taken from a mapped priority drinking water abstraction point (refer I Maps | Ngā mahere matawhenua) unsuitable for human consumption after existing treatment.

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APPENDIX D

Stormwater Calculations

Project Ref:	C0021		**STORMWATER ATTENUATION TANK DESIGN**	geologix consulting engineers
Project Address:	WAIOTEMARAMA GORGE ROAD			
Design Case:	CONCEPT FUTURE DEVELOPMENT		**50 % AEP STORM EVENT, 80 % OF PRE DEVELOPMENT**	
Date:	13 October 2023	REV 1		

ATTENUATION DESIGN PROVIDED IN ACCORDANCE WITH NEW ZEALAND BUILDING CODE E1 FOR THE RATIONALE METHOD ACCOUNTING FOR THE EFFECTS OF PREDICTED 2.1 DEGREE CLIMATE CHANGE. RESIDENTIAL DEVELOPMENT AREAS ARE BASED ON EXISTING SURVEY DATA.
RUNOFF COEFFIENTS DETERMINED FROM FNDC ENGINEERING STANDARDS 2023 TABLE 4-3.

PREDEVELOPMENT SCENARIO				**POST DEVELOPMENT SCENARIO**			
ITEM	AREA, A, m2	COEFFICIENT, C	RUNOFF, l/s	ITEM	AREA, A, m2	COEFFICIENT, C	RUNOFF, l/s
IMPERVIOUS A	0	0	0.00	TO TANK	300	0.96	5.64
IMPERVIOUS B	0	0	0.00	OFFSET	200	0.83	3.25
IMPERVIOUS C	0	0	0.00	PERVIOUS	0	0.67	0.00
EX. PERVIOUS	500	0.67	6.56	EX. CONSENTED	0	0.96	0.00
TOTAL	**500**	TYPE D	**6.56**	**TOTAL**	**500**	TYPE D	**8.89**

PRE DEVELOPMENT RUNOFF			
50 % AEP RAINFALL INTENSITY, 10 MIN, I, mm/hr	56.1	mm/hr	* CLIMATE CHANGE FACTOR CALCULATED IN ACCORDANCE WITH NIWA HIRDS RECOMMENDATIONS. HISTORIC RAINFALL INTENSITY, 10 MINUTES IS MULTIPLIED BY POTENTIAL CLIMATE CHANGE FACTORS. NIWA RECOMMENDS THAT FOR 10 MINUTE TO 1 HOUR ADOPT THE 1 HR FACTOR.
CLIMATE CHANGE FACTOR, 2.1 DEG, 10 MIN*	25.62	%	
50 % AEP RAINFALL INTENSITY, 10 MIN WITH CC	70.47	mm/hr	
50 % AEP PRE DEVELOPMENT PEAK FLOW	6.56	l/s	
80 % OF PRE DEVELOPMENT PEAK FLOW	**5.25**	**l/s**	

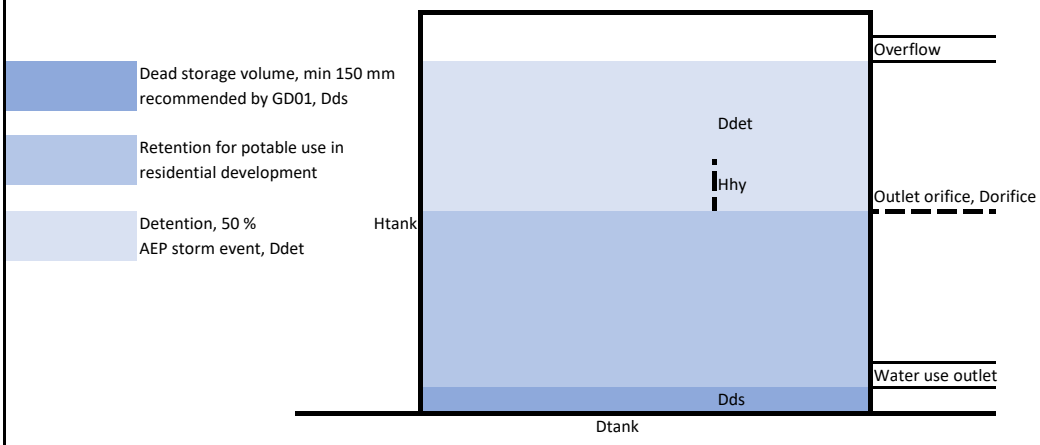
INCREASED POST DEVELOPMENT RUNOFF, 50 % AEP WITH CLIMATE CHANGE PROJECTION OF 2.1 DEGREES

TIME, min	INTENSITY, mm/hr	CC FACTOR	CC INTENSITY, mm/hr	RUNOFF, Q, l/s	Allowable flow, l/s	Difference, l/s	Required Storage, litres
10	56.10	1.2562	70.47	8.89	2.00	6.89	4134
20	39.20	1.2562	49.24	6.21	2.00	4.21	5056
30	31.70	1.2562	39.82	5.02	2.00	3.03	5445
60	21.80	1.2562	27.39	3.45	2.00	1.46	5245
120	14.80	1.2457	18.44	2.33	2.00	0.33	2364
360	7.83	1.2058	9.44	1.19	2.00	No Att. Req.	0
720	5.13	1.1785	6.05	0.76	2.00	No Att. Req.	0
1440	3.30	1.1512	3.80	0.48	2.00	No Att. Req.	0
2880	2.08	1.1281	2.35	0.30	2.00	No Att. Req.	0
4320	1.57	1.1155	1.75	0.22	2.00	No Att. Req.	0

NOTE: ALLOWABLE FLOW PROVIDES FOR ANY OFFSET ARISING FROM FLOWS NOT DIRECTLY DISCHARGING TO TANK

ATTENUATION TANK DESIGN OUTPUT

Concept sizing assuming 25,000 litre tank



SPECIFICATION

			NOTES:
TOTAL STORAGE REQUIRED	5.445	m3	
TANK HEIGHT, Htank	2.6	m	Concept sizing assuming 25,000 litre tank
TANK DIAMTER, Dtank	3.5	m	No. of Tanks 1
TANK AREA, Atank	9.62	m2	Single tank area
TANK MAX STORAGE VOLUME, Vtank	25015	litres	
REQUIRED STORAGE HEIGHT, Ddet	0.57	m	Below overflow
DEAD STORAGE VOLUME, Dds	0.15	m	GD01 recommended minimum
TOTAL WATER DEPTH REQUIRED	0.72	m	
AVERAGE DISCHARGE RATE, Qavg	0.00006	m3/s	
AVERAGE HYDRAULIC HEAD, Hhy	0.28	m	
AREA OF ORIFICE, Aorifice	4.31E-05	m2	
ORIFICE DIAMETER, Dorifice	7	mm	**Minimum 10 mm diameter**
VELOCITY AT ORIFICE	3.33	m/s	
ACHIEVABLE STORAGE OF SURFACES TO TANK IN 24 HOURS	51364	litres/ 24hrs	
AREA TO TANK CAN SERVICE ATTENUATION?		YES	

Project Ref:	C0021		**STORMWATER ATTENUATION TANK DESIGN**	geologix consulting engineers
Project Address:	WAIOTEMARAMA GORGE ROAD			
Design Case:	CONCEPT FUTURE DEVELOPMENT		**20 % AEP STORM EVENT, 80 % OF PRE DEVELOPMENT**	
Date:	13 October 2023	REV 1		

ATTENUATION DESIGN PROVIDED IN ACCORDANCE WITH NEW ZEALAND BUILDING CODE E1 FOR THE RATIONALE METHOD ACCOUNTING FOR THE EFFECTS OF PREDICTED 2.1 DEGREE CLIMATE CHANGE. RESIDENTIAL DEVELOPMENT AREAS ARE BASED ON EXISTING SURVEY DATA.
RUNOFF COEFFIENTS DETERMINED FROM FNDC ENGINEERING STANDARDS 2023 TABLE 4-3.

PREDEVELOPMENT SCENARIO				**POST DEVELOPMENT SCENARIO**			
ITEM	AREA, A, m2	COEFFICIENT, C	RUNOFF, l/s	ITEM	AREA, A, m2	COEFFICIENT, C	RUNOFF, l/s
IMPERVIOUS A	0	0	0.00	TO TANK	300	0.96	7.37
IMPERVIOUS B	0	0	0.00	OFFSET	200	0.83	4.25
IMPERVIOUS C	0	0	0.00	PERVIOUS	0	0.67	0.00
EX. PERVIOUS	500	0.67	8.57	EX. CONSENTED	0	0.96	0.00
TOTAL	**500**	TYPE D	**8.57**	**TOTAL**	**500**	TYPE D	**11.62**

PRE DEVELOPMENT RUNOFF			
20 % AEP RAINFALL INTENSITY, 10 MIN, I, mm/hr	72.6	mm/hr	* CLIMATE CHANGE FACTOR CALCULATED IN ACCORDANCE WITH NIWA HIRDS RECOMMENDATIONS. HISTORIC RAINFALL INTENSITY, 10 MINUTES IS MULTIPLIED BY POTENTIAL CLIMATE CHANGE FACTORS. NIWA RECOMMENDS THAT FOR 10 MINUTE TO 1 HOUR ADOPT THE 1 HR FACTOR.
CLIMATE CHANGE FACTOR, 2.1 DEG, 10 MIN*	26.88	%	
20 % AEP RAINFALL INTENSITY, 10 MIN WITH CC	92.1	mm/hr	
20 % AEP PRE DEVELOPMENT PEAK FLOW	8.57	l/s	
80 % OF PRE DEVELOPMENT PEAK FLOW	**6.86**	**l/s**	

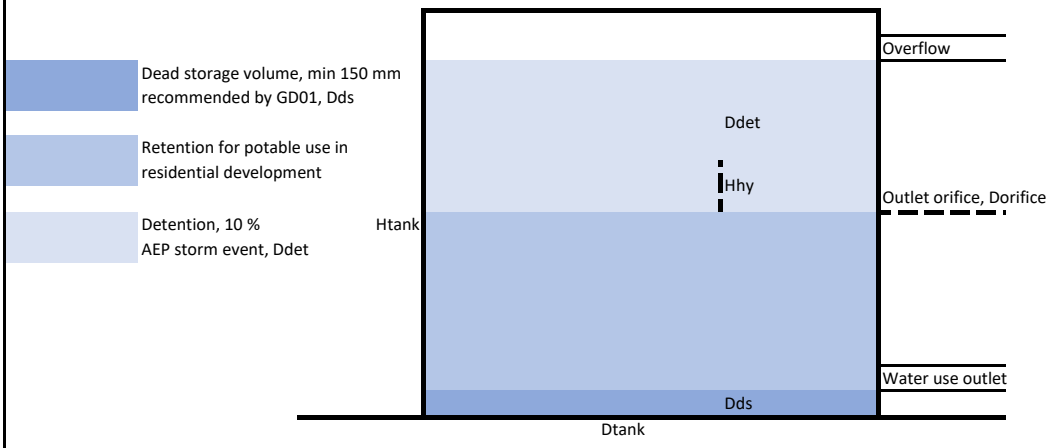
INCREASED POST DEVELOPMENT RUNOFF, 10 % AEP WITH CLIMATE CHANGE PROJECTION OF 2.1 DEGREES

TIME, min	INTENSITY, mm/hr	CC FACTOR	CC INTENSITY, mm/hr	RUNOFF, Q, l/s	Allowable flow, l/s	Difference, l/s	Required Storage, litres
10	72.60	1.2688	92.11	11.62	2.61	9.01	5404
20	50.80	1.2688	64.46	8.13	2.61	5.52	6622
30	41.10	1.2688	52.15	6.58	2.61	3.97	7140
60	28.30	1.2688	35.91	4.53	2.61	1.92	6906
120	19.30	1.2583	24.29	3.06	2.61	0.45	3260
360	10.20	1.2205	12.45	1.57	2.61	No Att. Req.	0
720	6.71	1.1932	8.01	1.01	2.61	No Att. Req.	0
1440	4.32	1.1638	5.03	0.63	2.61	No Att. Req.	0
2880	2.73	1.1407	3.11	0.39	2.61	No Att. Req.	0
4320	2.06	1.1302	2.33	0.29	2.61	No Att. Req.	0

NOTE: ALLOWABLE FLOW PROVIDES FOR ANY OFFSET ARISING FROM FLOWS NOT DIRECTLY DISCHARGING TO TANK

ATTENUATION TANK DESIGN OUTPUT

Concept sizing assuming 25,000 litre tank



SPECIFICATION

TOTAL STORAGE REQUIRED	7.140	m3		
TANK HEIGHT, Htank	2.6	m	Concept sizing assuming 25,000 litre tank	
TANK DIAMETER, Dtank	3.5	m	No. of Tanks	1
TANK AREA, Atank	9.62	m2	Single tank area	
TANK MAX STORAGE VOLUME, Vtank	25015	litres		
REQUIRED STORAGE HEIGHT, Ddet	0.74	m	Below overflow	
DEAD STORAGE VOLUME, Dds	0.15	m	GD01 recommended minimum	
TOTAL WATER DEPTH REQUIRED	0.89	m		
AVERAGE DISCHARGE RATE, Qavg	0.00008	m3/s		
AVERAGE HYDRAULIC HEAD, Hhy	0.37	m		
AREA OF ORIFICE, Aorifice	4.94E-05	m2		
ORIFICE DIAMETER, Dorifice	8	mm	**Minimum 10 mm diameter**	
VELOCITY AT ORIFICE	3.82	m/s		
ACHIEVABLE STORAGE OF SURFACES	67735	litres/ 24hrs		
AREA TO TANK CAN SERVICE ATTENUATION?		YES		

Project Ref:	C0021		**STORMWATER ATTENUATION TANK DESIGN**	geologix consulting engineers
Project Address:	WAIOTEMARAMA GORGE ROAD			
Design Case:	CONCEPT FUTURE DEVELOPMENT		**10 % AEP STORM EVENT**	
Date:	13 October 2023	REV 1		

ATTENUATION DESIGN PROVIDED IN ACCORDANCE WITH NEW ZEALAND BUILDING CODE E1 FOR THE RATIONALE METHOD ACCOUNTING FOR THE EFFECTS OF PREDICTED 2.1 DEGREE CLIMATE CHANGE. RESIDENTIAL DEVELOPMENT AREAS ARE BASED ON EXISTING SURVEY DATA.

RUNOFF COEFFIENTS DETERMINED FROM FNDC ENGINEERING STANDARDS 2023 TABLE 4-3.

PREDEVELOPMENT SCENARIO				**POST DEVELOPMENT SCENARIO**			
ITEM	AREA, A, m2	COEFFICIENT, C	RUNOFF, l/s	ITEM	AREA, A, m2	COEFFICIENT, C	RUNOFF, l/s
IMPERVIOUS A	0	0	0.00	TO TANK	300	0.96	8.64
IMPERVIOUS B	0	0	0.00	OFFSET	200	0.83	4.98
IMPERVIOUS C	0	0	0.00	PERVIOUS	0	0.67	0.00
EX. PERVIOUS	500	0.67	10.05	EX. CONSENTED	0	0.96	0.00
TOTAL	**500**	TYPE D	**10.05**	**TOTAL**	**500**	TYPE D	**13.62**

PRE DEVELOPMENT RUNOFF			
10 % AEP RAINFALL INTENSITY, 10 MIN, I, mm/hr	84.7	mm/hr	* CLIMATE CHANGE FACTOR CALCULATED IN ACCORDANCE WITH NIWA
CLIMATE CHANGE FACTOR, 2.1 DEG, 10 MIN*	27.51	%	HIRDS RECOMMENDATIONS. HISTORIC RAINFALL INTENSITY, 10 MINUTES
10 % AEP RAINFALL INTENSITY, 10 MIN WITH CC	108.0	mm/hr	IS MULTIPLIED BY POTENTIAL CLIMATE CHANGE FACTORS. NIWA
10 % AEP PRE DEVELOPMENT PEAK FLOW	10.05	l/s	RECOMMENDS THAT FOR 10 MINUTE TO 1 HOUR ADOPT 1 HR FACTOR

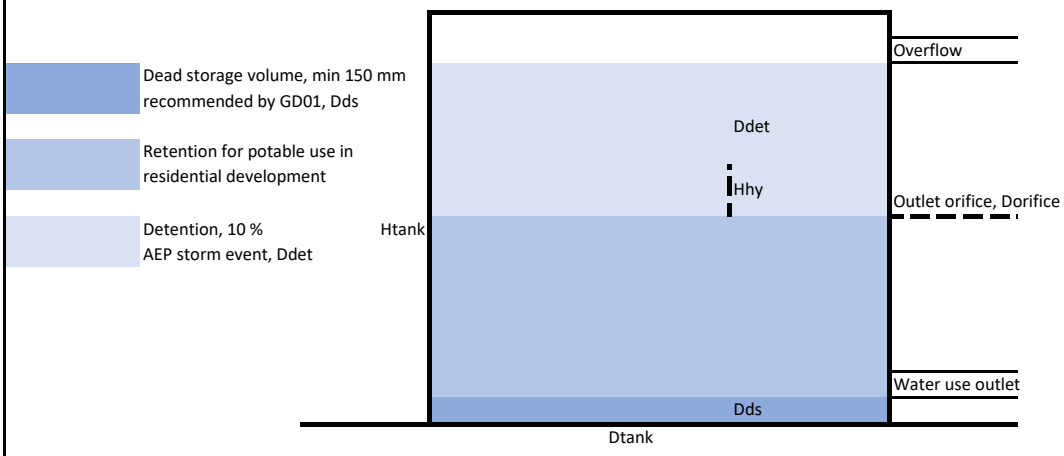
INCREASED POST DEVELOPMENT RUNOFF, 10 % AEP WITH CLIMATE CHANGE PROJECTION OF 2.1 DEGREES

TIME, min	INTENSITY, mm/hr	CC FACTOR	CC INTENSITY, mm/hr	RUNOFF, Q, l/s	Allowable flow, l/s	Difference, l/s	Required Storage, litres
10	84.70	1.2751	108.00	13.62	5.07	8.55	5130
20	59.40	1.2751	75.74	9.55	5.07	4.48	5378
30	48.10	1.2751	61.33	7.73	5.07	2.66	4796
60	33.20	1.2751	42.33	5.34	5.07	0.27	967
120	22.70	1.2646	28.71	3.62	5.07	No Att. Req.	0
360	12.00	1.2268	14.72	1.86	5.07	No Att. Req.	0
720	7.89	1.1995	9.46	1.19	5.07	No Att. Req.	0
1440	5.09	1.1701	5.96	0.75	5.07	No Att. Req.	0
2880	3.22	1.147	3.69	0.47	5.07	No Att. Req.	0
4320	2.44	1.1365	2.77	0.35	5.07	No Att. Req.	0

NOTE: ALLOWABLE FLOW PROVIDES FOR ANY OFFSET ARISING FROM FLOWS NOT DIRECTLY DISCHARGING TO TANK

ATTENUATION TANK DESIGN OUTPUT

Concept sizing assuming 25,000 litre tank



SPECIFICATION

TOTAL STORAGE REQUIRED	5.378	m3		
TANK HEIGHT, Htank	2.6	m	Concept sizing assuming 25,000 litre tank	
TANK DIAMETER, Dtank	3.5	m	No. of Tanks	1
TANK AREA, Atank	9.62	m2	Single tank area	
TANK MAX STORAGE VOLUME, Vtank	25015	litres		
REQUIRED STORAGE HEIGHT, Ddet	0.56	m	Below overflow	
DEAD STORAGE VOLUME, Dds	0.15	m	GD01 recommended minimum	
TOTAL WATER DEPTH REQUIRED	0.71	m		
AVERAGE DISCHARGE RATE, Qavg	0.00006	m3/s		
AVERAGE HYDRAULIC HEAD, Hhy	0.28	m		
AREA OF ORIFICE, Aorifice	4.29E-05	m2		
ORIFICE DIAMETER, Dorifice	7	mm	**Minimum 10 mm diameter**	
VELOCITY AT ORIFICE	3.31	m/s		
ACHIEVABLE STORAGE OF SURFACES	80023	litres/ 24hrs		
AREA TO TANK CAN SERVICE ATTENUATION?		YES		

Project Ref:	C0021		STORMWATER DISPERSION PIPE/ TRENCH	geologix consulting engineers
Project Address:	WAIOTEMARAMA GORGE ROAD			
Design Case:	CONCEPT FUTURE DEVELOPMENT		WEIGHTED RUNOFF	
Date:	13 October 2023	REV 1		

TP108 Worksheet 1 - Runoff curve number & Initial Abstraction

Soil Class	Cover description	Curve Number, CN	Area	Product of CN * Area
TYPE D	TO TANK	98	300	29400
TYPE D	OFFSET	89	200	17800
TYPE D	PERVIOUS	80	0	0
TYPE D	EX. CONSENTED	98	0	0
		Total	**500**	**47200**
		Total Pervious	0	m2
		Total Impervious	500	m2
		Weighted Runoff, CN	**94.4**	
		Weighted Initial Abstraction, Ia	**0.0**	mm

TP108, FIGURE 5.1

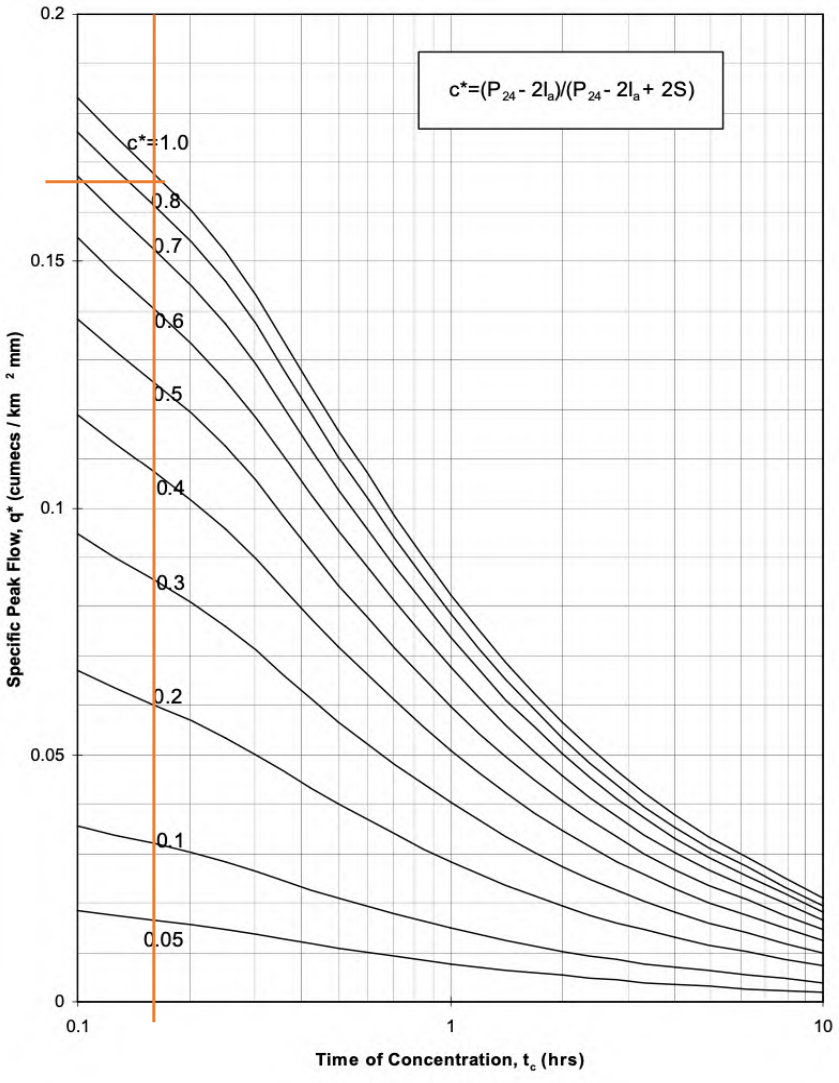


Figure 5.1 - Specific Peak Flow Rate

Project Ref:	C0021	**STORMWATER DISPERSION PIPE/ TRENCH**	geologix consulting engineers
Project Address:	WAIOTEMARAMA GORGE ROAD		
Design Case:	CONCEPT FUTURE DEVELOPMENT	**DISCHARGE DEVICE - LEVEL SPREADER OR TRENCH**	
Date:	13 October 2023 REV 1		

DESIGN BASED ON REFERENCED DEVELOPMENT PLANS TO PROVIDE A MINIMUM LENGTH OF ABOVE OR BELOW GROUND STORMWATER TANK OVERFLOW DISCHARGE DISPERSION DEVICE. IN GENERAL ACCORDANCE WITH TP108 GRAPHICAL METHOD BASED ON NIWA HIRDS DEPTH-DURATION DATA AND ACCOUNTING FOR THE PROVISION OF CLIMATE CHANGE.

DESIGN STORM EVENT **1%** AEP EVENT

ESTIMATE DESIGN RAINFALL DEPTH, P24

RAINFALL DEPTH	24 HR DURATION	1%	188	mm
CLIMATE CHANGE FACTOR	2.1 DEGREE INCREASE,24 HR	1%	8.6	%
RAINFALL DEPTH WITH CC, P24			204.2	mm

ESTIMATE DETENTION VOLUME, TP108 GRAPHICAL METHOD

PEAK FLOW RATE, qp = q* x A x P24

WHERE,
- q*= SPECIFIC PEAK FLOW RATE (l/s)
- P24= 24 HR DESIGN RAINFALL DEPTH (mm)
- A= CATCHMENT AREA TO BE MITIGATED (m2)

CURVE NUMBER, CN (WEIGHTED)	94		See summary table.
INITIAL ABSTRACTION, Ia	0.00	mm	As TP108, adopt 0 mm impervious, 5 mm pervious, value adopted is weighted
MITIGATION AREA, Am	500	m2	Impervious areas within this design
SOIL STORAGE, S	15.1	mm	
RUNOFF INDEX, C*	0.87	mm	
TIME OF CONCENTRATION, tc	0.167	hrs	
SPECIFIC PEAK FLOWRATE, q*	0.166		TP108, Figure 5.1, see next page.
PEAK FLOWRATE, qp	16.95	l/s	
RUNOFF DEPTH, Q24	190.1	mm	
RUNOFF VOLUME, V24	95068	litres	

CONSTRUCTION OF DISPERSION ABOVE GROUND PIPE OR PIPE WITHIN TRENCH

DIA. OF ORIFICE, D	10	mm
AREA OF ORIFICE, A	78.54	mm2
DESIGN VELOCITY, Dv	5.09	m/s
NUMBER OF ORIFICES	43	No.
ORIFICE INTERVALS, C/C	200	mm
DISPERSION PIPE LENGTH	8.4	m

Project Ref:	C0021	STORMWATER ATTENUATION TANK DESIGN	geologix consulting engineers
Project Address:	WAIOTEMARAMA GORGE ROAD		
Design Case:	CONCEPT FUTURE DEVELOPMENT	CLIMATE CHANGE FACTORS	
Date:	13 October 2023 REV 1		

CLIMATE CHANGE PROJECTIONS

REPRODUCED FROM NIWA HIRDS, *https://niwa.co.nz/information-services/hirds/help*

Duration/ARI	2 yr	5 yr	10 yr	20 yr	30 yr	40 yr	50 yr	60 yr	80 yr	100 yr
1 hour	12.2	12.8	13.1	13.3	13.4	13.4	13.5	13.5	13.6	13.6
2 hours	11.7	12.3	12.6	12.8	12.9	12.9	13	13	13.1	13.1
6 hours	9.8	10.5	10.8	11.1	11.2	11.3	11.3	11.4	11.4	11.5
12 hours	8.5	9.2	9.5	9.7	9.8	9.9	9.9	10	10	10.1
24 hours	7.2	7.8	8.1	8.2	8.3	8.4	8.4	8.5	8.5	8.6
48 hours	6.1	6.7	7	7.2	7.3	7.3	7.4	7.4	7.5	7.5
72 hours	5.5	6.2	6.5	6.6	6.7	6.8	6.8	6.9	6.9	6.9
96 hours	5.1	5.7	6	6.2	6.3	6.3	6.4	6.4	6.4	6.5
120 hours	4.8	5.4	5.7	5.8	5.9	6	6	6	6.1	6.1

HIRDS V4 Intensity-Duration-Frequency Results
Sitename: waiotemarama gorge road
Coordinate system: WGS84
Longitude: 173.4261
Latitude: -35.5266

DDF Mode Parameters:	c	d	e	f	g	h	i
Values:	0.00247304	0.4523835	-0.0121567	-0.00090973	0.25186548	-0.0110854	2.9914247

Example:	Duration (hrs)	ARI (yrs)	x	y	Rainfall Rate (mm/hr)
	24	100	3.17805383	4.60014923	7.840310188

Rainfall intensities (mm/hr) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	51.3	35.8	28.9	19.9	13.5	7.14	4.67	3	1.9	1.4	1.2	0.99
2	0.5	56.1	39.2	31.7	21.8	14.8	7.83	5.13	3.3	2.1	1.6	1.3	1.09
5	0.2	72.6	50.8	41.1	28.3	19.3	10.2	6.71	4.3	2.7	2.1	1.7	1.44
10	0.1	84.7	59.4	48.1	33.2	22.7	12	7.89	5.1	3.2	2.4	2	1.7
20	0.05	97.1	68.2	55.2	38.2	26.1	13.9	9.12	5.9	3.7	2.8	2.3	1.97
30	0.033	105	73.4	59.4	41.1	28.1	15	9.85	6.4	4	3.1	2.5	2.13
40	0.025	110	77.1	62.5	43.3	29.6	15.8	10.4	6.7	4.3	3.2	2.6	2.25
50	0.02	114	80.1	64.9	44.9	30.8	16.4	10.8	7	4.4	3.4	2.8	2.34
60	0.017	117	82.5	66.9	46.3	31.7	16.9	11.1	7.2	4.6	3.5	2.8	2.42
80	0.013	123	86.3	70	48.5	33.2	17.7	11.7	7.6	4.8	3.6	3	2.54
100	0.01	127	89.2	72.4	50.2	34.4	18.4	12.1	7.8	5	3.8	3.1	2.64
250	0.004	144	101	82.1	57	39.2	21	13.8	9	5.7	4.3	3.6	3.03

Intensity standard error (mm/hr) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	6.6	4.1	3.1	2.2	1.5	0.92	0.69	0.3	0.2	0.1	0.1	0.09
2	0.5	7.3	4.5	3.4	2.4	1.7	1	0.75	0.3	0.2	0.2	0.1	0.1
5	0.2	10	6.5	4.8	3.4	2.3	1.4	0.99	0.4	0.3	0.2	0.2	0.14
10	0.1	13	8.6	6.3	4.3	3	1.7	1.2	0.5	0.3	0.3	0.2	0.17
20	0.05	16	11	8.3	5.6	3.8	2.1	1.5	0.6	0.4	0.3	0.3	0.22
30	0.033	19	13	9.8	6.5	4.4	2.5	1.7	0.7	0.5	0.4	0.3	0.25
40	0.025	21	15	11	7.2	4.8	2.7	1.9	0.8	0.5	0.4	0.3	0.27
50	0.02	23	16	12	7.8	5.2	2.9	2	0.9	0.6	0.4	0.3	0.29
60	0.017	24	17	13	8.3	5.5	3.1	2.1	0.9	0.6	0.4	0.4	0.31
80	0.013	27	19	14	9.2	6.1	3.5	2.4	1	0.6	0.5	0.4	0.34
100	0.01	29	21	16	10	6.6	3.7	2.5	1.1	0.7	0.5	0.4	0.37
250	0.004	40	29	22	14	8.9	5.1	3.5	1.5	0.9	0.7	0.6	0.49

Rainfall intensities (mm/hr) :: RCP2.6 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	54.9	38.4	31	21.3	14.4	7.53	4.89	3.1	2	1.5	1.2	1.02
2	0.5	60.2	42.1	34	23.4	15.9	8.29	5.39	3.4	2.2	1.6	1.3	1.12
5	0.2	78.1	54.7	44.2	30.5	20.7	10.9	7.07	4.5	2.8	2.1	1.7	1.48
10	0.1	91.3	64	51.8	35.7	24.3	12.8	8.34	5.3	3.4	2.5	2.1	1.75
20	0.05	105	73.5	59.5	41.2	28	14.8	9.64	6.2	3.9	2.9	2.4	2.03
30	0.033	113	79.2	64.1	44.4	30.3	16	10.4	6.7	4.2	3.2	2.6	2.21
40	0.025	118	83.2	67.4	46.7	31.9	16.8	11	7.1	4.4	3.4	2.7	2.33
50	0.02	123	86.5	70.1	48.5	33.1	17.5	11.4	7.3	4.6	3.5	2.9	2.43
60	0.017	127	89	72.2	50	34.1	18.1	11.8	7.6	4.8	3.6	2.9	2.51
80	0.013	132	93.2	75.6	52.4	35.8	18.9	12.4	7.9	5	3.8	3.1	2.63
100	0.01	137	96.4	78.2	54.2	37	19.6	12.8	8.2	5.2	3.9	3.2	2.73
250	0.004	155	109	88.7	61.6	42.2	22.4	14.7	9.4	6	4.5	3.7	3.14

Rainfall intensities (mm/hr) :: RCP2.6 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	54.9	38.4	31	21.3	14.4	7.53	4.89	3.1	2	1.5	1.2	1.02
2	0.5	60.2	42.1	34	23.4	15.9	8.29	5.39	3.4	2.2	1.6	1.3	1.12
5	0.2	78.1	54.7	44.2	30.5	20.7	10.9	7.07	4.5	2.8	2.1	1.7	1.48
10	0.1	91.3	64	51.8	35.7	24.3	12.8	8.34	5.3	3.4	2.5	2.1	1.75
20	0.05	105	73.5	59.5	41.2	28	14.8	9.64	6.2	3.9	2.9	2.4	2.03
30	0.033	113	79.2	64.1	44.4	30.3	16	10.4	6.7	4.2	3.2	2.6	2.21
40	0.025	118	83.2	67.4	46.7	31.9	16.8	11	7.1	4.4	3.4	2.7	2.33
50	0.02	123	86.5	70.1	48.5	33.1	17.5	11.4	7.3	4.6	3.5	2.9	2.43
60	0.017	127	89	72.2	50	34.1	18.1	11.8	7.6	4.8	3.6	2.9	2.51
80	0.013	132	93.2	75.6	52.4	35.8	18.9	12.4	7.9	5	3.8	3.1	2.63
100	0.01	137	96.4	78.2	54.2	37	19.6	12.8	8.2	5.2	3.9	3.2	2.73
250	0.004	155	109	88.7	61.6	42.2	22.4	14.7	9.4	6	4.5	3.7	3.14

Rainfall intensities (mm/hr) :: RCP4.5 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	55.9	39	31.5	21.7	14.7	7.63	4.95	3.2	2	1.5	1.2	1.02
2	0.5	61.2	42.8	34.5	23.8	16.1	8.4	5.45	3.5	2.2	1.6	1.3	1.13
5	0.2	79.5	55.6	45	31	21.1	11	7.17	4.6	2.9	2.2	1.8	1.49
10	0.1	92.9	65.1	52.7	36.4	24.8	13	8.45	5.4	3.4	2.6	2.1	1.77
20	0.05	107	74.9	60.6	41.9	28.5	15	9.77	6.2	3.9	3	2.4	2.05
30	0.033	115	80.7	65.3	45.2	30.8	16.2	10.6	6.8	4.3	3.2	2.6	2.22
40	0.025	121	84.8	68.7	47.6	32.4	17.1	11.1	7.1	4.5	3.4	2.8	2.35
50	0.02	125	88.1	71.4	49.4	33.7	17.8	11.6	7.4	4.7	3.5	2.9	2.45
60	0.017	129	90.7	73.5	50.9	34.8	18.3	12	7.7	4.8	3.6	3	2.53
80	0.013	135	95	77	53.4	36.4	19.2	12.6	8	5.1	3.8	3.1	2.66
100	0.01	140	98.2	79.6	55.2	37.7	19.9	13	8.3	5.3	4	3.2	2.76
250	0.004	158	111	90.4	62.8	43	22.7	14.9	9.6	6	4.6	3.7	3.17

Rainfall intensities (mm/hr) :: RCP4.5 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	58.7	41	33.1	22.8	15.4	7.95	5.12	3.3	2	1.5	1.2	1.04
2	0.5	64.4	45	36.4	25	16.9	8.76	5.66	3.6	2.2	1.7	1.4	1.15
5	0.2	83.8	58.7	47.5	32.7	22.2	11.5	7.46	4.7	3	2.2	1.8	1.53
10	0.1	98.2	68.8	55.7	38.4	26.1	13.6	8.8	5.6	3.5	2.6	2.1	1.81
20	0.05	113	79.1	64.1	44.3	30.1	15.7	10.2	6.5	4.1	3.1	2.5	2.11
30	0.033	121	85.3	69.1	47.8	32.5	17	11	7	4.4	3.3	2.7	2.28
40	0.025	128	89.7	72.6	50.3	34.2	17.9	11.6	7.4	4.6	3.5	2.8	2.41
50	0.02	133	93.2	75.5	52.3	35.6	18.6	12.1	7.7	4.8	3.6	3	2.51
60	0.017	136	95.9	77.8	53.9	36.7	19.2	12.5	8	5	3.8	3.1	2.6
80	0.013	143	100	81.5	56.5	38.5	20.2	13.1	8.3	5.2	3.9	3.2	2.73
100	0.01	148	104	84.3	58.4	39.8	20.9	13.6	8.7	5.4	4.1	3.3	2.83
250	0.004	167	118	95.7	66.4	45.4	23.9	15.5	9.9	6.2	4.7	3.8	3.26

Rainfall intensities (mm/hr) :: RCP6.0 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	55.5	38.7	31.3	21.5	14.6	7.59	4.92	3.1	2	1.5	1.2	1.02
2	0.5	60.8	42.5	34.3	23.6	16	8.36	5.42	3.5	2.2	1.6	1.3	1.13
5	0.2	78.9	55.2	44.7	30.8	20.9	11	7.13	4.6	2.9	2.2	1.8	1.49
10	0.1	92.3	64.7	52.3	36.1	24.6	12.9	8.4	5.4	3.4	2.5	2.1	1.76
20	0.05	106	74.3	60.2	41.6	28.3	14.9	9.72	6.2	3.9	3	2.4	2.05
30	0.033	114	80.1	64.9	44.9	30.6	16.1	10.5	6.7	4.2	3.2	2.6	2.22
40	0.025	120	84.2	68.2	47.2	32.2	17	11.1	7.1	4.5	3.4	2.8	2.34
50	0.02	124	87.4	70.9	49.1	33.5	17.7	11.5	7.4	4.7	3.5	2.9	2.44
60	0.017	128	90	73	50.6	34.5	18.2	11.9	7.6	4.8	3.6	3	2.52
80	0.013	134	94.3	76.4	53	36.2	19.1	12.5	8	5	3.8	3.1	2.65
100	0.01	139	97.5	79	54.8	37.4	19.8	12.9	8.3	5.2	4	3.2	2.75
250	0.004	157	111	89.7	62.3	42.6	22.6	14.8	9.5	6	4.5	3.7	3.16

Rainfall intensities (mm/hr) :: RCP6.0 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	61.3	42.8	34.5	23.8	16	8.23	5.28	3.3	2.1	1.6	1.3	1.06
2	0.5	67.3	47	38	26.1	17.7	9.08	5.84	3.7	2.3	1.7	1.4	1.18
5	0.2	87.8	61.4	49.7	34.3	23.2	12	7.72	4.9	3	2.3	1.8	1.56
10	0.1	103	72.1	58.3	40.3	27.3	14.1	9.12	5.8	3.6	2.7	2.2	1.85
20	0.05	118	82.9	67.1	46.4	31.5	16.4	10.6	6.7	4.2	3.1	2.5	2.15
30	0.033	127	89.4	72.4	50.1	34	17.7	11.4	7.2	4.5	3.4	2.8	2.34
40	0.025	134	94	76.2	52.7	35.8	18.7	12.1	7.6	4.8	3.6	2.9	2.47
50	0.02	139	97.7	79.2	54.8	37.3	19.4	12.5	7.9	5	3.7	3	2.57
60	0.017	143	101	81.6	56.5	38.4	20.1	13	8.2	5.1	3.9	3.1	2.66
80	0.013	150	105	85.5	59.2	40.3	21	13.6	8.6	5.4	4.1	3.3	2.79
100	0.01	155	109	88.4	61.3	41.7	21.8	14.1	8.9	5.6	4.2	3.4	2.9
250	0.004	175	124	100	69.7	47.5	24.9	16.1	10	6.4	4.8	3.9	3.33

Rainfall intensities (mm/hr) :: RCP8.5 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	56.5	39.5	31.9	21.9	14.8	7.71	4.99	3.2	2	1.5	1.2	1.03
2	0.5	62	43.3	35	24.1	16.3	8.49	5.5	3.5	2.2	1.6	1.3	1.13
5	0.2	80.5	56.4	45.6	31.4	21.3	11.1	7.24	4.6	2.9	2.2	1.8	1.5
10	0.1	94.2	66	53.4	36.9	25.1	13.1	8.53	5.4	3.4	2.6	2.1	1.78
20	0.05	108	75.9	61.4	42.5	28.9	15.2	9.87	6.3	4	3	2.4	2.06
30	0.033	116	81.8	66.2	45.8	31.2	16.4	10.7	6.8	4.3	3.2	2.6	2.24
40	0.025	122	85.9	69.6	48.2	32.9	17.3	11.3	7.2	4.5	3.4	2.8	2.36
50	0.02	127	89.3	72.3	50.1	34.2	18	11.7	7.5	4.7	3.6	2.9	2.46
60	0.017	131	91.9	74.5	51.6	35.2	18.6	12.1	7.7	4.9	3.7	3	2.54
80	0.013	137	96.2	78	54.1	36.9	19.4	12.7	8.1	5.1	3.9	3.1	2.67
100	0.01	141	99.5	80.7	56	38.2	20.2	13.1	8.4	5.3	4	3.3	2.77
250	0.004	160	113	91.6	63.6	43.5	23	15	9.6	6.1	4.6	3.8	3.19

Rainfall intensities (mm/hr) :: RCP8.5 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	67.1	46.8	37.8	26	17.4	8.87	5.63	3.5	2.2	1.6	1.3	1.11
2	0.5	73.8	51.6	41.7	28.7	19.3	9.81	6.25	3.9	2.4	1.8	1.5	1.23
5	0.2	96.6	67.6	54.7	37.7	25.5	13	8.3	5.2	3.2	2.4	1.9	1.64
10	0.1	113	79.5	64.3	44.4	30	15.4	9.83	6.2	3.8	2.8	2.3	1.95
20	0.05	130	91.5	74.1	51.3	34.7	17.8	11.4	7.1	4.4	3.3	2.7	2.26
30	0.033	141	98.8	80	55.4	37.5	19.3	12.3	7.7	4.8	3.6	2.9	2.46
40	0.025	148	104	84.1	58.2	39.5	20.4	13	8.2	5.1	3.8	3.1	2.6
50	0.02	154	108	87.5	60.6	41.1	21.2	13.6	8.5	5.3	4	3.2	2.71
60	0.017	158	111	90.1	62.4	42.4	21.9	14	8.8	5.4	4.1	3.3	2.79
80	0.013	166	117	94.5	65.5	44.4	22.9	14.7	9.2	5.7	4.3	3.5	2.94
100	0.01	171	121	97.7	67.8	46	23.8	15.3	9.6	5.9	4.5	3.6	3.05
250	0.004	194	137	111	77.1	52.4	27.2	17.5	11	6.8	5.1	4.2	3.51

HIRDS V4 Depth-Duration-Frequency Results
Sitename: waiotemarama gorge road
Coordinate system: WGS84
Longitude: 173.4261
Latitude: -35.5266
DDF Model

	c	d	e	f	g	h	i
Parameters:							
Values:	0.00247304	0.4523835	-0.0121567	-0.00090973	0.25186548	-0.0110854	2.99142

Example:	Duration (hrs)	ARI (yrs)	x	y	Rainfall Depth (mm)
	24	100	3.17805383	4.60014923	188.1674445

Rainfall depths (mm) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	8.56	11.9	14.5	19.9	27.1	42.8	56	72	91	103	112	119
2	0.5	9.36	13.1	15.8	21.8	29.7	47	61.5	79	100	113	123	131
5	0.2	12.1	16.9	20.5	28.3	38.6	61.4	80.5	104	131	149	162	172
10	0.1	14.1	19.8	24	33.2	45.3	72.1	94.7	122	154	175	191	204
20	0.05	16.2	22.7	27.6	38.2	52.2	83.2	109	141	179	203	221	236
30	0.033	17.4	24.5	29.7	41.1	56.3	89.9	118	153	194	220	240	256
40	0.025	18.3	25.7	31.3	43.3	59.2	94.6	125	161	204	232	253	270
50	0.02	19	26.7	32.4	44.9	61.5	98.4	130	168	213	242	264	281
60	0.017	19.6	27.5	33.4	46.3	63.4	101	134	173	219	250	272	290
80	0.013	20.4	28.8	35	48.5	66.4	106	140	182	230	262	286	305
100	0.01	21.1	29.7	36.2	50.2	68.8	110	145	188	239	272	297	316
250	0.004	23.9	33.7	41.1	57	78.3	126	166	216	274	312	341	364

Depth standard error (mm) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	1.1	1.5	1.5	2.2	3.1	5.9	8.2	6.4	8.1	8.9	9.6	10
2	0.5	1.2	1.6	1.7	2.4	3.4	6.5	9	7.1	8.9	9.9	11	12
5	0.2	1.6	2.2	2.4	3.4	4.6	8.8	12	9.8	12	14	15	16
10	0.1	2.1	2.8	3.2	4.3	5.8	11	15	12	15	17	18	20
20	0.05	2.6	3.6	4.3	5.6	7.3	13	18	15	19	22	23	26
30	0.033	3	4.1	5	6.5	8.4	15	20	17	21	25	27	29
40	0.025	3.3	4.5	5.6	7.3	9.3	16	22	19	24	27	29	32
50	0.02	3.6	4.9	6.1	7.9	10	18	24	20	25	29	32	35
60	0.017	3.8	5.2	6.5	8.5	11	19	25	22	27	31	34	37
80	0.013	4.2	5.8	7.2	9.5	12	20	28	24	30	34	37	41
100	0.01	4.5	6.3	7.9	10	13	22	30	25	32	37	40	44
250	0.004	6.2	8.7	11	15	18	29	40	34	43	49	54	59

Rainfall depths (mm) :: RCP2.6 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	9.16	12.8	15.5	21.3	28.9	45.2	58.7	75	94	106	115	122
2	0.5	10	14	17	23.4	31.7	49.7	64.6	83	103	117	127	135
5	0.2	13	18.2	22.1	30.5	41.4	65.2	84.9	109	136	154	167	178
10	0.1	15.2	21.3	25.9	35.7	48.7	76.7	100	128	161	182	198	210
20	0.05	17.5	24.5	29.8	41.2	56.1	88.6	116	148	186	211	230	244
30	0.033	18.8	26.4	32.1	44.4	60.5	95.8	125	160	202	229	249	265
40	0.025	19.7	27.7	33.7	46.7	63.7	101	132	169	213	242	263	280
50	0.02	20.5	28.8	35	48.5	66.2	105	137	176	222	251	274	291
60	0.017	21.1	29.7	36.1	50	68.3	108	142	182	229	260	283	301
80	0.013	22.1	31.1	37.8	52.4	71.6	114	149	191	241	273	297	316
100	0.01	22.8	32.1	39.1	54.2	74.1	118	154	198	249	283	308	328
250	0.004	25.8	36.4	44.4	61.6	84.4	134	176	226	286	325	354	377

Rainfall depths (mm) :: RCP2.6 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	9.16	12.8	15.5	21.3	28.9	45.2	58.7	75	94	106	115	122
2	0.5	10	14	17	23.4	31.7	49.7	64.6	83	103	117	127	135
5	0.2	13	18.2	22.1	30.5	41.4	65.2	84.9	109	136	154	167	178
10	0.1	15.2	21.3	25.9	35.7	48.7	76.7	100	128	161	182	198	210
20	0.05	17.5	24.5	29.8	41.2	56.1	88.6	116	148	186	211	230	244
30	0.033	18.8	26.4	32.1	44.4	60.5	95.8	125	160	202	229	249	265
40	0.025	19.7	27.7	33.7	46.7	63.7	101	132	169	213	242	263	280
50	0.02	20.5	28.8	35	48.5	66.2	105	137	176	222	251	274	291
60	0.017	21.1	29.7	36.1	50	68.3	108	142	182	229	260	283	301
80	0.013	22.1	31.1	37.8	52.4	71.6	114	149	191	241	273	297	316
100	0.01	22.8	32.1	39.1	54.2	74.1	118	154	198	249	283	308	328
250	0.004	25.8	36.4	44.4	61.6	84.4	134	176	226	286	325	354	377

Rainfall depths (mm) :: RCP4.5 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	9.31	13	15.7	21.7	29.3	45.8	59.4	76	95	107	116	123
2	0.5	10.2	14.3	17.3	23.8	32.2	50.4	65.4	83	104	118	128	135
5	0.2	13.2	18.5	22.5	31	42.2	66.2	86	110	137	155	169	179
10	0.1	15.5	21.7	26.4	36.4	49.5	77.9	101	130	162	184	200	212
20	0.05	17.8	25	30.3	41.9	57.1	90	117	150	188	213	232	246
30	0.033	19.1	26.9	32.7	45.2	61.6	97.3	127	162	204	231	251	267
40	0.025	20.1	28.3	34.4	47.6	64.9	103	134	171	215	244	265	282
50	0.02	20.9	29.4	35.7	49.4	67.4	107	139	178	224	254	276	294
60	0.017	21.5	30.2	36.8	50.9	69.5	110	144	184	231	262	285	303
80	0.013	22.5	31.7	38.5	53.4	72.9	115	151	193	243	275	299	319
100	0.01	23.3	32.7	39.8	55.2	75.4	120	156	200	252	286	311	331
250	0.004	26.3	37.1	45.2	62.8	85.9	136	179	229	289	328	357	380

Rainfall depths (mm) :: RCP4.5 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	9.79	13.7	16.5	22.8	30.7	47.7	61.5	78	97	109	118	125
2	0.5	10.7	15	18.2	25	33.9	52.6	67.9	86	107	121	130	138
5	0.2	14	19.6	23.7	32.7	44.4	69.2	89.5	114	142	160	173	184
10	0.1	16.4	22.9	27.8	38.4	52.2	81.5	106	134	168	189	205	218
20	0.05	18.8	26.4	32	44.3	60.2	94.4	122	155	194	219	238	253
30	0.033	20.2	28.4	34.5	47.8	65	102	132	168	211	238	258	274
40	0.025	21.3	29.9	36.3	50.3	68.5	108	140	177	222	251	272	290
50	0.02	22.1	31.1	37.7	52.3	71.2	112	145	185	232	262	284	302
60	0.017	22.7	32	38.9	53.9	73.4	115	150	191	239	270	293	311
80	0.013	23.8	33.5	40.7	56.5	77	121	157	200	251	284	308	328
100	0.01	24.6	34.6	42.1	58.4	79.7	126	163	208	261	295	320	340
250	0.004	27.9	39.3	47.8	66.4	90.7	143	186	238	299	338	368	391

Rainfall depths (mm) :: RCP6.0 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	9.25	12.9	15.6	21.5	29.1	45.6	59.1	75	94	106	115	123
2	0.5	10.1	14.2	17.2	23.6	32	50.1	65.1	83	104	117	127	135
5	0.2	13.2	18.4	22.3	30.8	41.9	65.8	85.6	109	137	155	168	179
10	0.1	15.4	21.6	26.2	36.1	49.2	77.4	101	129	162	183	199	211
20	0.05	17.7	24.8	30.1	41.6	56.7	89.5	117	149	188	212	231	245
30	0.033	19	26.7	32.4	44.9	61.2	96.7	126	161	203	230	250	266
40	0.025	20	28.1	34.1	47.2	64.4	102	133	170	214	243	264	281
50	0.02	20.7	29.1	35.4	49.1	67	106	138	177	223	253	275	293
60	0.017	21.3	30	36.5	50.6	69	109	143	183	230	261	284	302
80	0.013	22.3	31.4	38.2	53	72.4	115	150	192	242	274	298	318
100	0.01	23.1	32.5	39.5	54.8	74.9	119	155	199	251	285	310	330
250	0.004	26.1	36.9	44.9	62.3	85.3	136	178	228	288	327	356	379

Rainfall depths (mm) :: RCP6.0 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	10.2	14.3	17.3	23.8	32	49.4	63.3	80	99	111	120	128
2	0.5	11.2	15.7	19	26.1	35.3	54.5	70.1	88	110	123	133	141
5	0.2	14.6	20.5	24.8	34.3	46.4	71.9	92.6	117	145	164	177	187
10	0.1	17.1	24	29.2	40.3	54.6	84.8	109	138	172	194	210	222
20	0.05	19.7	27.6	33.6	46.4	63	98.2	127	160	200	225	244	258
30	0.033	21.2	29.8	36.2	50.1	68.1	106	137	173	217	244	265	280
40	0.025	22.3	31.3	38.1	52.7	71.7	112	145	183	228	258	279	296
50	0.02	23.2	32.6	39.6	54.8	74.6	117	151	191	238	269	291	309
60	0.017	23.9	33.5	40.8	56.5	76.9	120	156	197	246	278	301	319
80	0.013	25	35.1	42.7	59.2	80.6	126	163	207	258	292	316	335
100	0.01	25.8	36.3	44.2	61.3	83.5	131	169	215	268	302	328	348
250	0.004	29.2	41.2	50.2	69.7	95	149	194	246	307	347	377	400

Rainfall depths (mm) :: RCP8.5 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	9.42	13.2	15.9	21.9	29.6	46.2	59.8	76	95	107	116	123
2	0.5	10.3	14.4	17.5	24.1	32.6	50.9	66	84	105	118	128	136
5	0.2	13.4	18.8	22.8	31.4	42.7	66.9	86.8	111	138	156	170	180
10	0.1	15.7	22	26.7	36.9	50.2	78.7	102	131	164	185	201	213
20	0.05	18	25.3	30.7	42.5	57.8	91	118	151	190	215	233	248
30	0.033	19.4	27.3	33.1	45.8	62.4	98.4	128	164	206	233	253	269
40	0.025	20.4	28.6	34.8	48.2	65.7	104	135	173	217	246	267	284
50	0.02	21.2	29.8	36.2	50.1	68.3	108	141	180	226	256	278	296
60	0.017	21.8	30.6	37.3	51.6	70.4	111	145	185	233	264	287	305
80	0.013	22.8	32.1	39	54.1	73.8	117	152	195	245	277	301	321
100	0.01	23.6	33.2	40.4	56	76.4	121	158	202	254	288	313	333
250	0.004	26.7	37.6	45.8	63.6	87	138	180	231	291	330	360	383

Rainfall depths (mm) :: RCP8.5 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	11.2	15.6	18.9	26	34.9	53.2	67.6	85	104	116	125	133
2	0.5	12.3	17.2	20.8	28.7	38.6	58.9	75	94	115	129	139	147
5	0.2	16.1	22.5	27.3	37.7	50.9	78	99.6	125	154	172	186	196
10	0.1	18.9	26.5	32.1	44.4	60	92.2	118	148	182	205	221	234
20	0.05	21.7	30.5	37.1	51.3	69.4	107	137	171	212	238	257	271
30	0.033	23.4	32.9	40	55.4	75	116	148	186	230	258	279	295
40	0.025	24.6	34.6	42.1	58.2	78.9	122	156	196	243	273	294	312
50	0.02	25.6	36	43.7	60.6	82.2	127	163	204	253	284	307	325
60	0.017	26.4	37.1	45.1	62.4	84.7	131	168	211	261	294	317	335
80	0.013	27.6	38.8	47.2	65.5	88.9	138	176	221	275	309	333	353
100	0.01	28.5	40.2	48.9	67.8	92	143	183	230	285	320	346	366
250	0.004	32.3	45.6	55.5	77.1	105	163	209	263	327	368	398	421

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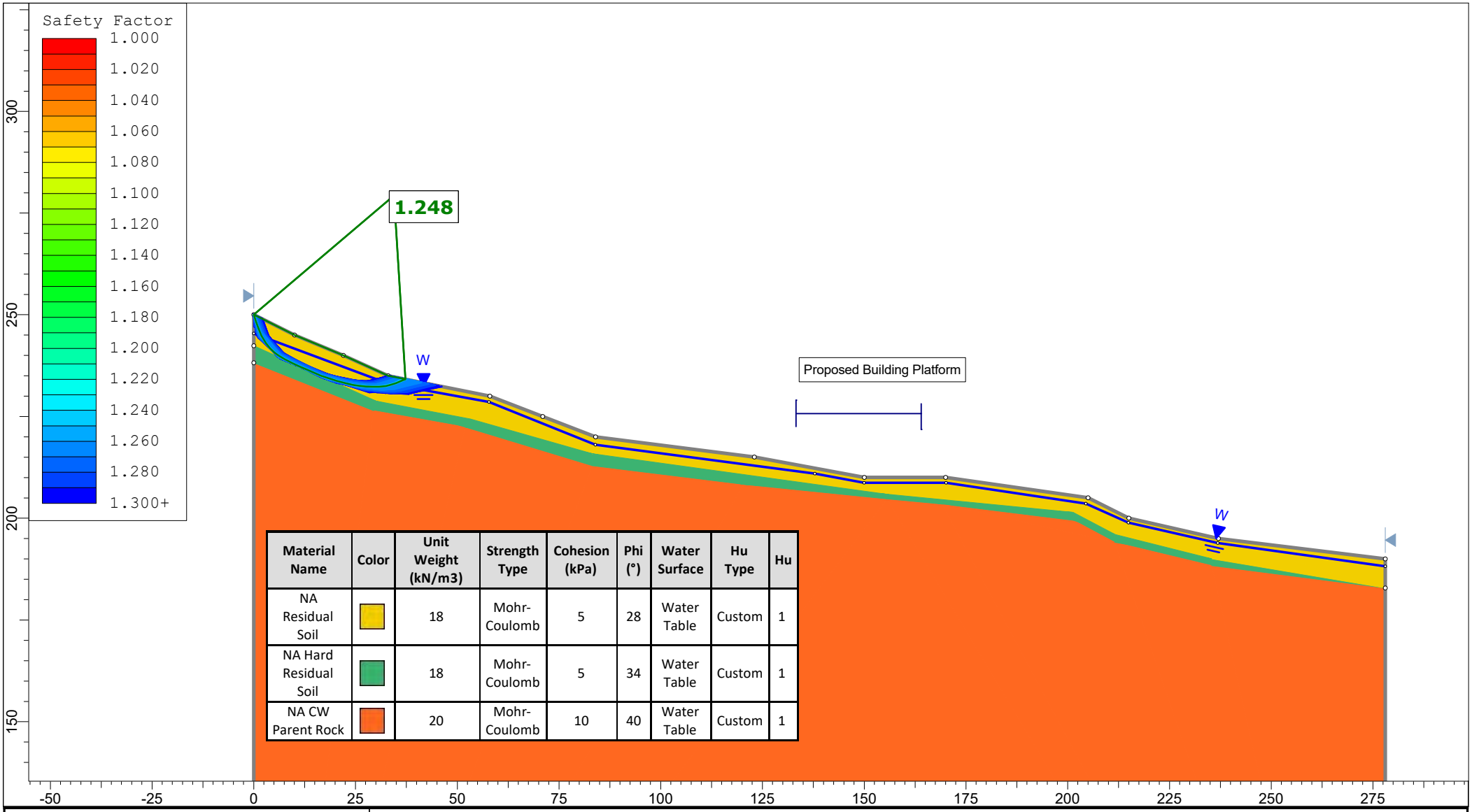
APPENDIX E

Slope Stability Models



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
NA Residual Soil		18	Mohr-Coulomb	5	28	Water Table	Custom	1
NA Hard Residual Soil		18	Mohr-Coulomb	5	34	Water Table	Custom	1
NA CW Parent Rock		20	Mohr-Coulomb	10	40	Water Table	Custom	1

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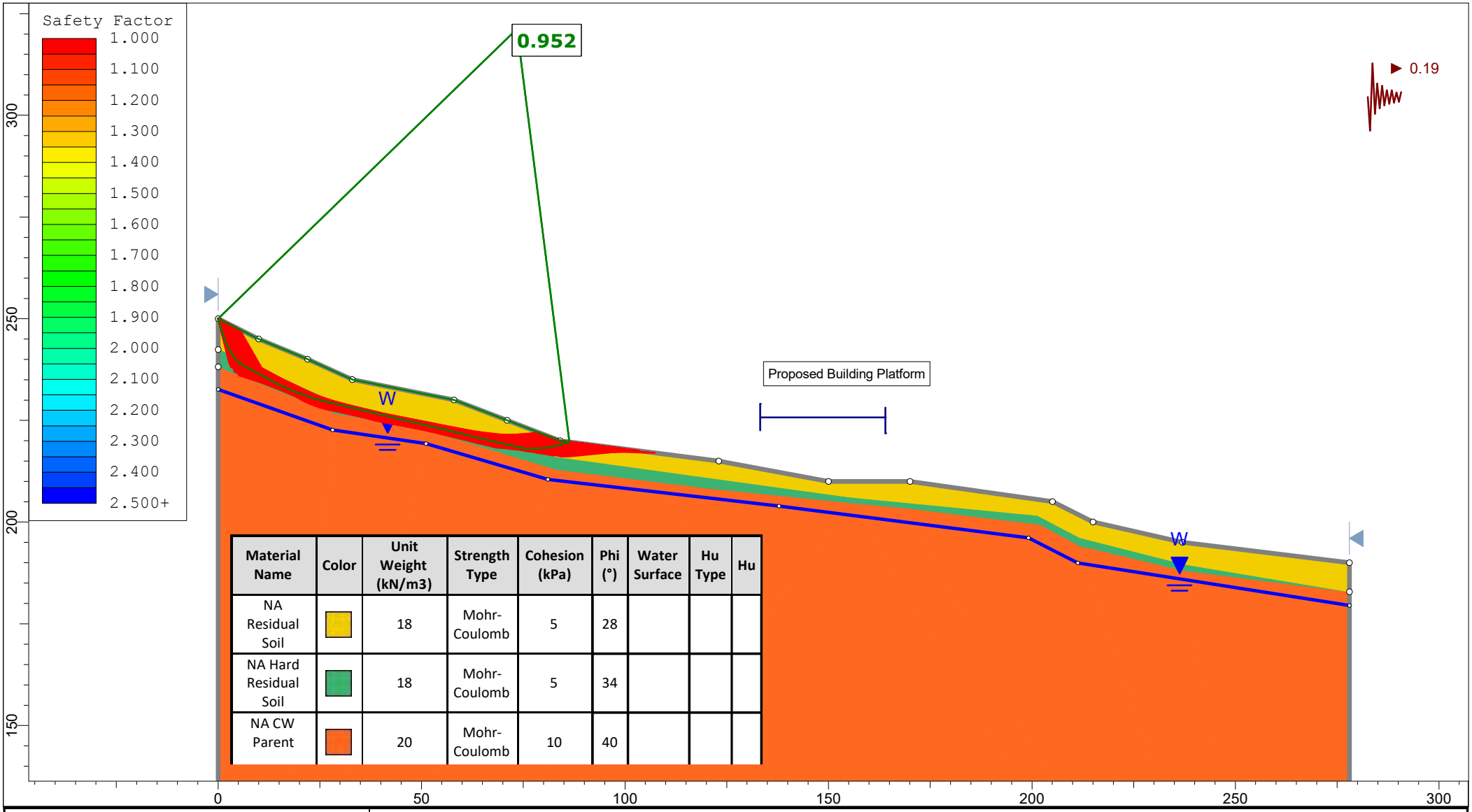
SLIDEINTERPRET 9.036

Project	C0021 - Lot 1		
Group	Lot 1 Cross Section A - Existing	*Scenario*	Existing Conditions - Elevated GWL
Drawn By	Luke Williams	*Company*	Geologix Consulting Engineers Ltd
Date	14/03/2025, 8:55:35 am	*File Name*	Slide_Model_New.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
NA Residual Soil		18	Mohr-Coulomb	5	28			
NA Hard Residual Soil		18	Mohr-Coulomb	5	34			
NA CW Parent		20	Mohr-Coulomb	10	40			

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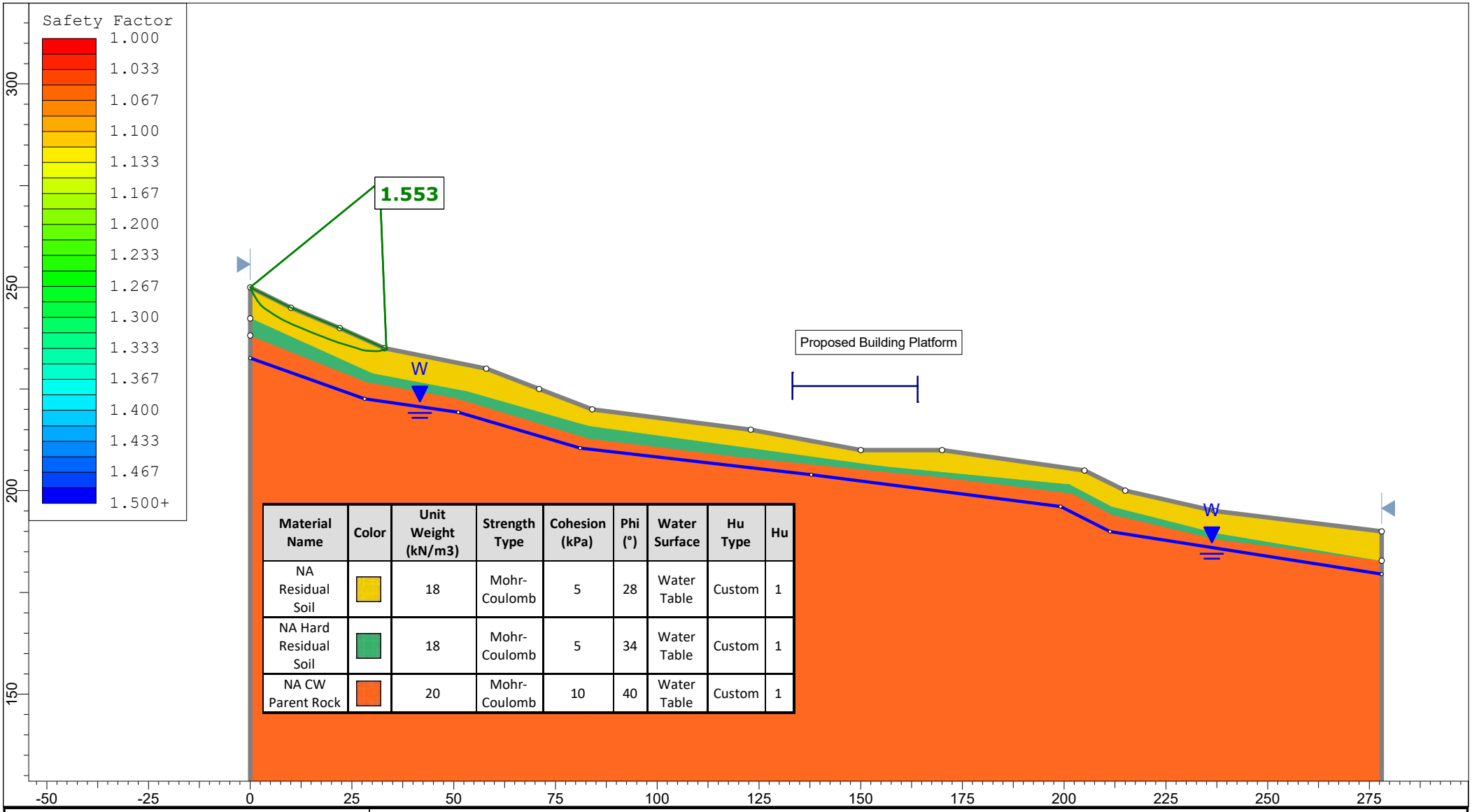
Project	C0021 - Lot 1		
Group	Lot 1 Cross Section A - Existing	*Scenario*	Existing Conditions - Siesmic
Drawn By	Luke Williams	*Company*	Geologix Consulting Engineers Ltd
Date	14/03/2025, 8:55:35 am	*File Name*	Slide_Model_New.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
NA Residual Soil		18	Mohr-Coulomb	5	28	Water Table	Custom	1
NA Hard Residual Soil		18	Mohr-Coulomb	5	34	Water Table	Custom	1
NA CW Parent Rock		20	Mohr-Coulomb	10	40	Water Table	Custom	1

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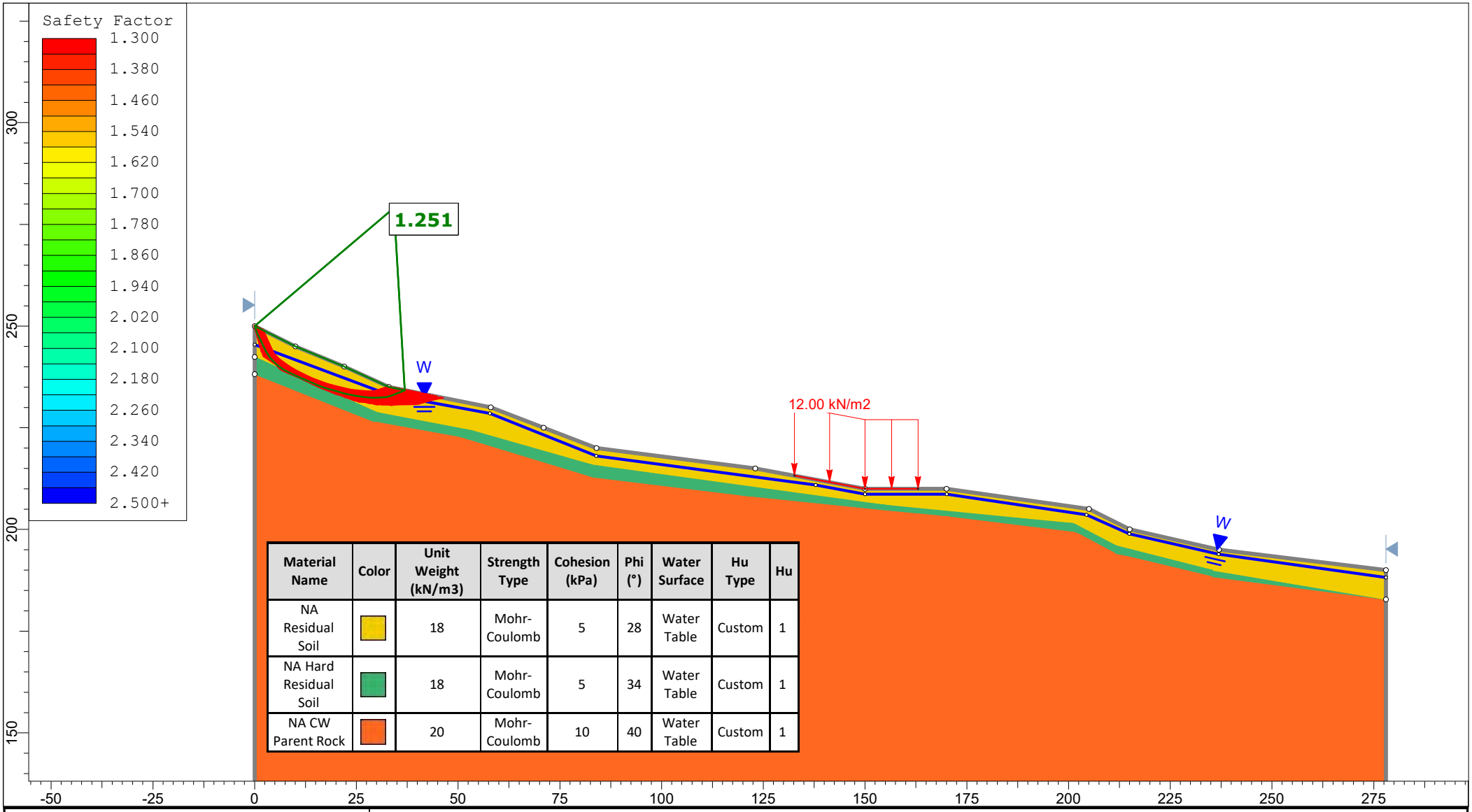
SLIDEINTERPRET 9.036

Project	C0021 - Lot 1		
Group	Lot 1 Cross Section A - Existing	*Scenario*	Existing Conditions - Static
Drawn By	Luke Williams	*Company*	Geologix Consulting Engineers Ltd
Date	14/03/2025, 8:55:35 am	*File Name*	Slide_Model_New.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
NA Residual Soil		18	Mohr-Coulomb	5	28	Water Table	Custom	1
NA Hard Residual Soil		18	Mohr-Coulomb	5	34	Water Table	Custom	1
NA CW Parent Rock		20	Mohr-Coulomb	10	40	Water Table	Custom	1

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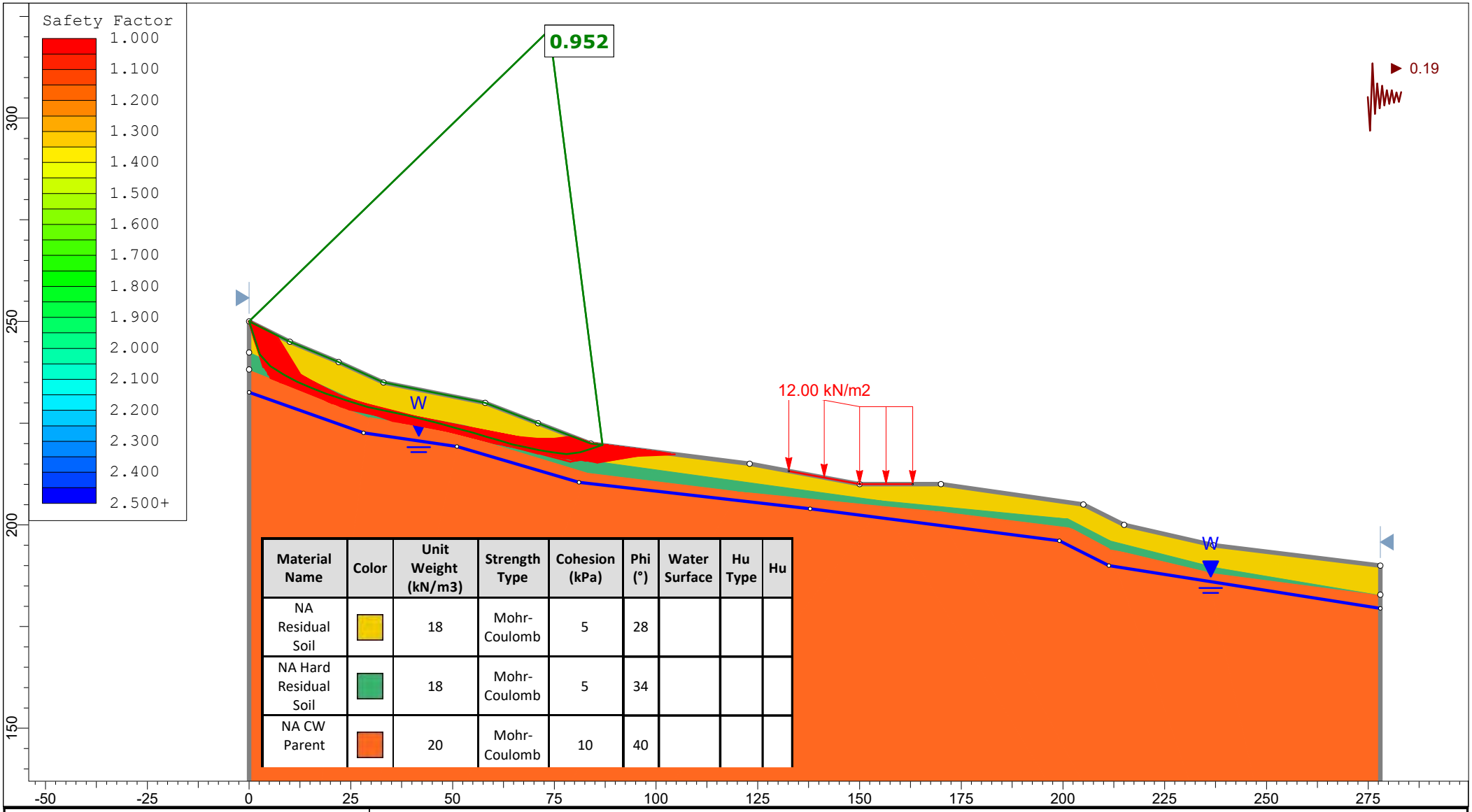
SLIDEINTERPRET 9.036

Project	C0021 - Lot 1		
Group	Lot 1 Cross Section A-A - Proposed	*Scenario*	Proposed Conditions - Elevated GWL
Drawn By	Luke Williams	*Company*	Geologix Consulting Engineers Ltd
Date	14/03/2025, 8:55:35 am	*File Name*	Slide_Model_New.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
NA Residual Soil		18	Mohr-Coulomb	5	28			
NA Hard Residual Soil		18	Mohr-Coulomb	5	34			
NA CW Parent		20	Mohr-Coulomb	10	40			

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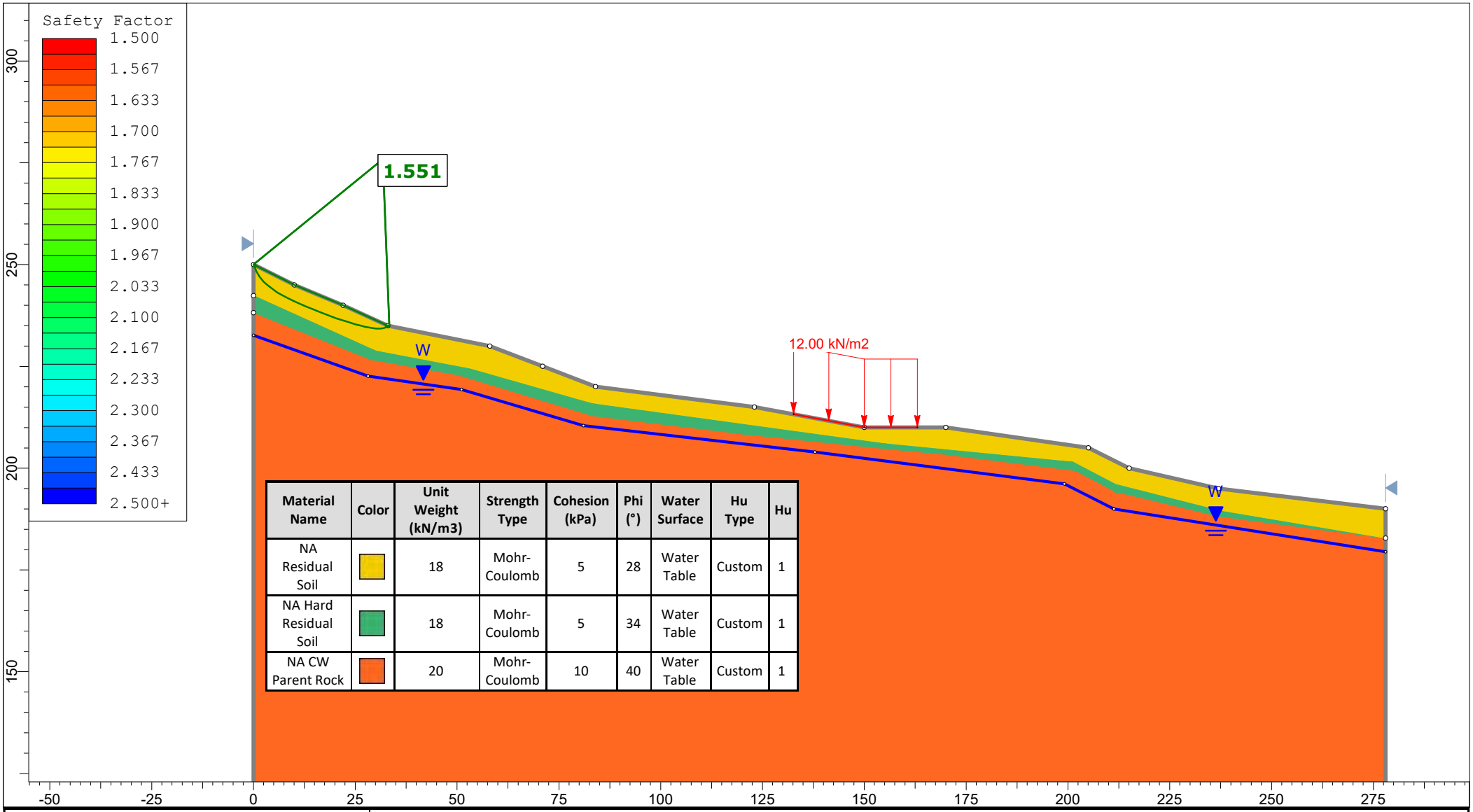
Project	C0021 - Lot 1		
Group	Lot 1 Cross Section A-A - Proposed	*Scenario*	Proposed Conditions - Siesmic
Drawn By	Luke Williams	*Company*	Geologix Consulting Engineers Ltd
Date	14/03/2025, 8:55:35 am	*File Name*	Slide_Model_New.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
NA Residual Soil		18	Mohr-Coulomb	5	28	Water Table	Custom	1
NA Hard Residual Soil		18	Mohr-Coulomb	5	34	Water Table	Custom	1
NA CW Parent Rock		20	Mohr-Coulomb	10	40	Water Table	Custom	1

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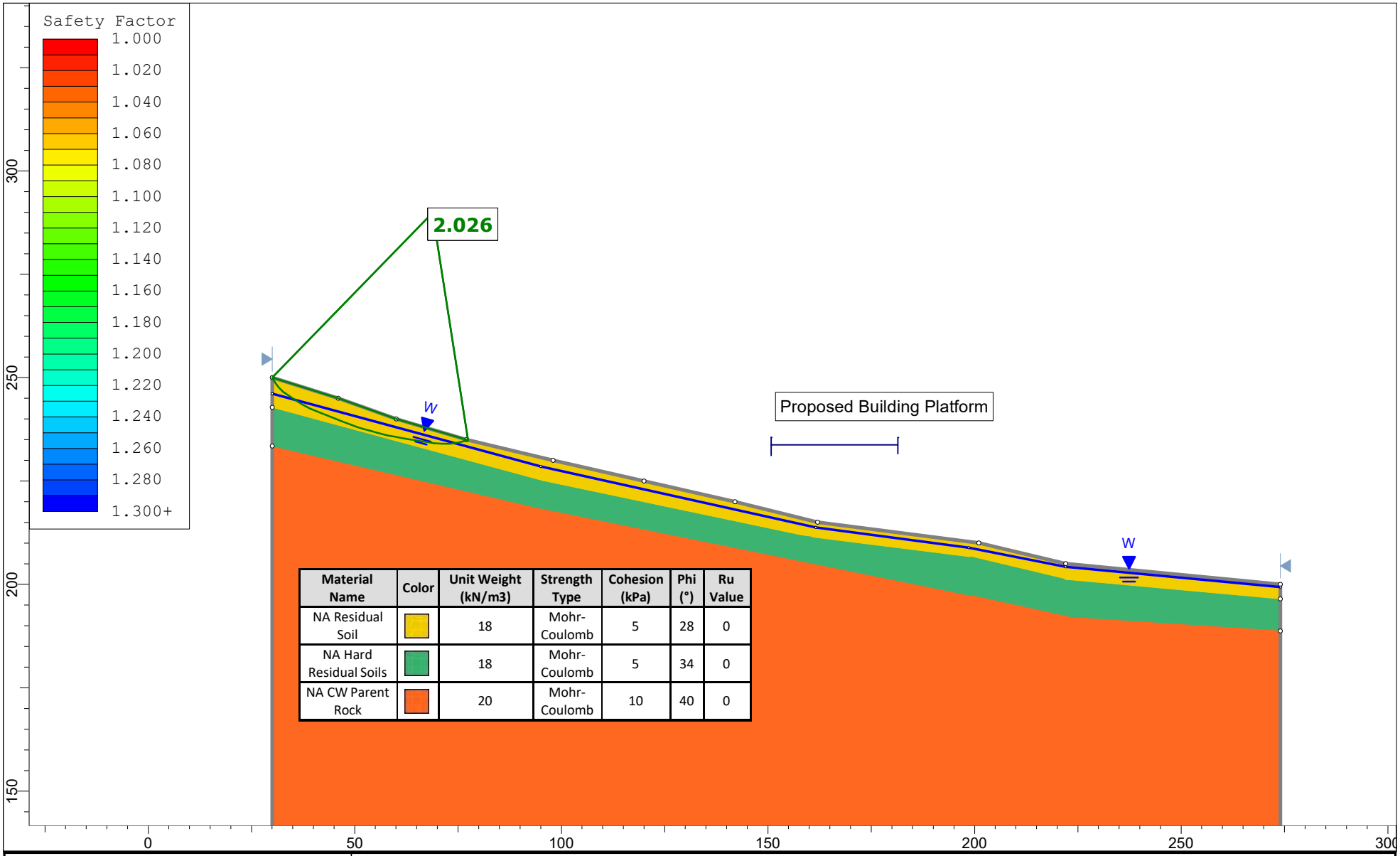
SLIDEINTERPRET 9.036

Project	C0021 - Lot 1		
Group	Lot 1 Cross Section A-A - Proposed	*Scenario*	Proposed Conditions - Static
Drawn By	Luke Williams	*Company*	Geologix Consulting Engineers Ltd
Date	14/03/2025, 8:55:35 am	*File Name*	Slide_Model_New.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
NA Residual Soil		18	Mohr-Coulomb	5	28	0
NA Hard Residual Soils		18	Mohr-Coulomb	5	34	0
NA CW Parent Rock		20	Mohr-Coulomb	10	40	0

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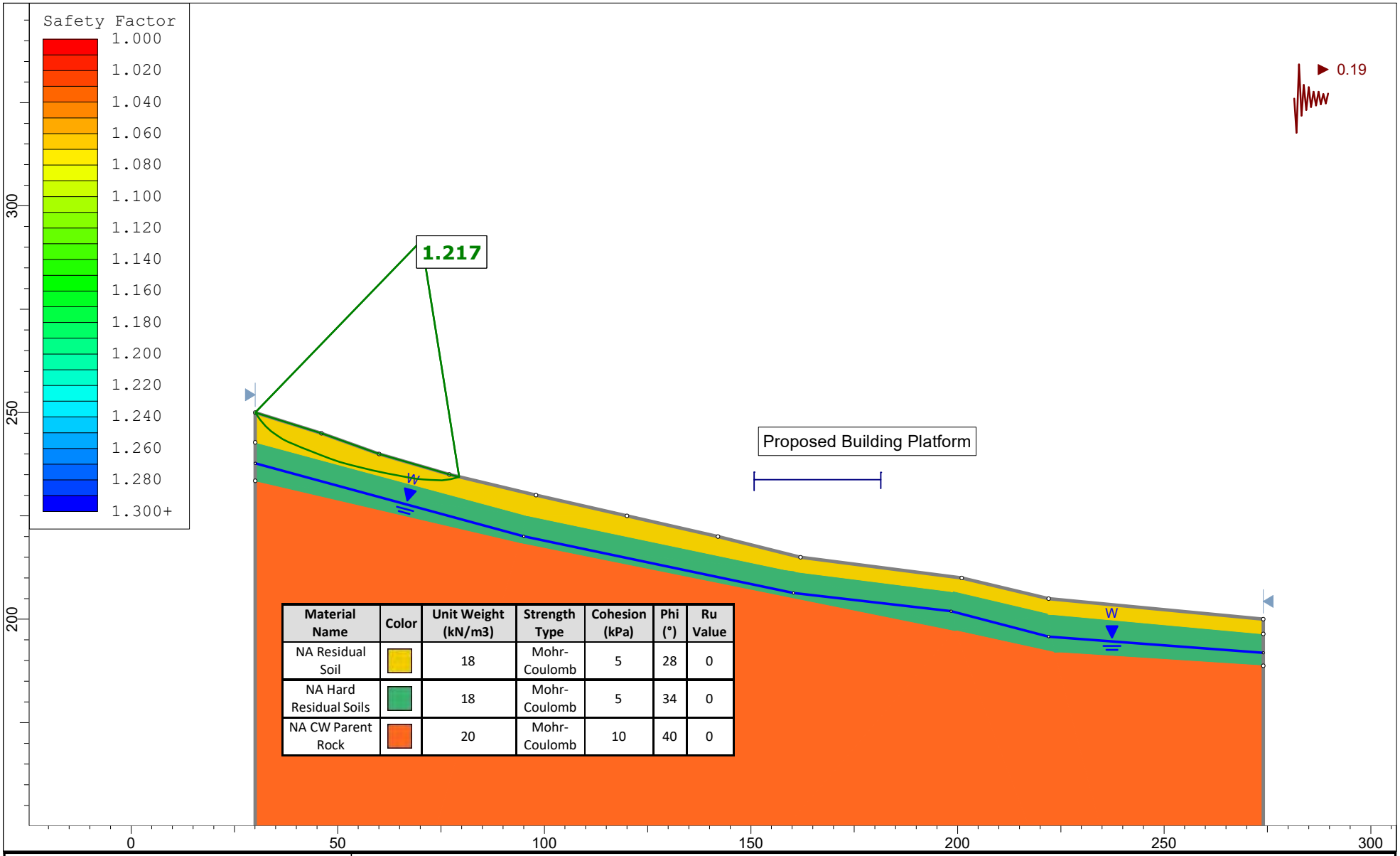
SLIDEINTERPRET 9.036

Project	Lot 2		
Group	Lot 2 Cross Section B-B	*Scenario*	Existing Conditions - Elevated GWL
Drawn By	Luke Williams	*Company*	Geologix Consulting Engineers Ltd
Date	14/03/2025, 10:09:39 am	*File Name*	Slide_Model_New_Cross section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
NA Residual Soil		18	Mohr-Coulomb	5	28	0
NA Hard Residual Soils		18	Mohr-Coulomb	5	34	0
NA CW Parent Rock		20	Mohr-Coulomb	10	40	0

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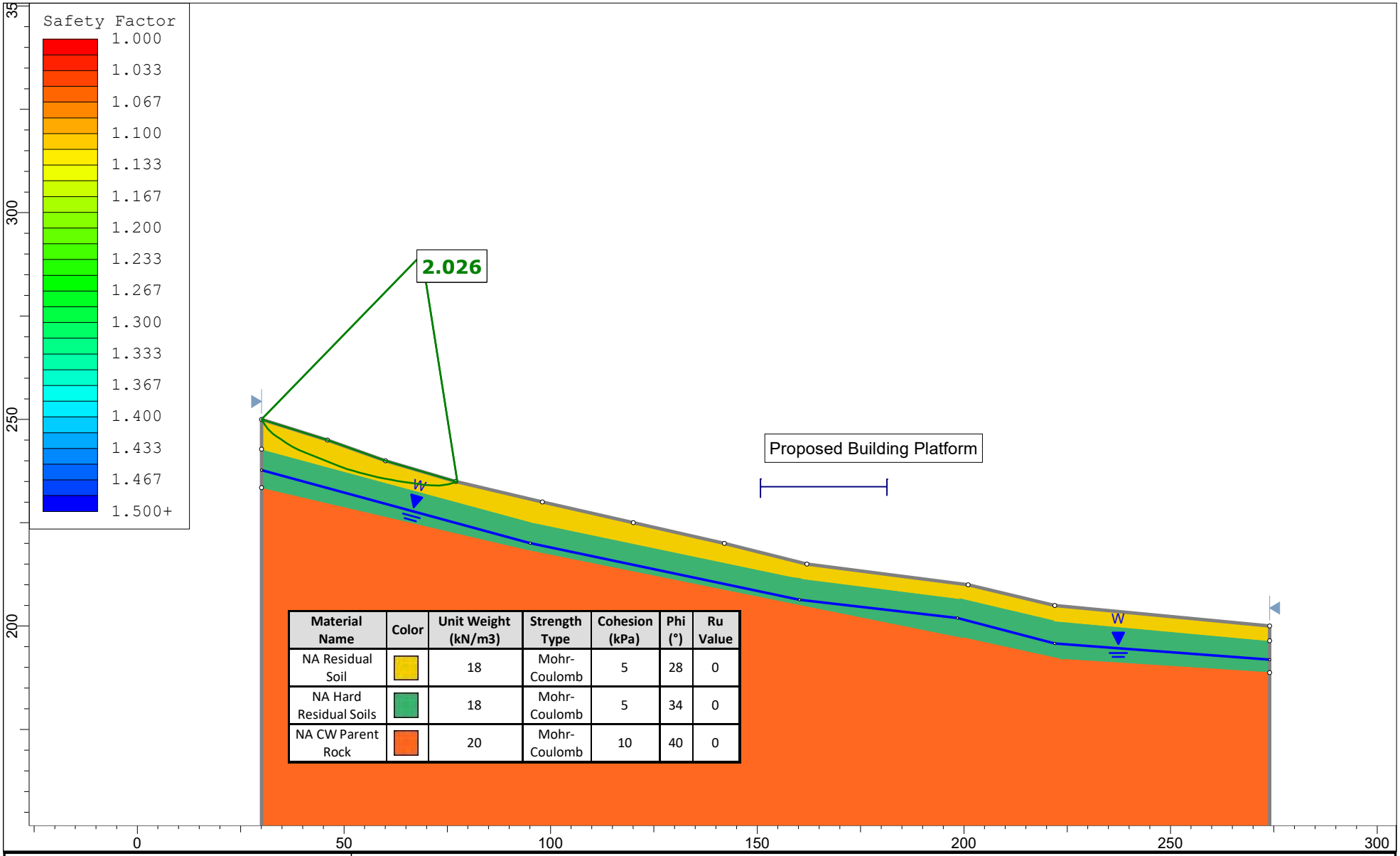
SLIDEINTERPRET 9.036

Project	Lot 2		
Group	Lot 2 Cross Section B-B	*Scenario*	Existing Conditions - Siesmic
Drawn By	Luke Williams	*Company*	Geologix Consulting Engineers Ltd
Date	14/03/2025, 10:09:39 am	*File Name*	Slide_Model_New_Cross section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
NA Residual Soil		18	Mohr-Coulomb	5	28	0
NA Hard Residual Soils		18	Mohr-Coulomb	5	34	0
NA CW Parent Rock		20	Mohr-Coulomb	10	40	0

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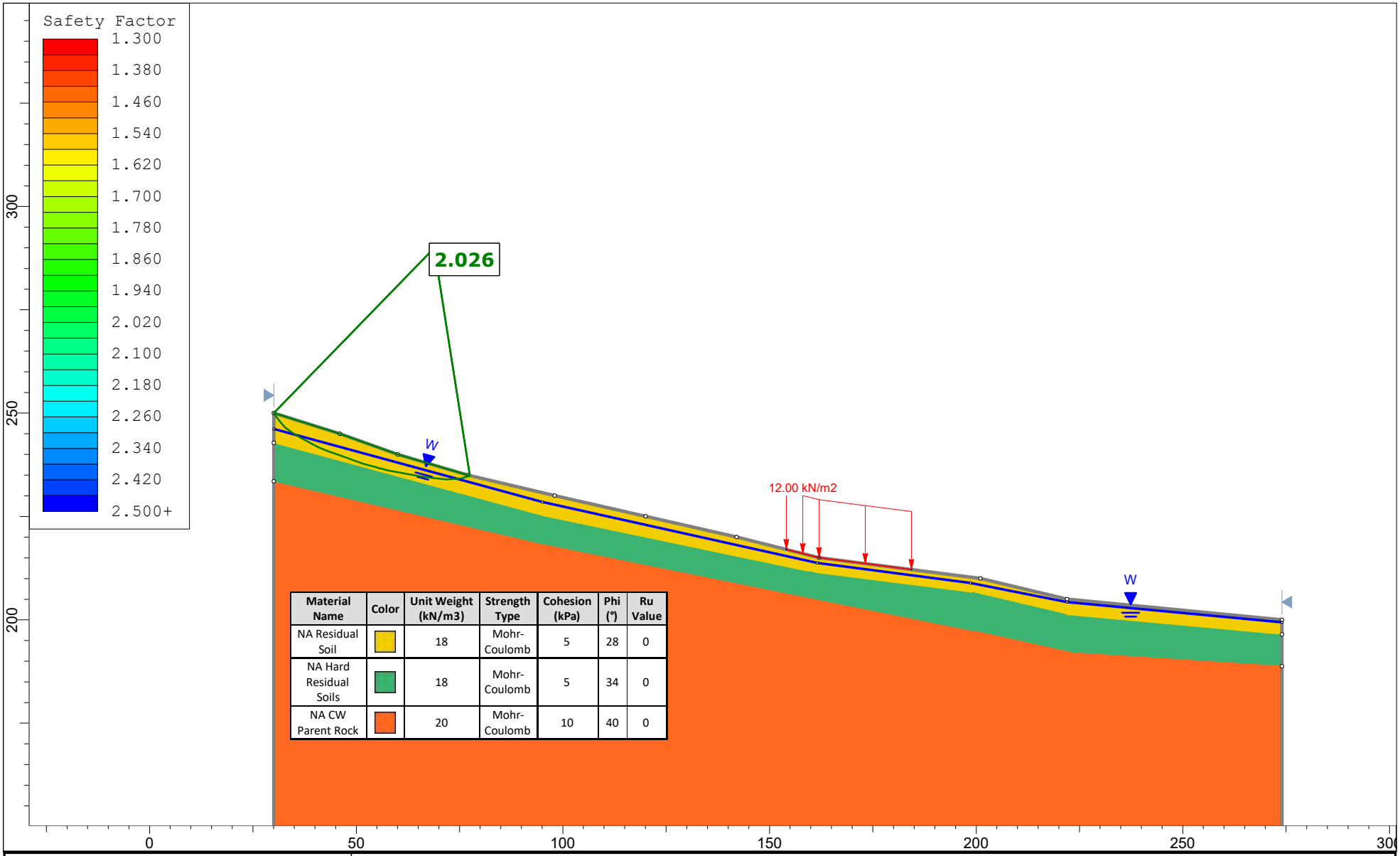
SLIDEINTERPRET 9.036

Project	Lot 2		
Group	Lot 2 Cross Section B-B	*Scenario*	Existing Conditions - Static
Drawn By	Luke Williams	*Company*	Geologix Consulting Engineers Ltd
Date	14/03/2025, 10:09:39 am	*File Name*	Slide_Model_New_Cross section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
NA Residual Soil		18	Mohr-Coulomb	5	28	0
NA Hard Residual Soils		18	Mohr-Coulomb	5	34	0
NA CW Parent Rock		20	Mohr-Coulomb	10	40	0

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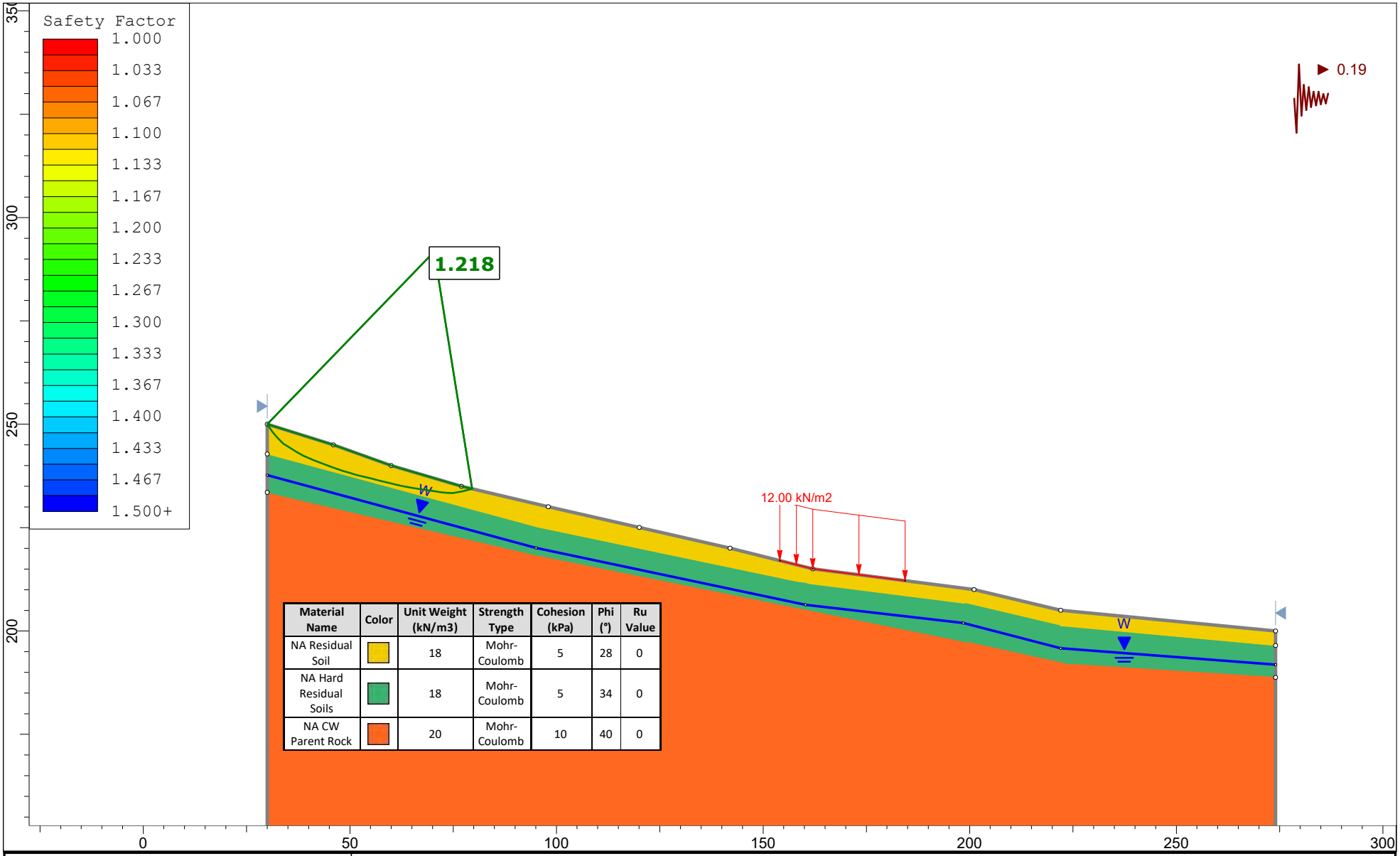
SLIDEINTERPRET 9.036

Project	Lot 2		
Group	Lot 2 Proposed	*Scenario*	Proposed Conditions - Elevated GWL
Drawn By	Luke Williams	*Company*	Geologix Consulting Engineers Ltd
Date	14/03/2025, 10:09:39 am	*File Name*	Slide_Model_New_Cross section B.slmd



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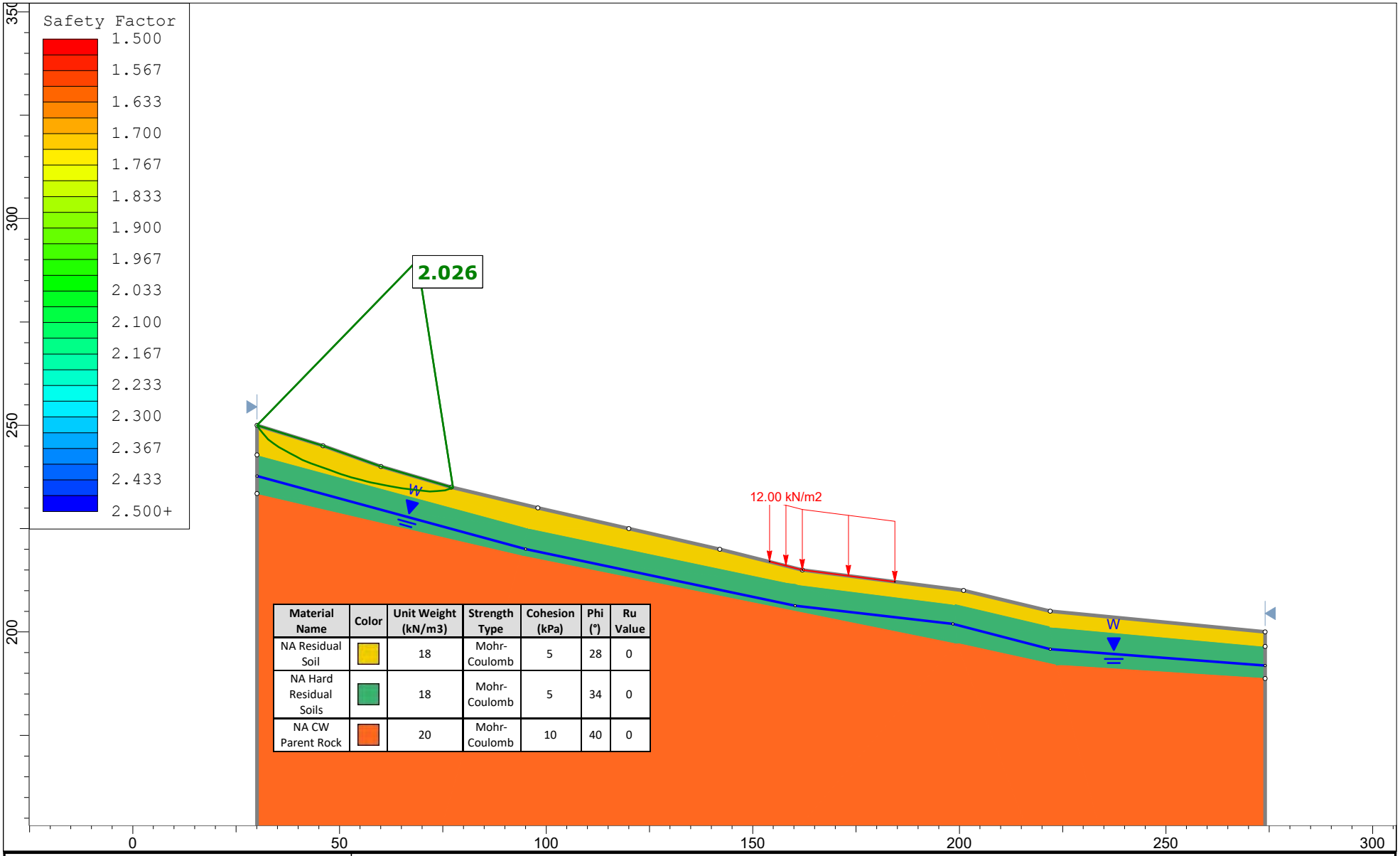
SLIDEINTERPRET 9.036

Project	Lot 2		
Group	Lot 2 Proposed	*Scenario*	Proposed Conditions - Siesmic
Drawn By	Luke Williams	*Company*	Geologix Consulting Engineers Ltd
Date	14/03/2025, 10:09:39 am	*File Name*	Slide_Model_New_Cross section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
NA Residual Soil		18	Mohr-Coulomb	5	28	0
NA Hard Residual Soils		18	Mohr-Coulomb	5	34	0
NA CW Parent Rock		20	Mohr-Coulomb	10	40	0

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SLIDEINTERPRET 9.036

Project	Lot 2		
Group	Lot 2 Proposed	*Scenario*	Proposed Conditions - Static
Drawn By	Luke Williams	*Company*	Geologix Consulting Engineers Ltd
Date	14/03/2025, 10:09:39 am	*File Name*	Slide_Model_New_Cross section B.slmd