CORE
ENGINEERING SOLUTIONS

GEOTECHNICAL COMPLETION REPORT
STAGE 2

Lot 14 DP 374000
51 TE MAIKA ROAD, NGUNGURU

Job Details:	Residential Subdivision – Stage Two
Job number:	20-0078
Client:	Traverse Ltd
Site Address:	51 Te Maika Road, Ngunguru
Legal Description:	Lot 14 DP 374000
Date:	16 August 2022
Prepared by:	Stuart Gemmell
Author email:	jobs@coreeng.nz
Author Phone No:	09 553 3660

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Core Engineering Solutions Limited

Geotechnical Completion Report for Stage 2 - Residential Subdivision at Lot 14 DP 374000
51 Te Maika Road, Ngunguru

Job No	20-0078
Project Name	Residential Subdivision – Stage Two
Street Address	51 Te Maika Road, Ngunguru
Legal Description	Lot 14 DP 374000
Applicable Consents	SL2100003
Client	Traverse Ltd
Author	Stuart Gemmell
Authoriser	David Leslie BEng (Civil), MEMgt (Hons), DipEng(Civil) CPEng (Geotechnical / Structural)
Version No	3
Date	28/09/2022
Author Signature	
Authoriser Signature	

Please note that NZS4431:1989 has been updated during the course of this project to NZS4431:2022.

This document refers to both NZS4431:1989 and NZS4431:2022. This is not an error and relates to the change in practices outlined in each of these documents and the timeframe during which earthworks took place.

1. INTRODUCTION

This Geotechnical Completion Report (GCR) has been prepared By Core Engineering Solutions Ltd (CES Ltd) for Traverse Ltd as part of the documentation to be submitted to Whangarei District Council (WDC) on completion of the Stage Two of the Te Maika Road subdivision in Ngunguru, located at 51 Te Maika Road, Ngunguru, hereinafter referred to as 'the site'. Stage Two initially comprises of the development of eight residential lots with the inclusion of Lot 33 (Balance Lot).

This report addresses the geotechnical engineering aspects of the subdivision development, identifies and discusses geotechnical engineering issues that must be taken into consideration during individual Lot development, and includes a Statement of Professional Opinion (SOPO) that covers the Suitability of the Land for its Intended Purpose. The SOPO includes a summary table, outlining the Geotechnical Design Recommendations from CES Ltd in regard to individual Residential Lots. The SOPO is located within Appendix One.

The subdivision design was prepared by Reyburn & Bryant Limited (R&B Ltd), and the main civil contractor was Clements Contractors Ltd (CC Ltd). Supporting Producer Statements for construction are included and appended to this report.

CES Ltd Drawings in this report are based on final contour levels provided by Reyburn and Bryant for the purposes of establishing building setbacks. Final 'AS Built' plans are to be provided by Reyburn and Bryant.

CES Ltd was commissioned to observe and undertake construction monitoring for earthworks and specific design engineering works (e.g. retaining walls).

Subdivision Earthworks were carried out in general accordance with NZS4404:2010 Land Development and Subdivision Infrastructure, NZS 4431:1989 and NZS4431:2022 Code of practice for Earth Fill for Residential Development.

This document has been prepared in general accordance with the Whangarei District Council (WDC) Engineering Standards 2022, with special reference to Site Development Suitability (Geotechnical and Natural Hazards).

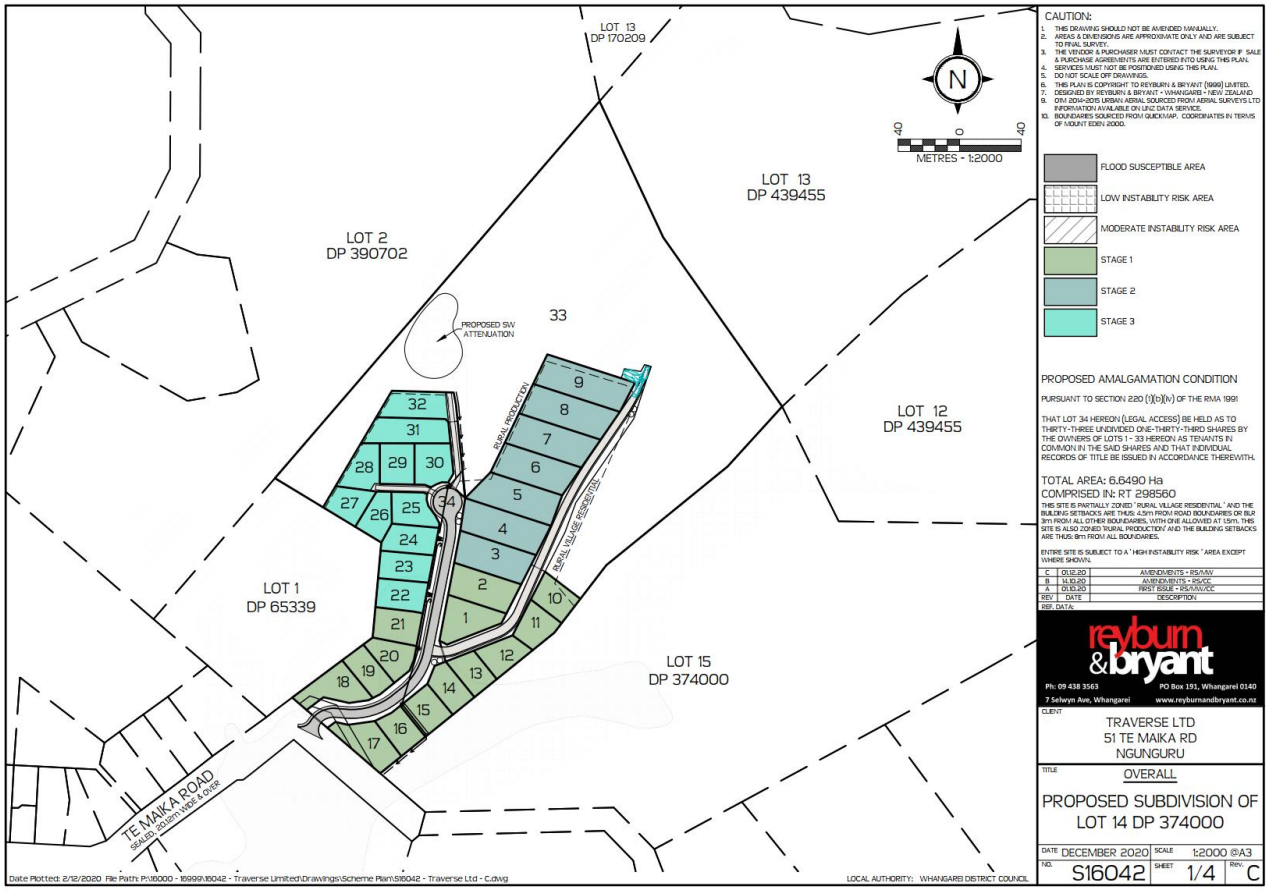

Figure 1 - Map of subdivision, showing various Stages. (Source R&B Ltd)

2. SITE DESCRIPTION

This 66490m² property is located on the northern side at the end of Te Maika Road. The property has a prominent broad crested spur ridgeline which runs down towards the south. The western and north-western boundaries back onto the flank of a ridgeline that runs through the neighbouring properties.

Stage Two of the Te Maika Road Development occupies the north eastern part of the property at 51 Te Maika Road Ngunguru, currently legally described as Lot 14 DP 374000. Flanks on the ridgeline generally ranged between 20° and 30°. Groundcover is grass within the low-lying areas. On the spur ridgeline, the allotments have been recently planted with native bush and shrubs located on the flanks.

The extent of Stage Two within this property is presented on the R&B 'Scheme Plan' drawings contained in Appendix 3. Stage Two Lots comprise the higher areas of the subdivision extending up the ridgeline, namely Lots 3-9 inclusive and Lot 33.

2.1 Completed Subdivision Works

The completed Stage Two Subdivision has resulted in the formation of eight new residential Lots (Lots 3-9 inclusive and Lot 33) that, on completion of the subdivision works and certification from Council, will be released for individual development.

2.2 Topographical Description Post-Construction

The land within Stage Two has undergone significant transformation in order to obtain the finished site profile. Stage Two sections level building sites, with sea and estuary views to the south.

Topsoil and non-engineered fill has been removed from the site. A significant volume of silt clay fill from the spur to the northeast of the site has been cut and transported down the hill to raise the valley and form the road and new platforms, mitigating the flood hazard and liquefaction risk. Residential Lots have been raised above flood heights and are more evenly sloping.

Roads and infrastructure have been constructed. Infrastructure includes stormwater, wastewater, power and internet (fibre) infrastructure. Topsoil has then be reinstated.

Stage Two sites are all created completely within cut (natural ground), and no settlement monitoring is required for these sites.

Fifteen retaining walls have been built within Stage Two of the subdivision, with two of the retaining walls located on the downhill (southern) side of Lot 3 within Stage One.

The finished site topography is to be supplied by Reyburn and Bryant with the As-Built plans. CES Ltd has been supplied finished levels over Stage 2 so that final setbacks and individual allotment recommendations can be provided.

3. PREVIOUS WORK

The following reports on this site have been previously issued:

- Engineering Report for Subdivision for the property by Richardson Stevens Consultants (1996) Ltd, Ref: 6886, dated: 5 November 2007 (Amended June 2008)
- Geotechnical Assessment Longview Estuary Estate Ngunguru (30 October 2007) Riley Consultants
- Subdivision Report 51 Te Maika Road Ngunguru (31 October 2018) Wilton Joubert Consulting Engineers Ref#81048, covering the original initial stage of this development (now known as Stage 2)

The following reports on this development have previously been issued by CES Ltd:

- Subdivision Report, Lot 14 DP 374000, 51 Te Maika Road Ngunguru (4/12/2020)
- Retaining Wall Design and Calculations (15/12/2020)
- Concrete Driveway reinforcing detail (20/05/2022)

4. SITE OPERATIONS

4.1 Construction Works and Programme

The primary works on-site were carried out between January 2021 and August 2022. Earthworks comprised:

- Cut and fill earthworks
- Installation of Geocomposite materials
- Retaining Wall structures construction
- Creation and relocation of main drain
- Fill old drain
- Construction of roads and services (power, telecommunications, stormwater and wastewater, sewers, firefighting tanks etc.)
- Topsoil spreading upon completion of the bulk formation and retaining wall construction works
- Planting of native seedlings to stabilise ridge flanks

Services such as stormwater, wastewater and firefighting tanks were constructed at the completion of earthworks. Refilling trenches and compaction of excavated areas was monitored by Clements Contractors Ltd.

Likewise, utility services (power, telecommunication etc,) were constructed following the completion of the bulk earthworks. Refilling trenches and compaction of excavated areas was monitored by Clements Contractors Ltd.

4.2 Extent of Formation Works

Stage Two was the source of fill for the balance of the subdivision. Areas of up to 8.0m in depths were excavated from the upper reaches of the hill in order to provide sufficient fill for the balance of the subdivision.

Stage Two land was affected by the site formation works, and final levels are to be supplied with the Reyburn and Bryant As-Built Plans.

4.3 Field Control

During the construction of the terraced retaining walls within this stage, excavated foundations were intermittently inspected as the walls were constructed to ensure that the ground conditions were in accordance with the design parameter. Site observations revealed that the retaining walls and building sites are well set into completely weathered greywacke. In-situ shear strengths were taken throughout the construction of these walls and were all well in excess of 140kPa (uncorrected). Foundations for these walls were up to 2.8m below cleared ground level with no signs of elevated groundwater. The recovered soil from the excavation of the foundations did not reveal any colour disfiguration or mottling to suggest a seasonal perched water table.

Calibrated Pilcon Shear Vanes, used in accordance with New Zealand Geotechnical Society Guideline for Hand Held Shear Vane Test, 2001, were used every 0.2m in the hand augered drilled holes, measuring both in situ and remoulded strengths.

At the completion of earthworks on the hill locations, samples of both cut parent material and fill at finished ground level were obtained from eleven locations across the entire subdivision and the material was sent to Geocivil in Whangarei for Atterberg Testing and linear shrinkage testing to assist with establishing the anticipated soil expansivity and classification. Results for this are appended.

Post-earthworks on-site testing was undertaken on the hill sites. DPSH-B testing was undertaken on the hill sites to establish depth to solid less weathered greywacke to assist with collating a profile of the underlying soil strata. DPSB-B testing indicated a consistent depth to hard material down the hill of between 14.6 and 18.0m BGL.

The tests above have been used in conjunction with the previous subsoil testing, our ongoing monitoring and observations to gain an understanding of the overall ground conditions within Stage 2.

5. EVALUATION OF SITE FOR RESIDENTIAL DEVELOPMENT

The majority of the lower areas of the subdivision have been raised using fill material harvested from Stage 2 of the Development. Earthworks have been carried out in such a manner as to form level or near level sites throughout the subdivision. The final levels within Stage 2 were not finalised until earthworks for Stage 1 and 3 were near complete. This was due to exact fill quantities being unknown as it was dependent on the extent of undercutting required over the lower areas of the site. Reyburn and Bryant Ltd have supplied the As-Built Plans finished heights over the entire development, and these are appended to this report.

CES Ltd considers Stage Two of this Development as largely free of significant geotechnical issues that would affect Lot development; however, specific items that may affect development within the subdivision are noted below.

5.1 General Ground Conditions

All residential Lots within Stage Two have been affected by undercutting, which has exposed the underlying completely weathered Waipapa Group geology (Greywacke). The excess cut material has been used as bulk fill to assist with constructing Stages 1 and 3 in general accordance with NZS4431:2022. This material has proven to be exceedingly consistent throughout the cut areas in Stage 2 and with Linear Shrinkage ranging from 13 to 19.

Stage 2 is completely situated in areas that were subject to bulk excavation (cut), and thus, underlying in situ soils were exposed in these locations prior to topsoil respreading.

5.2 Seismic Classification

The development is proposed to include residential dwellings and supporting structures which are assessed to be, as a minimum, designed to be an Importance level 2 (IL2) structure in accordance with NZS1170. Return periods for limit state design events for an IL2 structure are Serviceability Limit State (SLS) 1/25 years and Ultimate Limit State (ULS) 1/500 years.

CES Ltd undertook an assessment of the Seismic Subsoil Class, as per the criteria outlined in NZS 1170.5. Soils on-site demonstrated stiff and very stiff representative undrained shear strengths, at depths of less than 20m.

CES Ltd assesses the site subsoil class as being a Class C – Shallow Soils Site in accordance with Section 3.1.3, NZS1170.5.

5.3 Liquefaction

Reference has been made to the 2017 Geotechnical Modules released by MBIE, EQC and the Ministry for the Environment, Planning and Engineering Guidance for potentially liquefaction-prone land. Previous assessment in regard to liquefaction has been addressed by CES Ltd at the initial application stage for this development (Refer to CES Ltd Subdivision Report as referenced under Section 3 of this report).

Stage Two of the Te Maika Road subdivision has been assessed by CES Ltd on the following basis:

- Deep groundwater levels, groundwater >4.0m.
- Any uncontrolled fill has been removed.
- Clear of geologically young OIS1 (Holocene) river deposits.
- Clear of swamp areas with elevated groundwater levels.

This subdivision lies within an area of the country with a low seismicity risk. In our opinion, CES Ltd is satisfied that the risk of liquefaction within Stage 2 of this development is low.

5.4 Expansive Soils

The underlying soil within this development stage comprises of completely to highly weathered Waipapa Group. Experience with similar soils elsewhere suggests that the site soils are likely to be susceptible to seasonal shrink/swell movements as the ground dries out and then wets up in a cyclic manner from summer to winter. However, it is more common that the upper residual soils are typically more susceptible to shrinkage and swelling, and with this material removed from the sites within Stage 2, expansive soils are expected to be less variable.

The New Zealand Building code defines 'good ground' in the following manner:

'Good ground means any soil or rock capable of permanently withstanding an ultimate bearing pressure of 300 kPa (i.e. an allowable bearing pressure of 100 kPa using a factor of safety of 3.0), but excludes:

> *a) Potentially compressible ground such as topsoil, soft soils such as clay which can be moulded easily in the fingers, and uncompacted loose gravel which contains obvious voids,*
> *b) Expansive soils being those that have a liquid limit of more than 50% when tested in accordance with NZS 4402 Test 2.2, and a linear shrinkage of more than 15% when tested, from the liquid limit, in accordance with NZS 4402 Test 2.6, and*
> *c) Any ground which could foreseeably experience movement of 25 mm or greater for any reason including one or a combination of: land instability, ground creep, subsidence, liquefaction, lateral spread, seasonal swelling and shrinking, frost heave, changing ground water level, erosion, dissolution of soil in water, and effects of tree roots.*

CES Ltd identified the soils as expansive in our initial site investigations stage and proposed to defer classification until earthworks completion. Since soils are expansive in nature, and the foreseeable movement is expected to be greater than 25mm, therefore soils on-site are not considered to meet the definition prescribed above for 'good ground'.

CES Ltd commissioned Geocivil Ltd to undertake Linear Shrinkage testing and determination of the liquid limit, plastic limit, plasticity index and water content from samples of the Waipapa Group parent material and of the material placed as fill. This form of testing was preferred due to the geology present.

The samples taken in within stage were retrieved from within the cut ground (~4.0m below natural ground level) on Lot 4, Lot 7 and Lot 33 (Sample 1). The samples returned a Plasticity Index (PI) ranging between 23 and 44. The Liquid Limit (LL) ranged from 55 to 83. Linear shrinkage (LS) testing of the sample taken resulted in a LS ranging from 13% and 17%.

In NZS 3604:2011, expansive soils are defined as those with:

- Liquid Limit, LL > 50% (as tested by NZS4402.2.2:1986)
- Linear Shrinkage, LS > 15% (as tested by NZS4402.2.6:1986)

From the sample taken on the ridgeline, and the above criteria for expansive soils, we are satisfied that the soils on-site are expansive in nature as the liquid limits exceed the definition above. From further review of the results and use of the Casagrande Plasticity Chart, the soils on-site are assessed as a elastic SILT which exhibits low to medium levels of plasticity. The linear shrinkage results were marginally over the threshold for 'good ground' in accordance with NZS3604, therefore soil expansivity of higher than a CLASS S as per NZBC – B1 should be expected.

From the above and experience with the geology present at the site, CES Ltd assesses the soils on-site for this stage of the subdivision as Class M – Moderately Expansive in accordance with NZBC – B1 Structure.

5.5 Settlement Monitoring

Stage Two of the Te Maika Road Subdivision has been completely created within cut. No settlement monitoring is required within Stage Two of this subdivision.

5.6 Bearing Capacity

Post earthworks subsoil testing, including visual inspection and shear vane testing of cut soils and DPSH-B testing over Stage 2, revealed soils which were very stiff and dry along the ridgeline.

Dynamic Probe Super Heavy – B type testing (DPSH-B) involves driving a 20cm^2 probe into the ground using a 63.5kg hammer dropping 760mm. Penetration is recorded as the number of hammer drops per 200m penetration by the probe.

The test methodology therefore is similar to a Standard Penetrometer Test (SPT), utilising the same sized hammer and drop. The SPT utilises a split spoon sampler, bringing samples to the surface, whereas no samples can be recovered using DPSH-B.

DPSH-B tests were driven until effective refusal – CES Ltd term effective refusal as anything greater than 30 blows per 200mm penetration. DPSH-B results are appended to this report.

Shallow shear vanes (finished ground level) and deeper shear vanes (retaining pile holes) were taken at numerous locations across Stage Two sites. Results indicated a high (consistently >100kPa) shear strength is available at both shallow and deeper depths.

Three Hand Augered boreholes were undertaken On Lot 3, Lot 6 and Lot 9. Borehole results are appended to this report.

CES Ltd assesses that the soils at each proposed building site will achieve an Ultimate Bearing Strength of 300kPa from below cleared ground level. As required by the Building Code, a strength reduction factor must be applied to the above values in order to determine the dependable values for use in ultimate limit state design; a reduction factor of 0.5 is recommended.

When considering the above and ignoring the topsoil layer, near-surface soils (within 2m of finished ground levels) within each building platform are generally considered to comply with the requirements of NZS3604:2011 and, with the exception of expansive soil properties, should otherwise be designated as '*good ground*'.

5.7 Lot Gradients & Stability

Within Stage Two, the majority of residential Lots have been finished with a near level or gently sloping gradient. All lots have a steep slope to the west. Rihi Paea Rise is on the eastern side of the sections, and there is a batter down to Rihi Paea Rise from each of the sections. Lot 3 to Lot 9 are finished with terraced retaining walls present to the north and south of each of the Lots.

Lot 33 contains the balance of land leftover from the subdivision. A building platform has been constructed at the top of the hill for Lot 33, on the top of the ridge. There is a retaining wall at the base Lot 33 at the boundary with Lot 9. A site-specific geotechnical assessment and foundation design will be required for the dwelling on Lot 33.

Figure 2 - Lot 1 and Lot 2 during the construction phase. Note the location of the retaining walls and batters on the left and right-hand sides (west and east). Source CES Ltd.

Pre-development slope stability analysis, as discussed in reports listed in Section 3, suggested that the site profile would remain stable post-earthworks. However, as final levels were not known, a

further assessment of the setback requirement to the flanks and retaining structures was deferred to the earthworks completion stage. CES Ltd has undertaken an assessment of the flanks to ascertain a suitable setback from the slopes in accordance with WDC – Land Development Stabilisation – Technical Design Requirements Policy (Dated: April 2018).

5.7.1 Subsoil Conditions

The flank slopes did not indicate any signs of previous instability and are standing at grades of up to 25 degrees. Cut faces within this stage were left near vertical and exposed by the contractor for the majority of the 2021 winter period. No signs of significant slippages occurred, which provided confidence that the recently exposed, completely weathered material is consistent at depth. DPSH-B testing confirmed the depth to the underlying moderately weathered greywacke.

Due to the lack of evidence of slope failure on the slopes a back analysis was not undertaken and the reliance on parameters used are based on experience with this geology in the area.

5.7.2 Groundwater Conditions

Groundwater has been conservatively assumed to be as shallow as 1.0m below finished ground level for the elevated groundwater level and as shallow as 2.0m below finished ground level at the lower end of the flank for normal groundwater levels.

5.7.3 Site Seismic Characteristics

Ground motion inputs from Table A1 of the NZGS/MBIE Earthquake Geotechnical Engineering Practice Module 1 have been adopted for the purpose of geotechnical engineering assessment within this report. Due to the location of the site, Method 1 of the Module 1 has been adopted to determine the Peak Ground Acceleration (PGA). From Appendix 1 of Module 1, a conservative approach has been taken, and we have adopted the PGA for a 500-year return period of 0.19. This PGA is to be adopted for stability assessment of the ridge flanks.

Module 6 of the MBIE guidance documents has been adopted to calculate the horizontal design acceleration with the position of the building and retaining structures in relation to slopes down the ridgeline as generally considered to be a Class 3 scenario with a Topographical factor of 1.0 and wall displacement factor of 0.5. Based on these guidelines, a minimum PGA for pseudo-static design of 0.095 has been adopted for down the ridgeline where retaining structures have been constructed.

Results of this updated stability analysis are summarised within Appendix 7. From the analysis, CES Ltd is satisfied that a stable building site is available on each allotment, provided compliance with this report. A minimum building setback of 3.0m to the flanks is to be applied to the building sites and upper level areas of the existing retaining structures without further stability assessment by a geo-professional.

5.8 Retaining Walls

As indicated on the CES Ltd plans (Refer to Appendix 4), fifteen retaining walls have been constructed within or adjacent to Stage Two to form level or gently sloping building platforms on Lots 3-9.

Retaining walls were built to the CES Ltd design (Appendix 4).

Retaining walls have been designed assuming a surface surcharge value of 2.5kPa above each wall. These retaining walls have been designed to accommodate loadings generated by lightweight vehicles (as defined in NZS1170) and does not consider any permanent loads in close proximity to the walls. A minimum setback of 3.0m horizontally from the upper walls will need to be maintained from any structures to avoid any additional surcharge loads.

Alternatively, specific design advice should be sought from a suitably qualified Chartered Professional Engineer should any structure or foundations be designed to intrude into this setback area.

It is recommended that only limited site formation works take place immediately in front (downslope) of any retaining walls. Any works that require excavation greater than 0.5m deep should be subject to a specific engineering design to ensure that retaining walls are not undermined. Further to this, it is recommended that a minimum setback of 1.5m from the downslope retaining wall be applied for any future development. To illustrate the building setback, a 'Restricted Development Area Plan' has been prepared by CES Ltd and is appended to this report, refer to Appendix 4. Restricted Development Areas are discussed in further detail within Section 5.12 below.

5.9 Piped Services, Service Trenches and Drainage

As indicated within the approved engineering plans for the development, council stormwater and sewer reticulation are present. In general, these services are either constructed within road reserves or adjacent to Lot boundaries. As such, we consider it unlikely that such constructed services would be encountered during individual Lot development. Regardless, all building works on individual Lots should be laid out so as not to disturb any nearby services.

Should any site-specific development layouts that encroach near or over these services be unavoidable, foundations must be designed per current WDC Engineering Standards guidelines for building near or over services (WDC Policy #0022).

5.10 Topsoil

Topsoil depths were checked on individual Lots. The topsoil check indicated variable topsoil thicknesses, ranging from 100mm to 300mm. An average thickness of approximately 150mm is anticipated across the subdivision.

5.11 Stormwater Control

A stormwater reticulation system servicing the subdivision was constructed as part of the site formation works. All stormwater run-off from hard-standing areas (driveways, patios, footpaths etc) and any outflow from rainwater tank overflow, should be directed towards the stormwater system for disposal.

On-site stormwater disposal or soakage systems are not recommended unless further site-specific assessment is undertaken by a suitably qualified and experienced engineer. Under no circumstances should stormwater be disposed of by allowing it to flow onto or into the ground in an uncontrolled manner at any location on the subdivision.

5.12 Restricted Development Areas

From the assessment above, Restricted Development Areas have been imposed on portions of Stage Two, specifically Lot 3-9 and Lot 33.

These Restricted Development Areas have been imposed due to:

- Flanks on the ridgeline being in excess of 20 degrees (Lot 3-9 and Lot 33)
- Downslope of a retaining wall within 1.5 times the overall height of the wall (Lots 3-9)

Any developments that encroach on into a Restricted Development Area will need to be subject to a specific engineering investigation and design at the Building Consent stage. This is to ensure that future developments will not have an adverse effect on slope stability or retaining wall stability.

Lot 33 has a large area in comparison to the other allotments within Stage 2. It is proposed that any future structures within this allotment require a site-specific geotechnical assessment to accompany any Building Consent application.

For reference, CES Ltd has prepared a site plan outlining and summarising areas suitable for residential development and recommendations within Appendix 2 and 4 of this report.

Lots within Stage 2 are characterized by retaining walls above and below the Lots. No modification should be undertaken to retaining walls should be undertaken without consultation with a Chartered Professional Engineer familiar with the site.

Likewise, there are significant batter slopes present to the east and west of the Lots. Slope and batter modification, including low retaining walls, should only be undertaken after consultation with a geo-professional familiar with the site.

6. CONCLUSION

From our assessment of the site and construction monitoring, CES Ltd is satisfied that the proposed new allotments with Stage 2 are suitable for residential development, designed in general accordance with NZS:3604. A summary of each site is appended to this report for referral for site-specific developments. This report is intended to provide design guidance for the future development of the individual allotments. Should any works deviate from the recommendations of this report, then a site-specific assessment by a Geo-Professional (as defined within the WDCEES) should be undertaken prior to application for Building Consent.

A summary of the site restrictions are as follows;

Lots 3 – 9

- Buildings are to be setback a minimum of 3.0m from the ridgeline flanks and existring retaining structures within the development. Should any site specific development on the site encouch into this setback an assessment by a geo-professional should be undertaken to ensure the site stability.
- A minimum setback of 1.5m from the downslope retaining wall be applied for any future development infront of the existing retaining walls.
- Any developments that encroach on into a Restricted Development Area will need to be subject to a specific engineering investigation and design at the Building Consent stage.
- Foundations will need to be designed for Class M – Moderately Expansive in accordance with NZBC – B1 Structure.
- All stormwater run-off from hard-standing areas (driveways, patios, footpaths etc) and any outflow from rainwater tank overflow, should be directed towards the stormwater system for disposal.
- On-site stormwater disposal or soakage systems are not recommended unless further site-specific assessment is required by a suitably qualified and experienced engineer.

Lot 33

- Any future structures within this allotment require a site-specific geotechnical assessment to accompany any Building Consent application

7. APPENDICES

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APPENDIX 1 – STATEMENT OF PROFESSIONAL OPINION

Statement of Professional Opinion on Suitability of Land for Building Construction

Development	Traverse Ltd - Te Maika Road Development
Developer	Traverse Ltd
Location	51 Te Maika Road, Ngunguru, Whangarei
I *(full name)*	David Andrew Leslie
Of *(Name and address of firm)*	Core Engineering Solutions Ltd, 31 Vine Street Whangarei

1 I am a Geo-Professional as defined in Section 1.3 Abbreviations and Definitions and was retained by the Developer as the geo-professional on the above development

2 The extent of my preliminary investigations are described in my Report(s) number ___Subdivision Report Ref :20-0078 _ dated __Rev 01 21/05/2021 __ and the conclusions and recommendations of that/those document(s) have been re-evaluated in the preparation of this report. The extent of my inspections during construction, and the results of all tests and/or re-evaluations carried out are as described in my geotechnical completion report dated _16/08/2022 __.

3 In my professional opinion, not to be construed as a guarantee, I consider that *(delete as appropriate)*:

a. The earth fills shown on the attached Plan No _____EWA16042_____have been placed in compliance with the requirements of the Whangārei District Council and my specification. (However, lots _____10-12 (Stage 1), 29-32 (Stage 3)_____ did not pass final fill specification testing and as a result, specific site investigations and foundation designs will be required here at the time of building consent application)

b. The completed works take into account land slope and foundation stability considerations, subject to the appended foundation recommendations and earthworks restrictions, *(which should be read in conjunction with the appended final site contour plan)*

c. Subject to 3(a) and 3(b) above, the original ground not affected by filling satisfies the description of 'good ground' as described in B1 Acceptable Solutions and Verification Methods and NZS 4229:2013 _☐ Yes ☒ No

(If no, a specific foundation investigation/design will be required at the time of Building Consent)

d. Subject to 3(a) and 3(b) above, the filled ground satisfies the description of 'good ground' as described in NZS 3604:2011 and NZS 4229:2013 ☐ Yes ☒ No

(If no, a specific foundation investigation/design will be required at the time of Building Consent)

e. The original ground not affected by filling and the filled ground are not subject to erosion, subsidence, or slippage in accordance with the

provisions of section 106 of the Resource Management Act 1991 provided that:

i. Compliance with the Subdivison Report and Geotechnical Completion Reports by CES Ltd for this development.

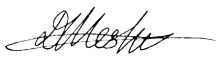
ii. Vibrations and Land Excavations within Stage 1 and 3 for site specific developements, are overseen and undertaken in responsible manner by suitably experienced contractors.

iii.

iv.

4 This professional opinion is furnished to the TA and the Developer for their purposes alone on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any building

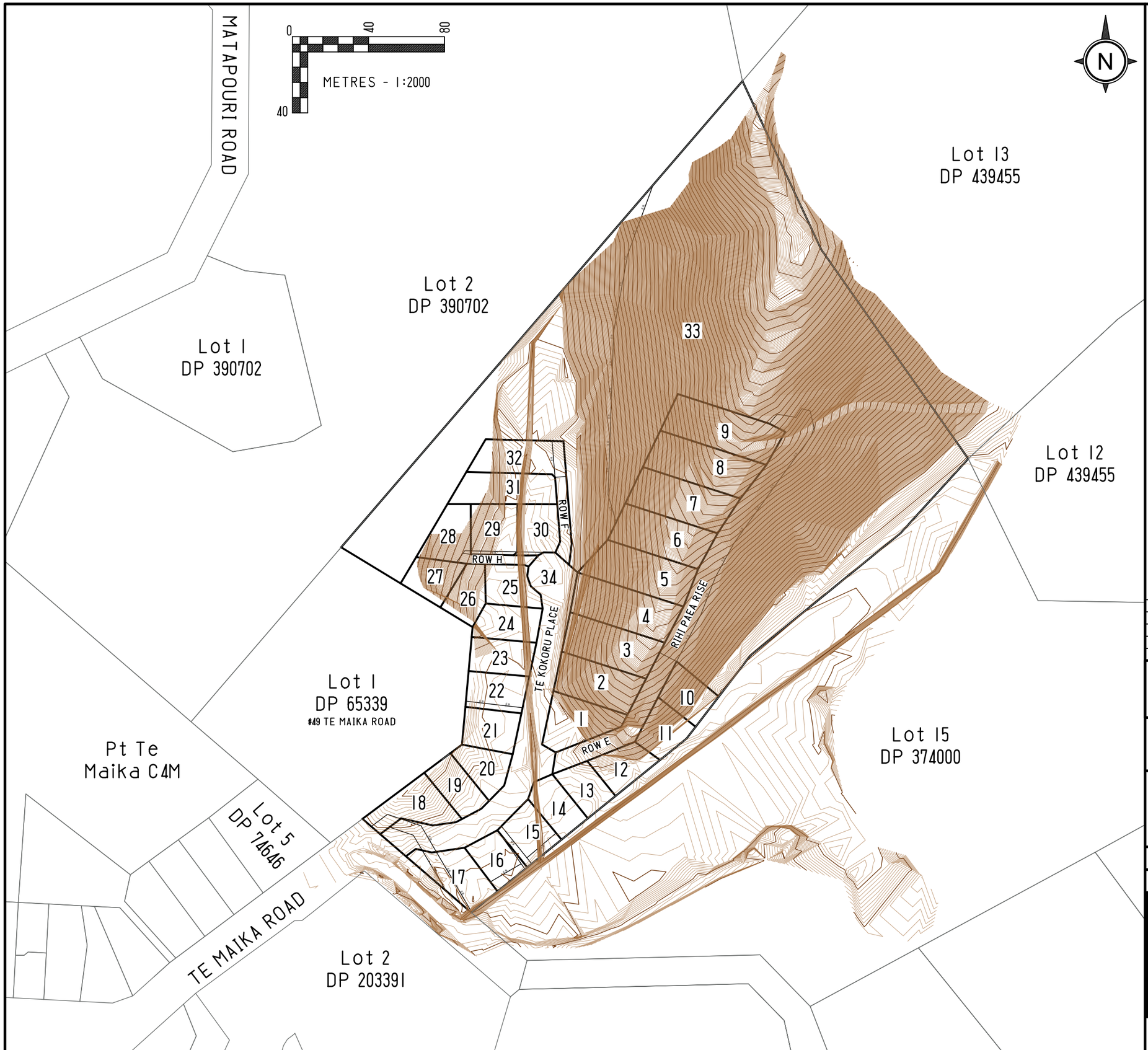
5 This certificate shall be read in conjunction with my geotechnical report referred to in clause 2 above and shall not be copied or reproduced except in conjunction with the full geotechnical completion report

	BEng(Civil), DipEng(Civil),MEMgt(Hons) CMENGNZ, CPEng(Geotechnical/Structural)	16/08/2022
Signature	*Professional Qualifications*	*Date*

APPENDIX 2 – SUMMARY OF GEOTECHNICAL DESIGN RECOMMENDATIONS

Lot No	Area	Anticipated Soil Type	Unworked Natural Ground Present within Lot	Foundations may be designed to 3604:2011	Shallow Foundations Ultimate Unfactored Bearing Capacity	Expansive Soils Present	Site Soil Classification (as defined in NZBC - B1)	Resticted Development Area Present on Lot	Other Comments
	m^2	In Situ Soil / Engineered Fill	Y/N	Y/N	(kPa)	Y/N	(S, M, H, E)	Y/N	
3	1043	In Situ Soil	Y	No, SED Design to account for expansive soils required for buildings within setback lines	300	Y	M	Yes, minimum setback from retaining wall structures and flanks as defined in Appendix 4 of the GCR, any works within these setback will require further review by a Geo-professional	Any development outside of the building restrictions will require further investigations by a suitably qualified engineer in accordance with WDCEES 2022
4	1169	In Situ Soil	Y		300	Y	M		
5	1147	In Situ Soil	Y		300	Y	M		
6	1065	In Situ Soil	Y		300	Y	M		
7	1108	In Situ Soil	Y		300	Y	M		
8	1186	In Situ Soil	Y		300	Y	M		
9	1249	In Situ Soil	Y		300	Y	M		
33	39146	In Situ Soil	Y		300	Y	M		

APPENDIX 3 – REYBURN & BRYANT LTD SCHEME PLAN



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MINOR CONTOURS @ 0.1m INTERVALS

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
ORIGINAL CONTOURS: OVERALL

SCALE: 1:2000 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

reyburn & bryant
Ph: 09 438 3563
PO Box 191, Whangarei 0140
7 Selwyn Ave, Whangarei
www.reyburnandbryant.co.nz

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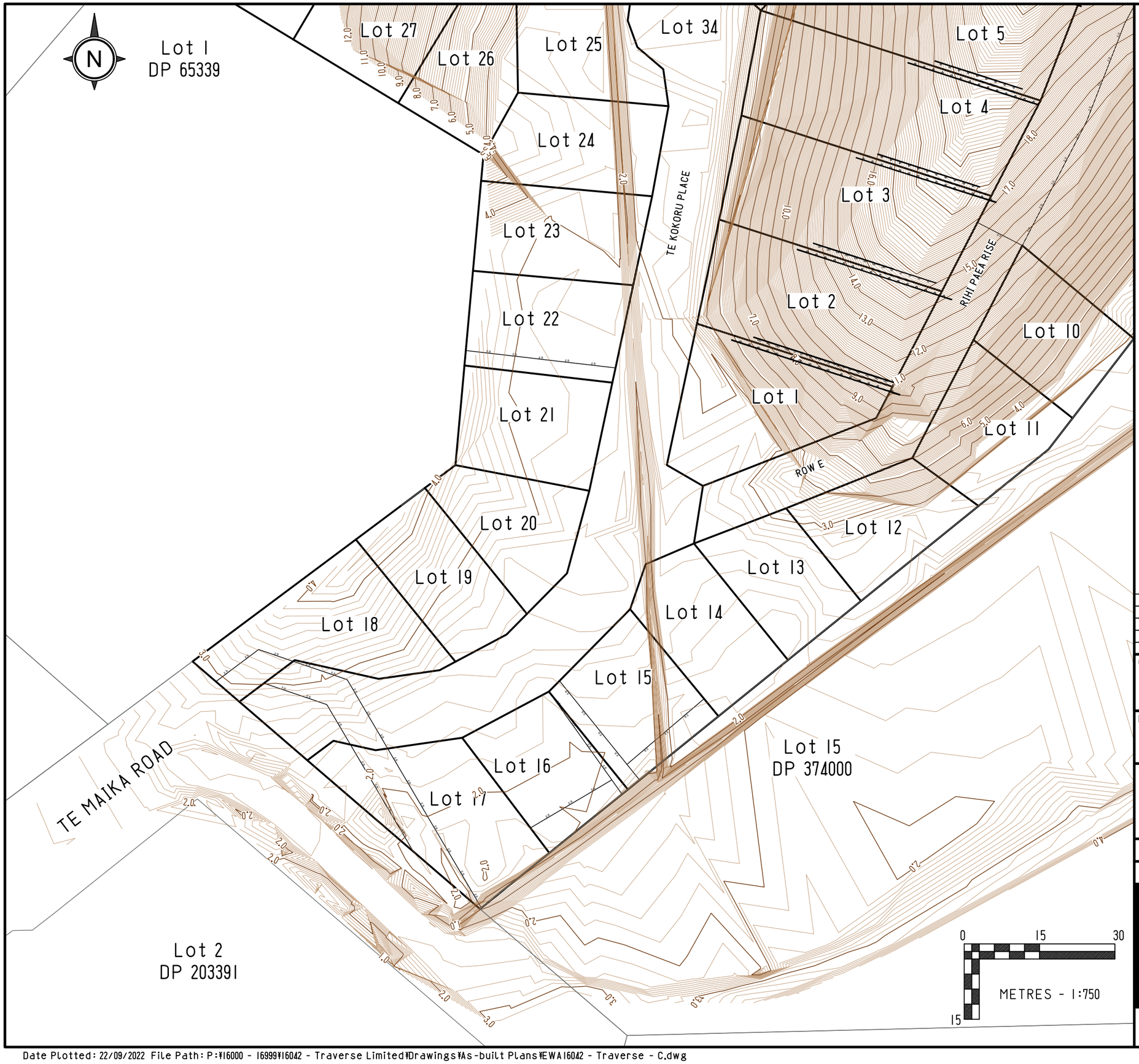

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RETAINING WALL : MAX HEIGHT - 1m

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
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DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
ORIGINAL CONTOURS

SCALE : 1:750 @A3

COUNCIL REFERENCE : SL2100003 AND P117722

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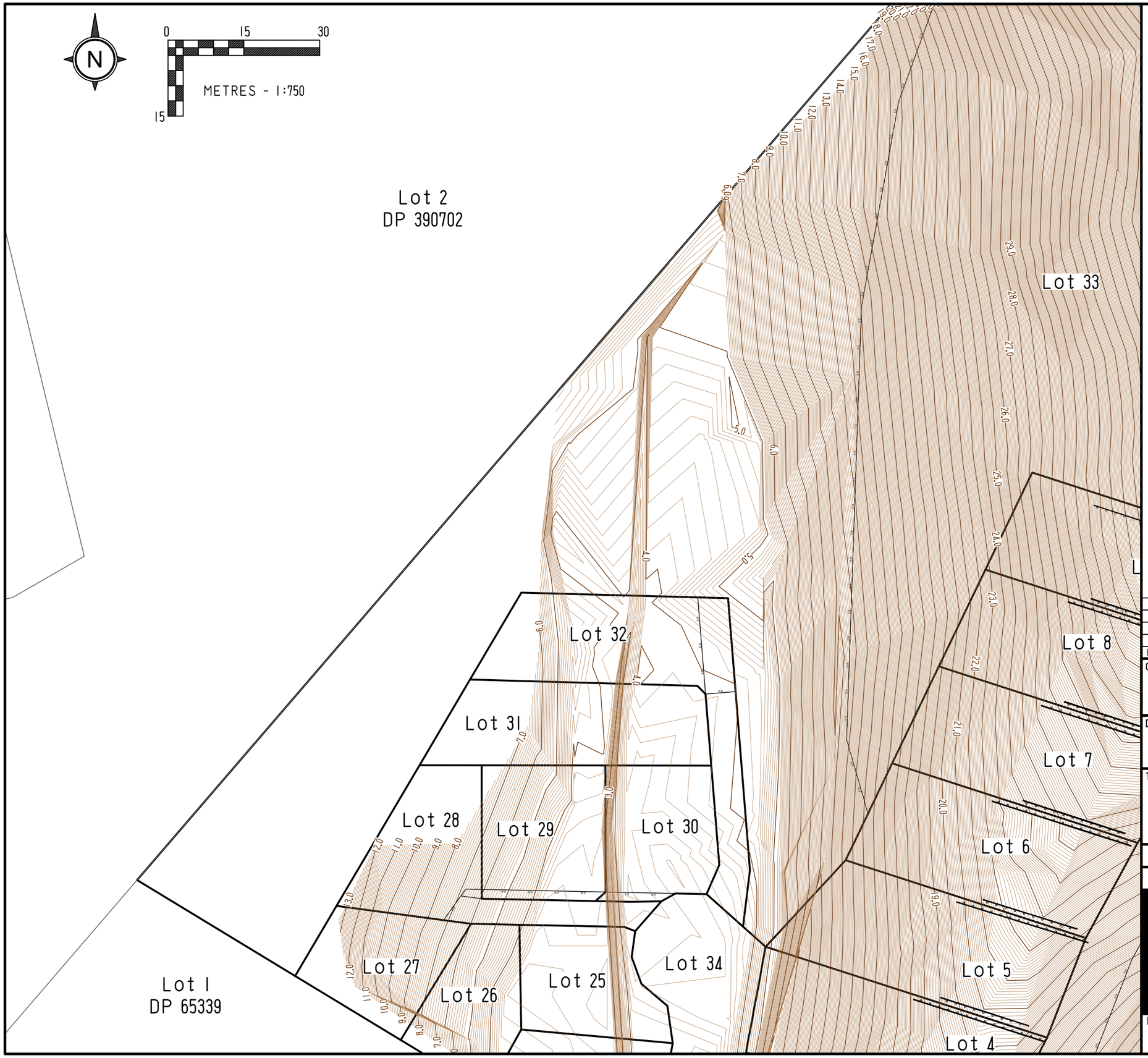

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- RETAINING WALL : MAX HEIGHT - 1m

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A	18.08.22	FIRST ISSUE - CK/PD

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DESCRIPTION

LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE

EARTHWORKS ASBUILT
ORIGINAL CONTOURS

SCALE : 1:750 @A3

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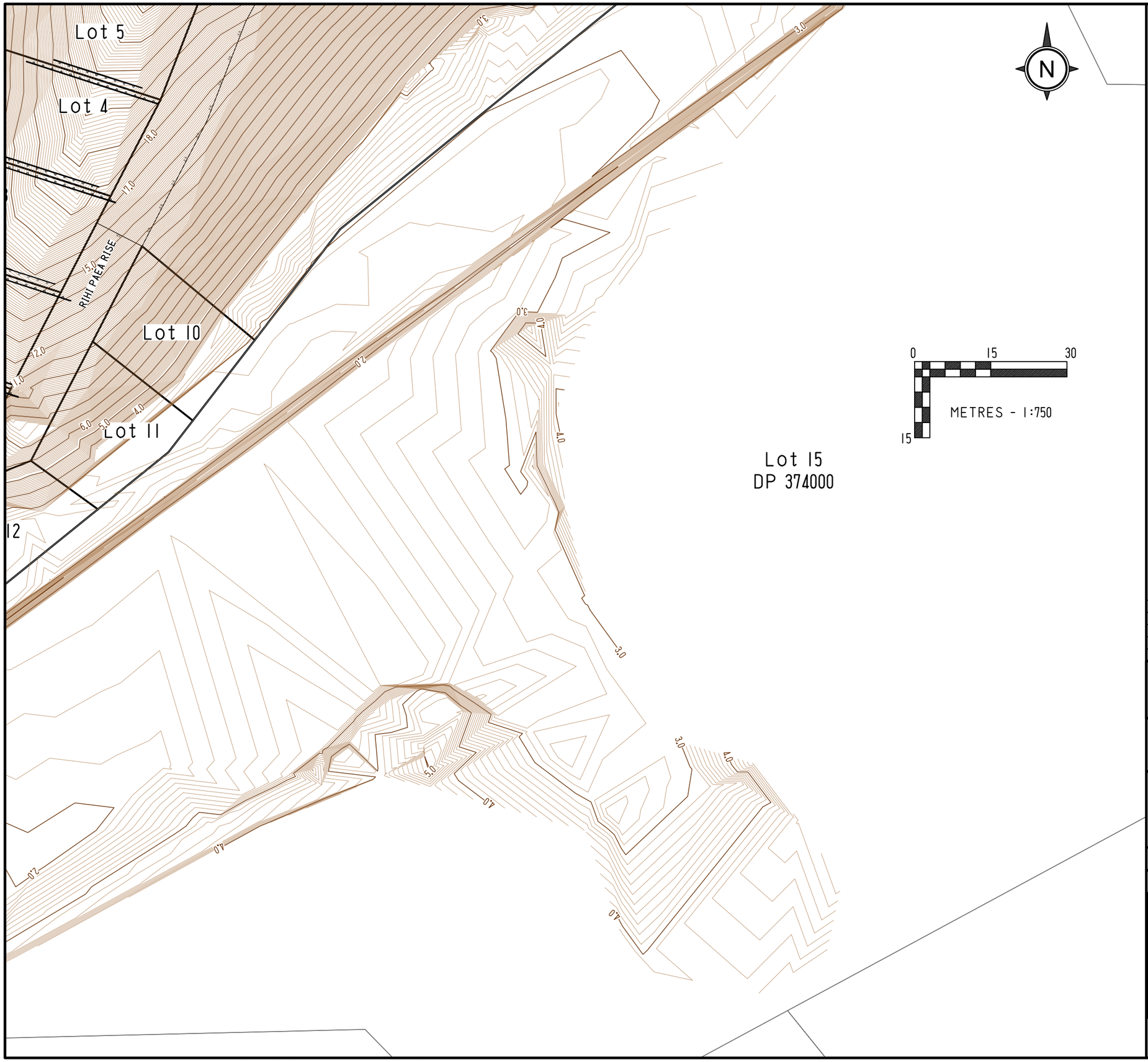

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REV	DATE	AMENDMENTS
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A	18.08.22	FIRST ISSUE - CK/PD

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51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION

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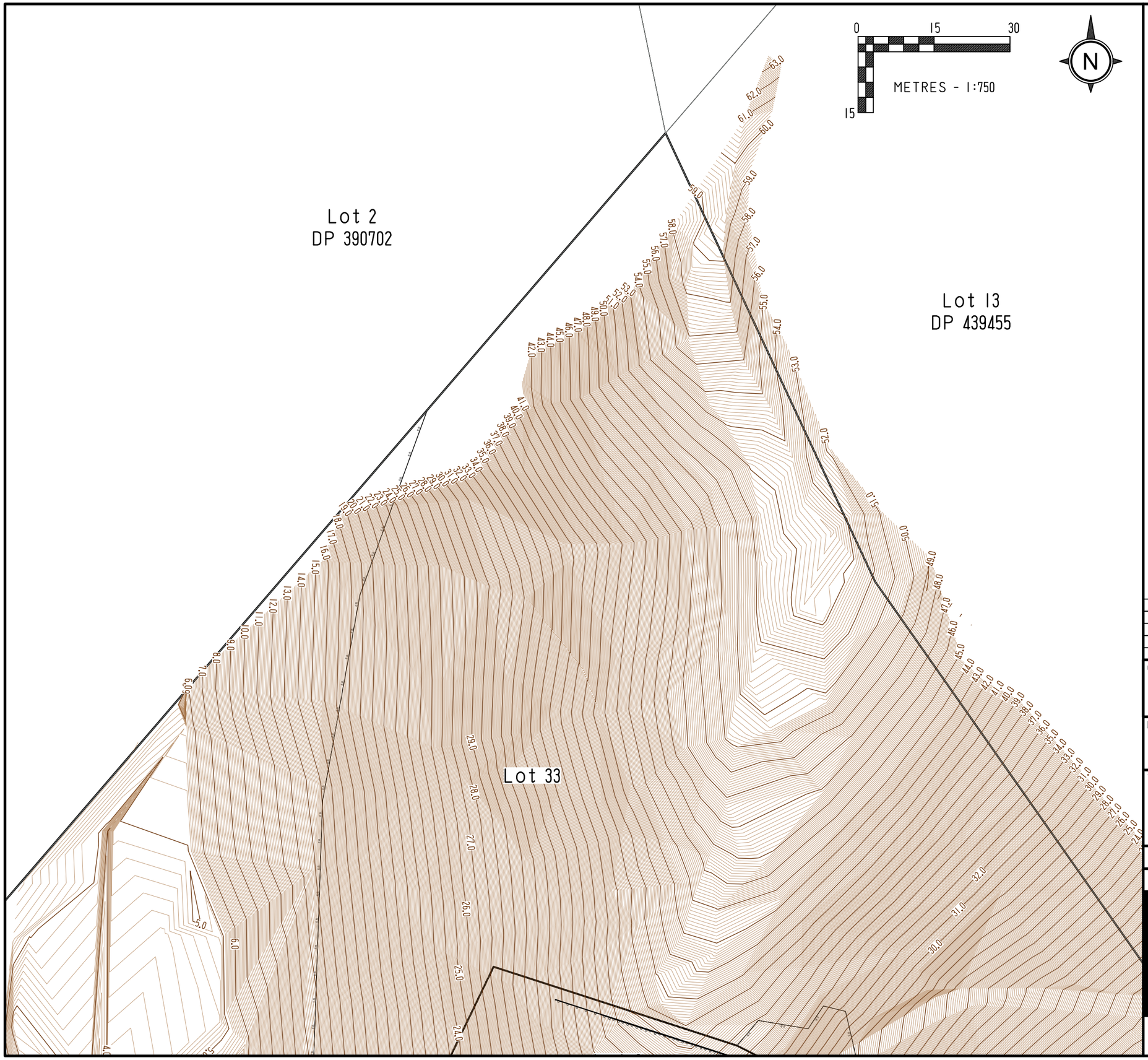

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51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION

LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE

EARTHWORKS ASBUILT
ORIGINAL CONTOURS

SCALE : 1:750 @A3

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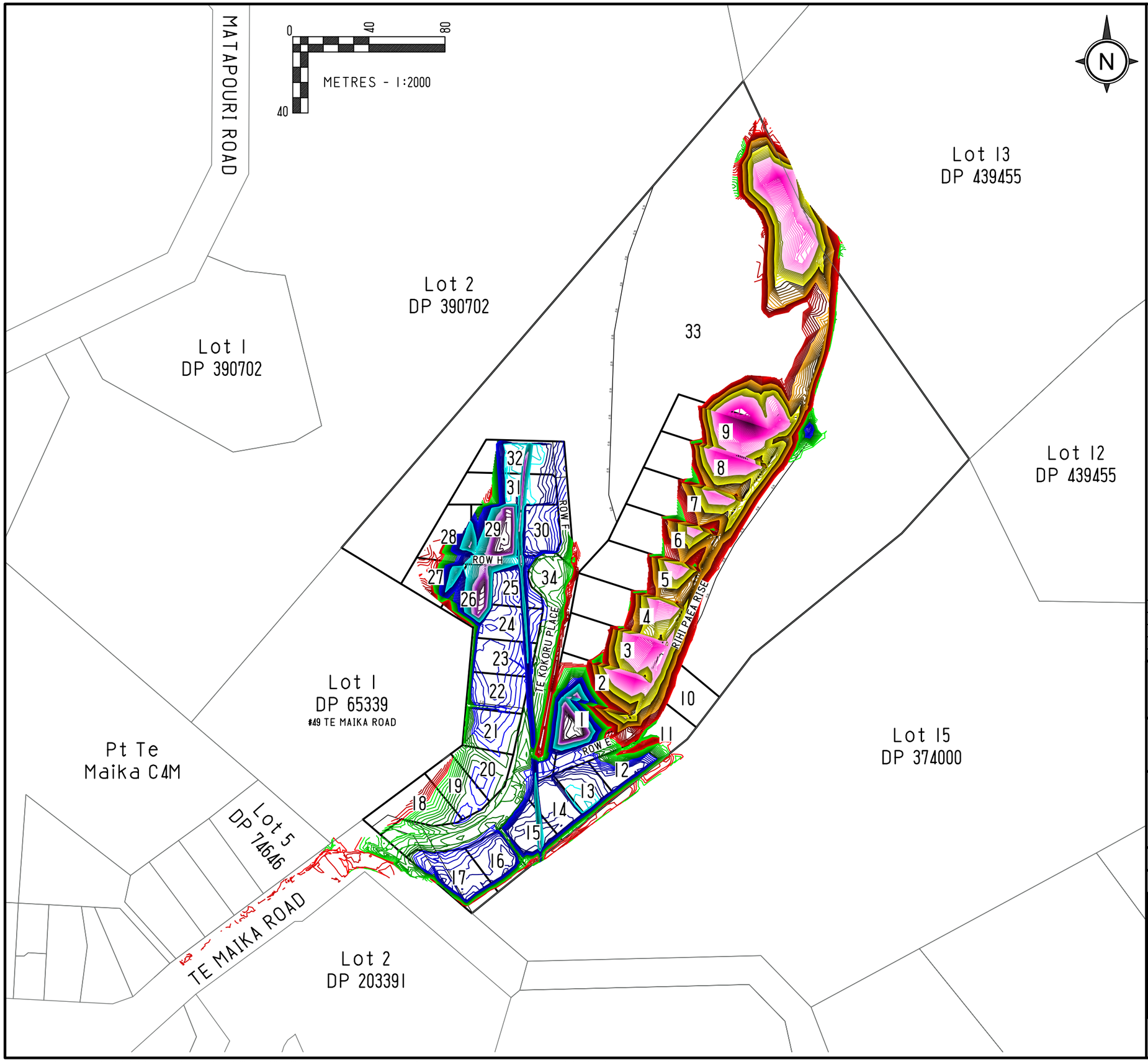

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REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT

TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION

LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE

EARTHWORKS ASBUILT
CUTFILL: OVERALL

SCALE: 1:2000 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

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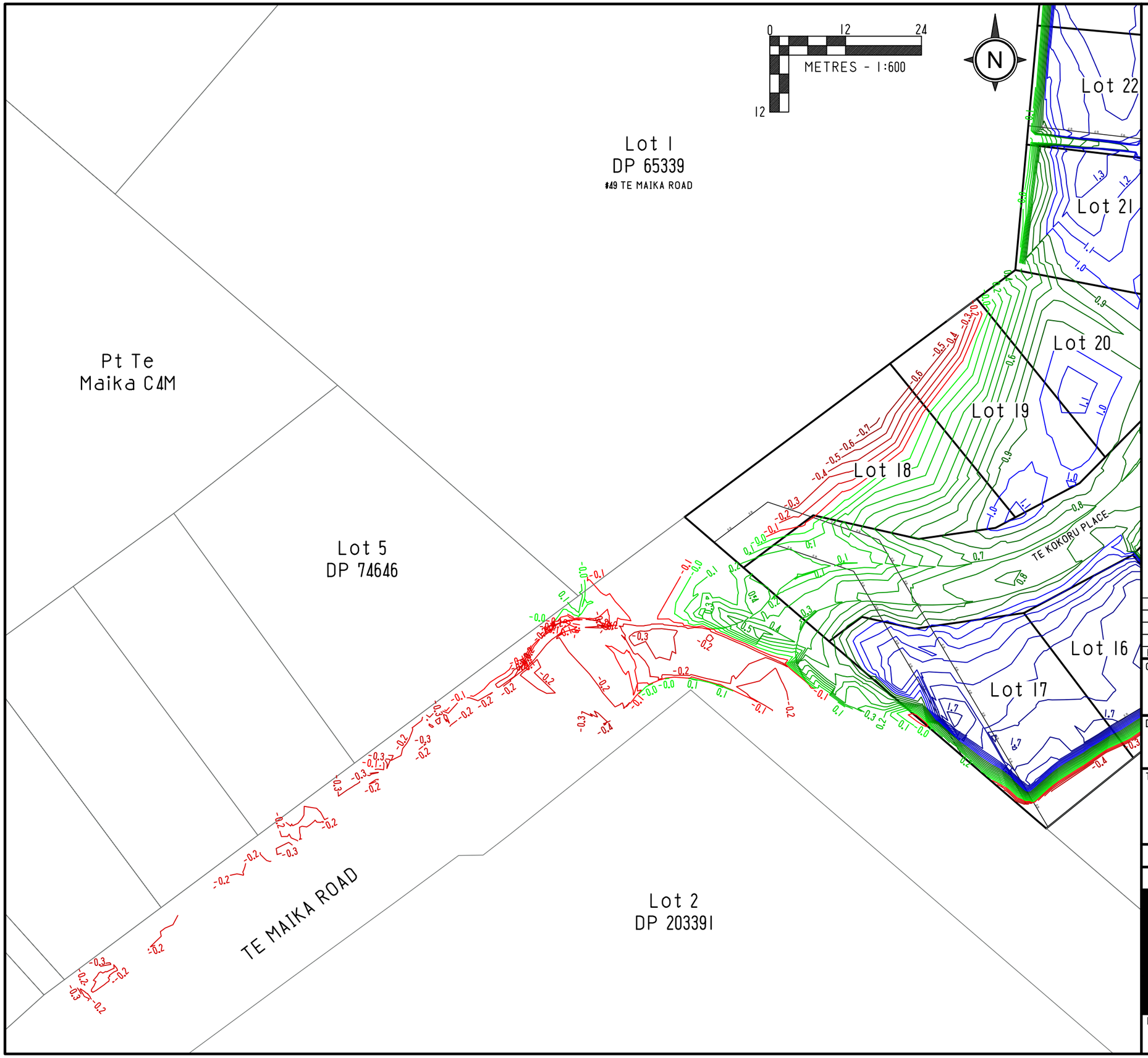

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REV	DATE	AMENDMENTS
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A	18.08.22	FIRST ISSUE - CK/PD

CLIENT

TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION

LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE

EARTHWORKS ASBUILT
CUTFILL LAYOUT

SCALE: 1:600 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

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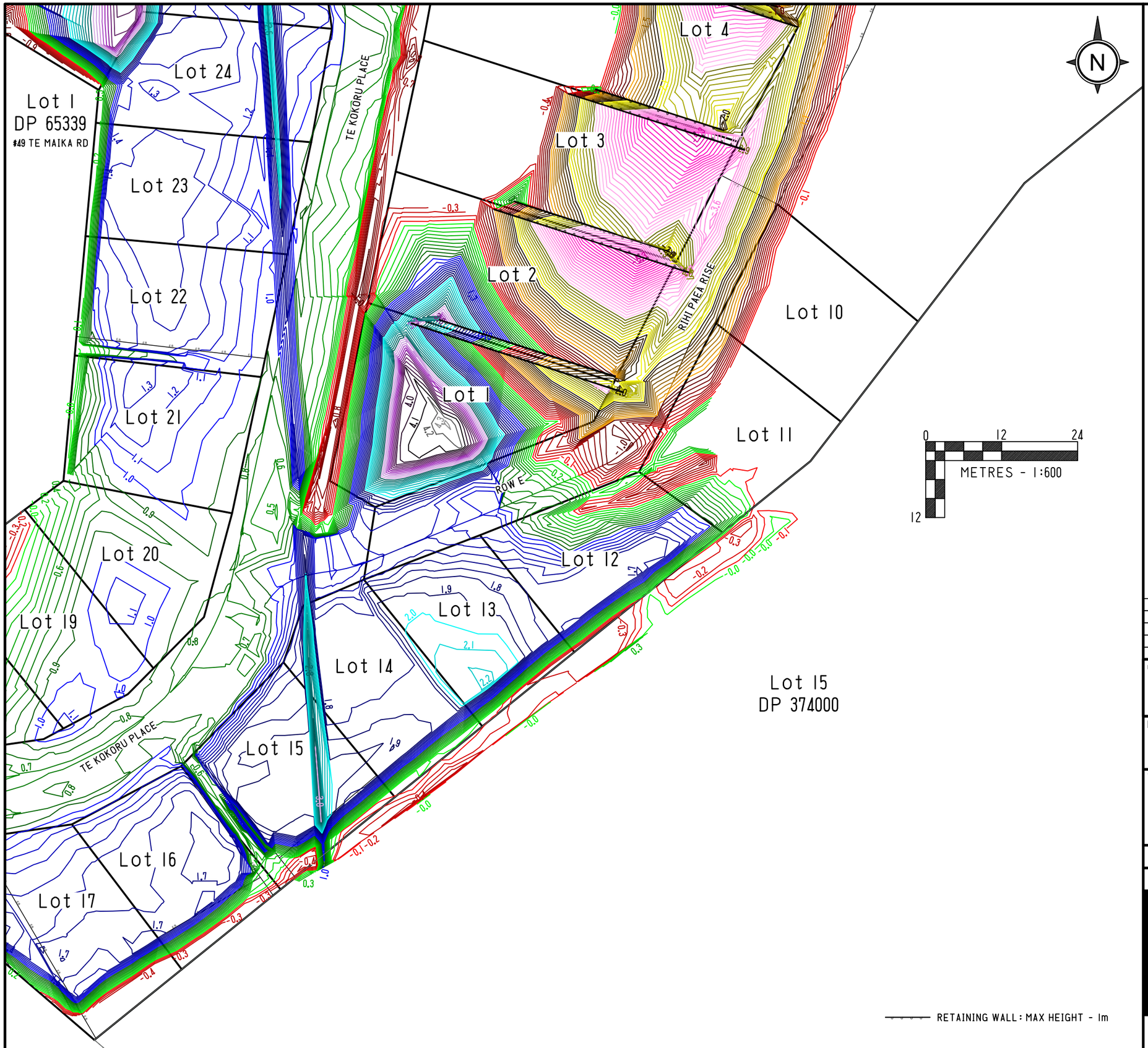

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DEPTH OF CUT :

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-2.40	TO	-2.50	-5.30	TO	-5.40			
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-2.80	TO	-2.90	-5.70	TO	-5.80			
-2.90	TO	-3.00	-5.80	TO	-5.90			

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT

TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION

LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE

EARTHWORKS ASBUILT
CUTFILL LAYOUT

SCALE : 1:600 @A3

COUNCIL REFERENCE : SL2100003 AND P117722

reyburn & bryant
Ph: 09 438 3563
7 Selwyn Ave, Whangarei
PO Box 191, Whangarei 0140
www.reyburnandbryant.co.nz

DRAWING REF.	SHEET	REV
EWA16042	09 OF 19	C

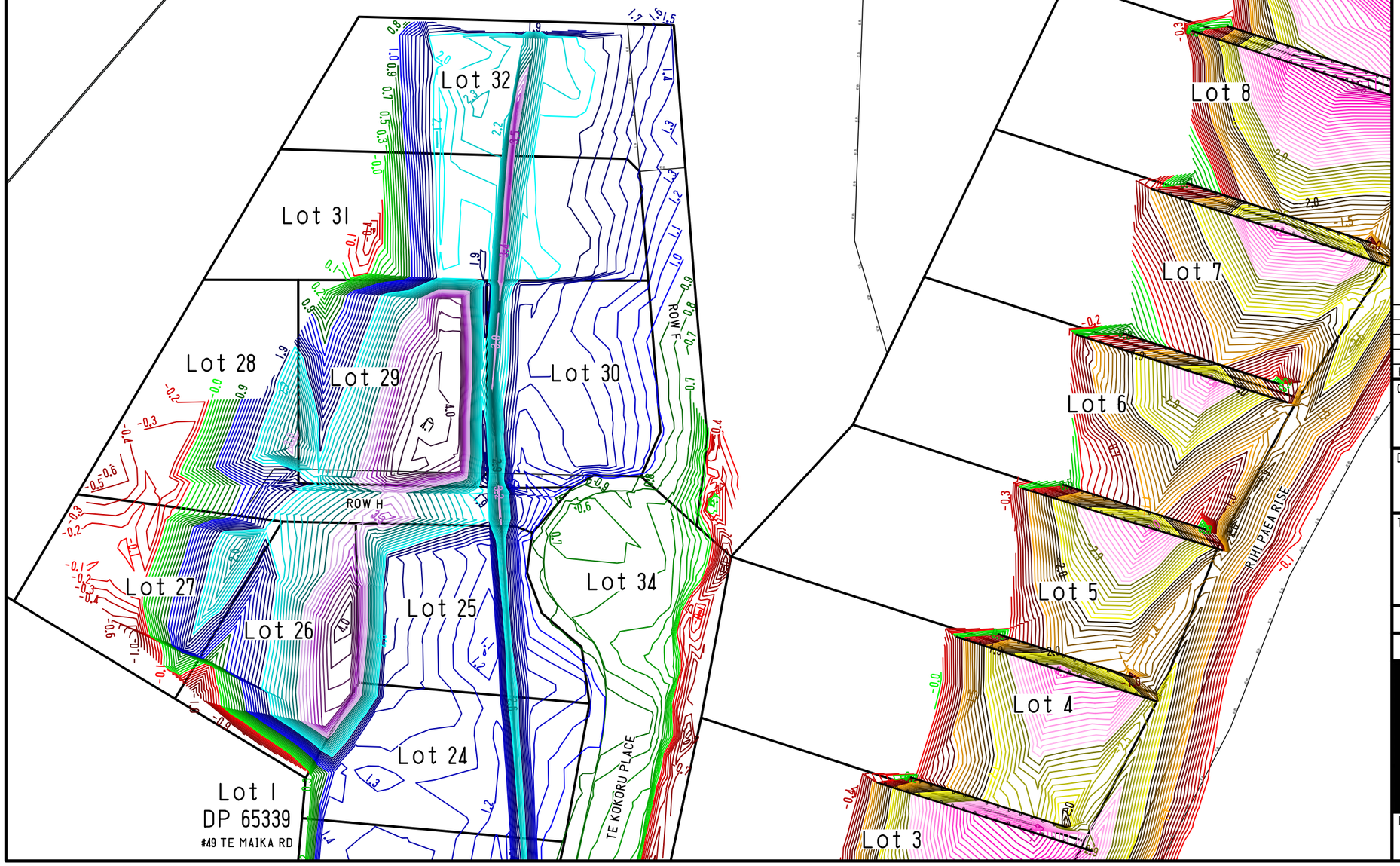
RETAINING WALL : MAX HEIGHT - Im

Lot 2
DP 390702

Lot 33

0 12 24
METRES - 1:600

N



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DEPTH OF FILL :

0.00	TO 0.10	1.50	TO 1.60	3.00	TO
0.10	TO 0.20	1.60	TO 1.70	3.10	TO
0.20	TO 0.30	1.70	TO 1.80	3.20	TO
0.30	TO 0.40	1.80	TO 1.90	3.30	TO
0.40	TO 0.50	1.90	TO 2.00	3.40	TO
0.50	TO 0.60	2.00	TO 2.10	3.50	TO
0.60	TO 0.70	2.10	TO 2.20	3.60	TO
0.70	TO 0.80	2.20	TO 2.30	3.70	TO
0.80	TO 0.90	2.30	TO 2.40	3.80	TO
0.90	TO 1.00	2.40	TO 2.50	3.90	TO
1.00	TO 1.10	2.50	TO 2.60	4.00	TO
1.10	TO 1.20	2.60	TO 2.70	4.10	TO
1.20	TO 1.30	2.70	TO 2.80	4.20	TO
1.30	TO 1.40	2.80	TO 2.90	4.30	
1.40	TO 1.50	2.90	TO 3.00		

DEPTH OF CUT :

-0.10	TO -0.20	-3.00	TO -3.10	-5.90	TO
-0.20	TO -0.30	-3.10	TO -3.20	-6.00	TO
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-1.90	TO -2.00	-4.80	TO -4.90		
-2.00	TO -2.10	-4.90	TO -5.00		
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-2.50	TO -2.60	-5.40	TO -5.50		
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-2.70	TO -2.80	-5.60	TO -5.70		
-2.80	TO -2.90	-5.70	TO -5.80		
-2.90	TO -3.00	-5.80	TO -5.90		

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
CUTFILL LAYOUT

SCALE : 1:600 @A3

COUNCIL REFERENCE : SL2100003 AND P117722

reyburn & bryant
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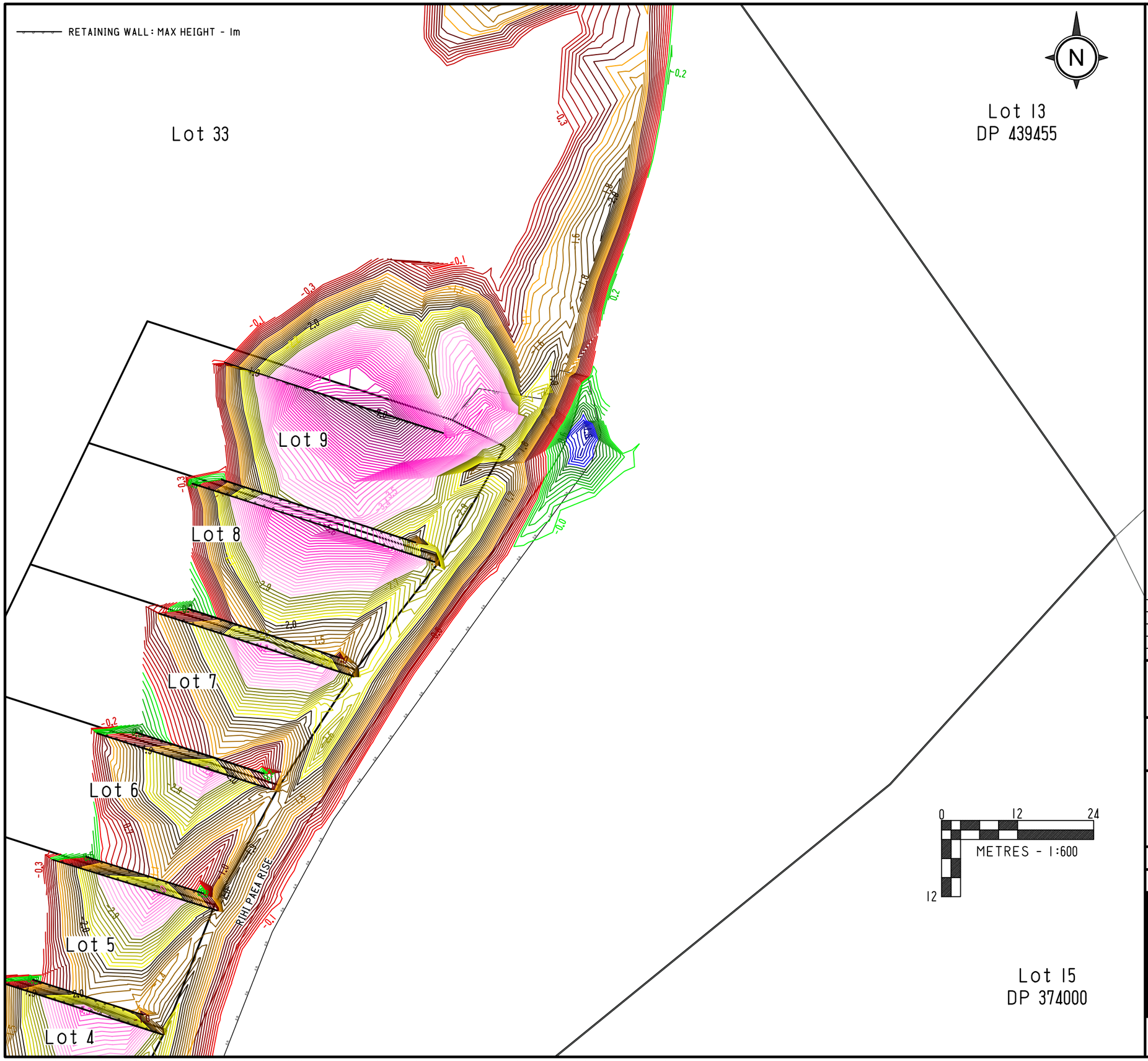
DRAWING REF. EWA16042 | SHEET 10 OF 19 | REV C

Date Plotted: 22/09/2022 File Path: P:¥16000 - 16999¥16042 - Traverse Limited¥Drawings¥As-built Plans¥EWA16042 - Traverse - C.dwg

RETAINING WALL : MAX HEIGHT - Im



0 12 24
METRES - 1:600

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DEPTH OF FILL :

0.00	TO 0.10	1.50	TO 1.60	3.00	TO
0.10	TO 0.20	1.60	TO 1.70	3.10	TO
0.20	TO 0.30	1.70	TO 1.80	3.20	TO
0.30	TO 0.40	1.80	TO 1.90	3.30	TO
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0.60	TO 0.70	2.10	TO 2.20	3.60	TO
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0.90	TO 1.00	2.40	TO 2.50	3.90	TO
1.00	TO 1.10	2.50	TO 2.60	4.00	TO
1.10	TO 1.20	2.60	TO 2.70	4.10	TO
1.20	TO 1.30	2.70	TO 2.80	4.20	TO
1.30	TO 1.40	2.80	TO 2.90	4.30	
1.40	TO 1.50	2.90	TO 3.00		

DEPTH OF CUT :

-0.10	TO -0.20	-3.00	TO -3.10	-5.90	TO
-0.20	TO -0.30	-3.10	TO -3.20	-6.00	TO
-0.30	TO -0.40	-3.20	TO -3.30	-6.10	TO
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-2.80	TO -2.90	-5.70	TO -5.80		
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REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
CUTFILL LAYOUT

SCALE : 1:600 @A3

COUNCIL REFERENCE : SL2100003 AND P117722

reyburn & bryant
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DRAWING REF. EWA16042 | SHEET 11 OF 19 | REV C

0 12 24

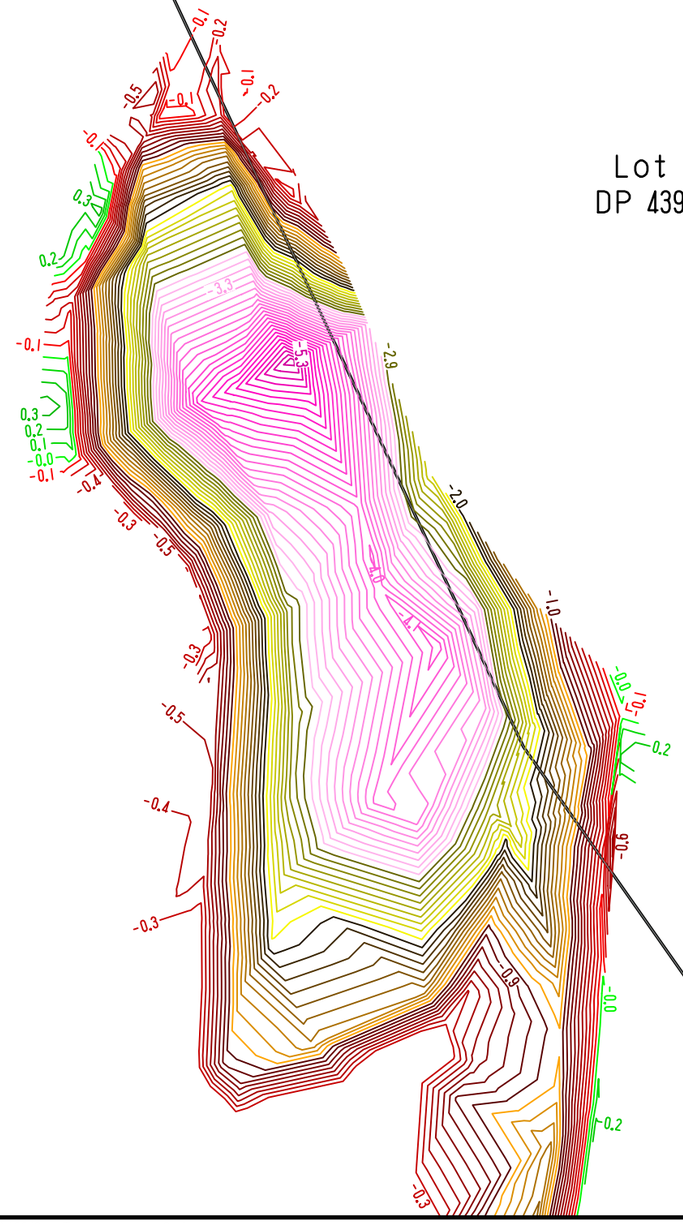
METRES - 1:600

12

N

Lot 2
DP 390702

Lot 13
DP 439455



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DEPTH OF FILL:

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1.30	TO	1.40	2.80	TO	2.90	4.30		
1.40	TO	1.50	2.90	TO	3.00			

DEPTH OF CUT:

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-2.90	TO	-3.00	-5.80	TO	-5.90			

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT

TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION

LOTS 1 - 24 BEING A PROPOSED SUBDIVISION
OF LOT 14 DP 374000

TITLE

EARTHWORKS ASBUILT
CUTFILL LAYOUT

SCALE: 1:600 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

reyburn & bryant

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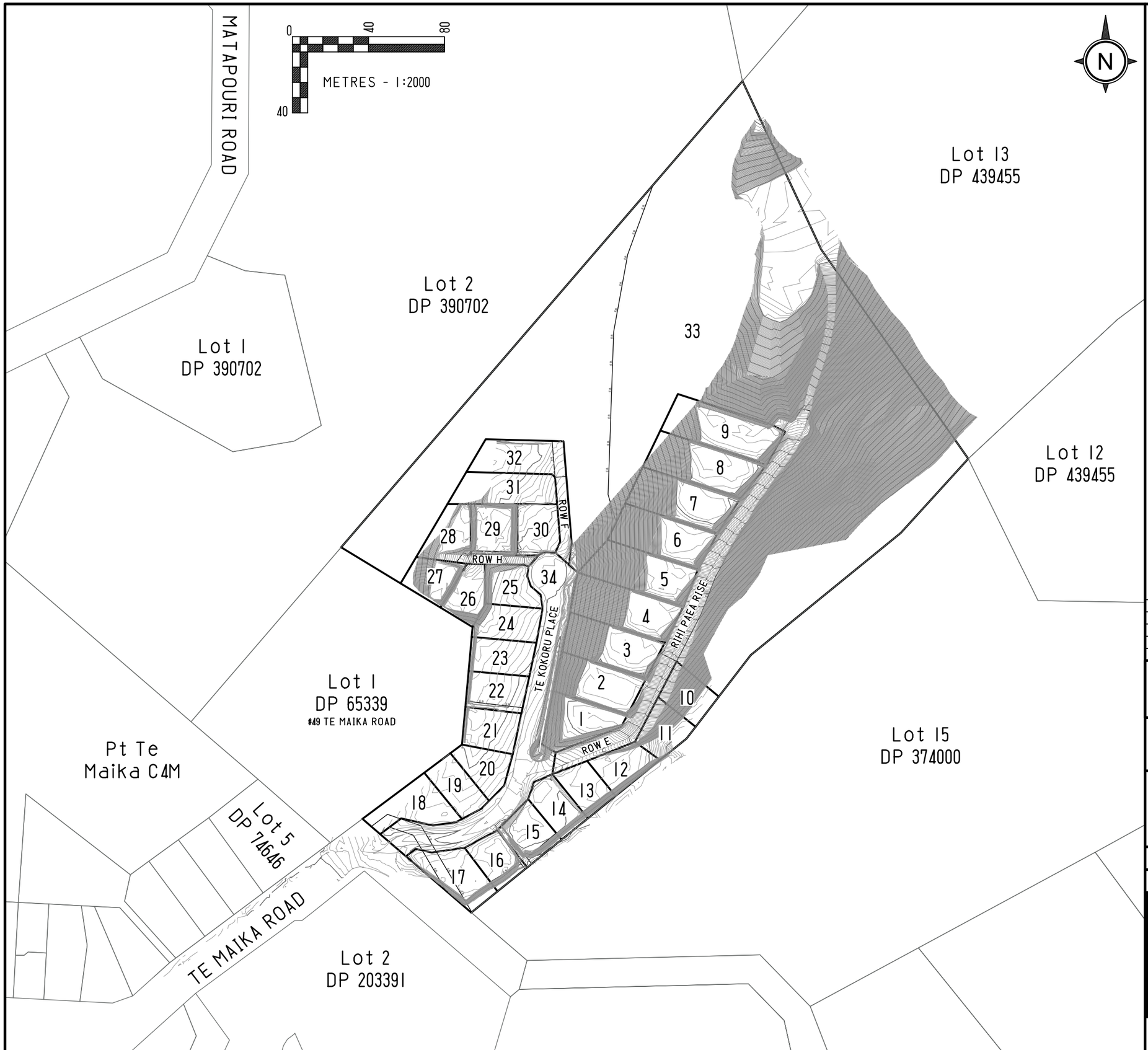
DRAWING REF. EWA16042

SHEET 12 OF 19

REV C



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MAJOR CONTOURS @ 1.0m INTERVALS
MINOR CONTOURS @ 0.1m INTERVALS

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
FINAL CONTOURS: OVERALL

SCALE: 1:2000 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

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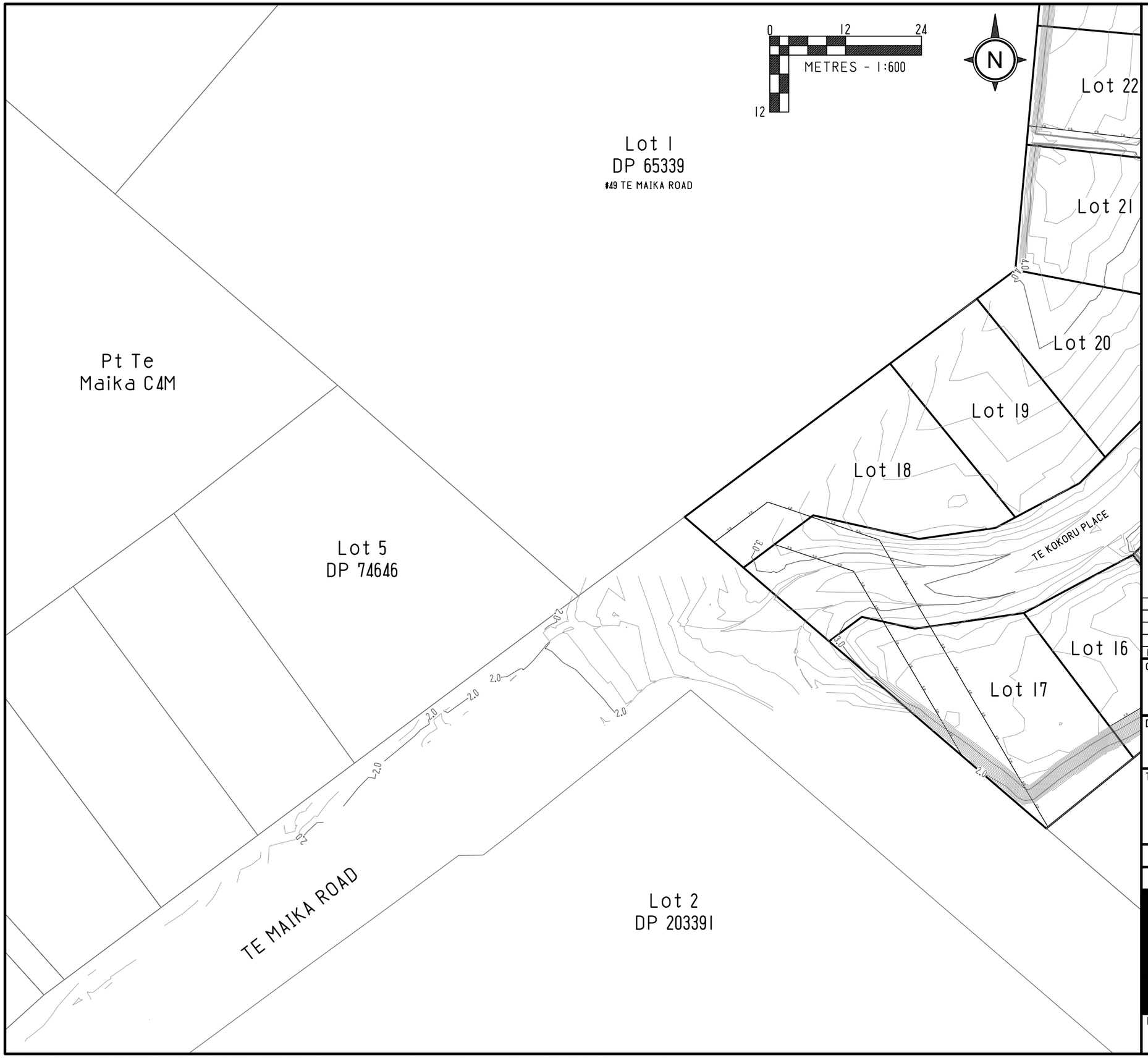
DRAWING REF.	SHEET	REV
EWA16042	13 OF 19	C

Date Plotted: 22/09/2022 File Path: P:¥16000 - 16999¥16042 - Traverse Limited¥Drawings¥As-built Plans¥EWA16042 - Traverse - C.dwg



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MAJOR CONTOURS @ 1.0m INTERVALS
MINOR CONTOURS @ 0.1m INTERVALS

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
FINAL CONTOURS LAYOUT

SCALE: 1:600 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

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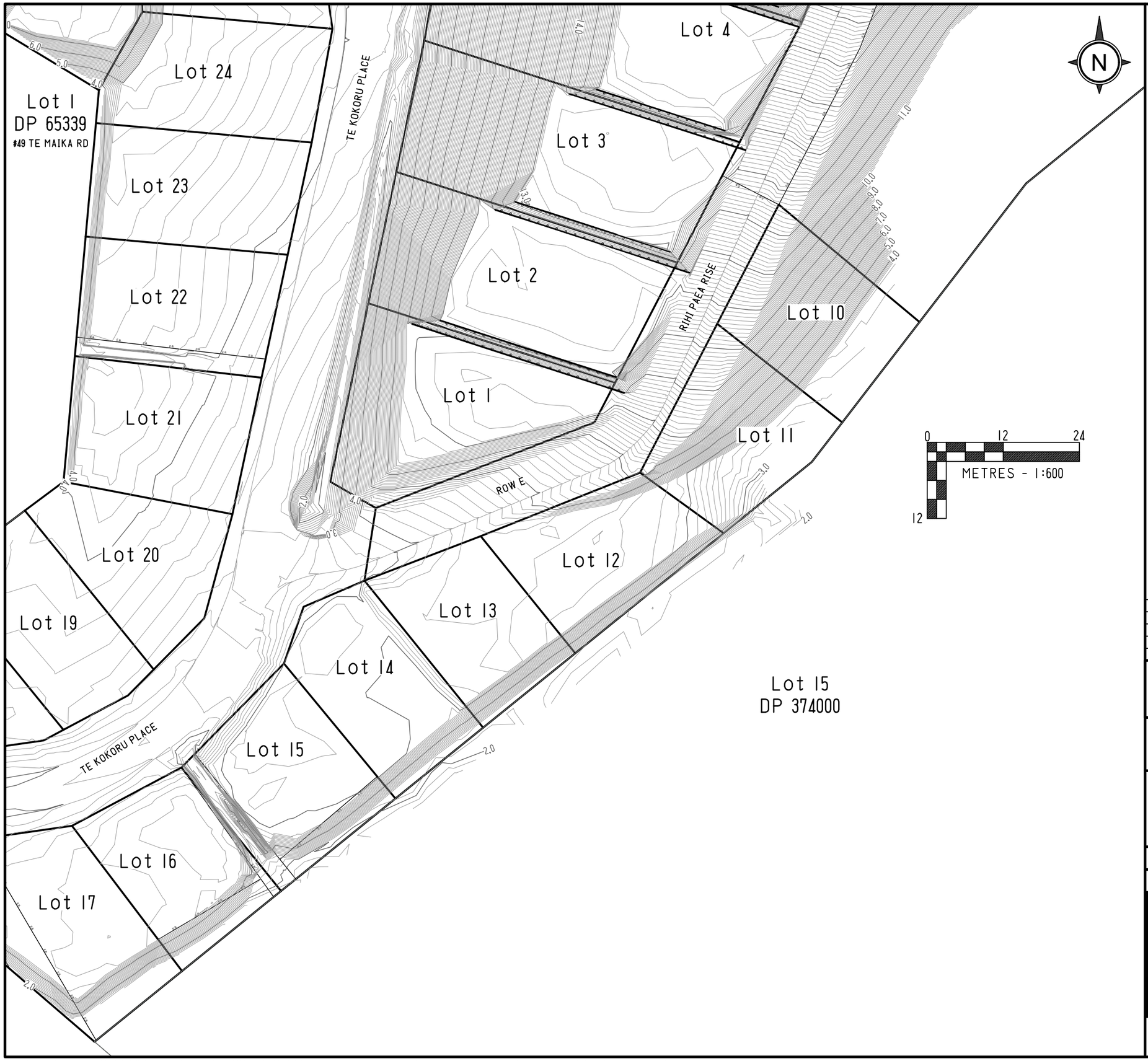
DRAWING REF. EWA16042 | SHEET 14 OF 19 | REV C

Date Plotted: 22/09/2022 File Path: P:¥16000 - 16999¥16042 - Traverse Limited¥Drawings¥As-built Plans¥EWA16042 - Traverse - C.dwg



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MAJOR CONTOURS @ 1.0m INTERVALS
MINOR CONTOURS @ 0.1m INTERVALS
RETAINING WALL : MAX HEIGHT - 1m

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
FINAL CONTOURS LAYOUT

SCALE : 1:600 @A3

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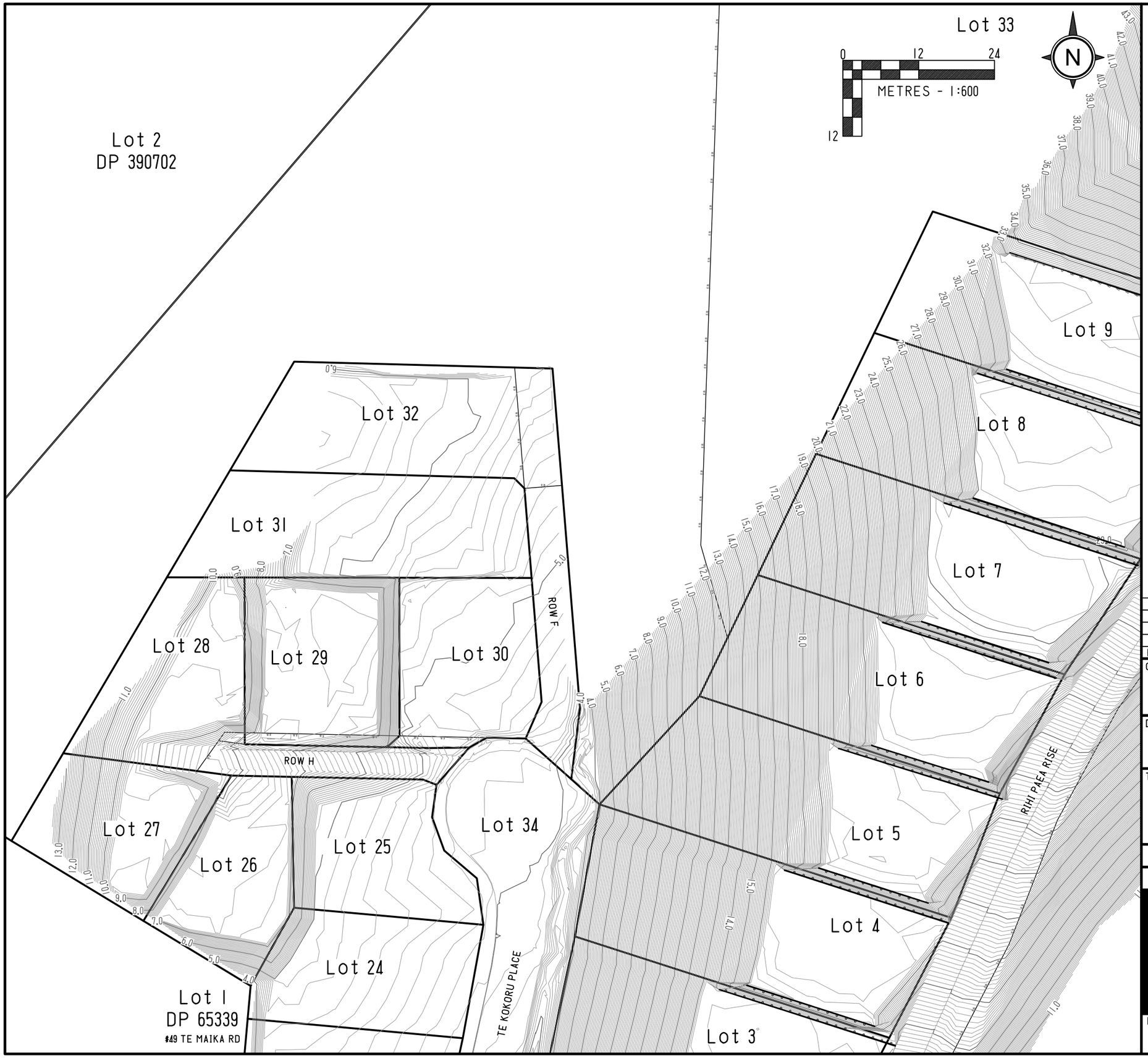
DRAWING REF. EWA16042 | SHEET 15 OF 19 | REV C

Date Plotted: 22/09/2022 File Path: P:¥16000 - 16999¥16042 - Traverse Limited¥Drawings¥As-built Plans¥EWA16042 - Traverse - C.dwg



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- MAJOR CONTOURS @ 1.0m INTERVALS
- MINOR CONTOURS @ 0.1m INTERVALS
- RETAINING WALL : MAX HEIGHT - 1m

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT

TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION

LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE

EARTHWORKS ASBUILT
FINAL CONTOURS LAYOUT

SCALE: 1:600 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

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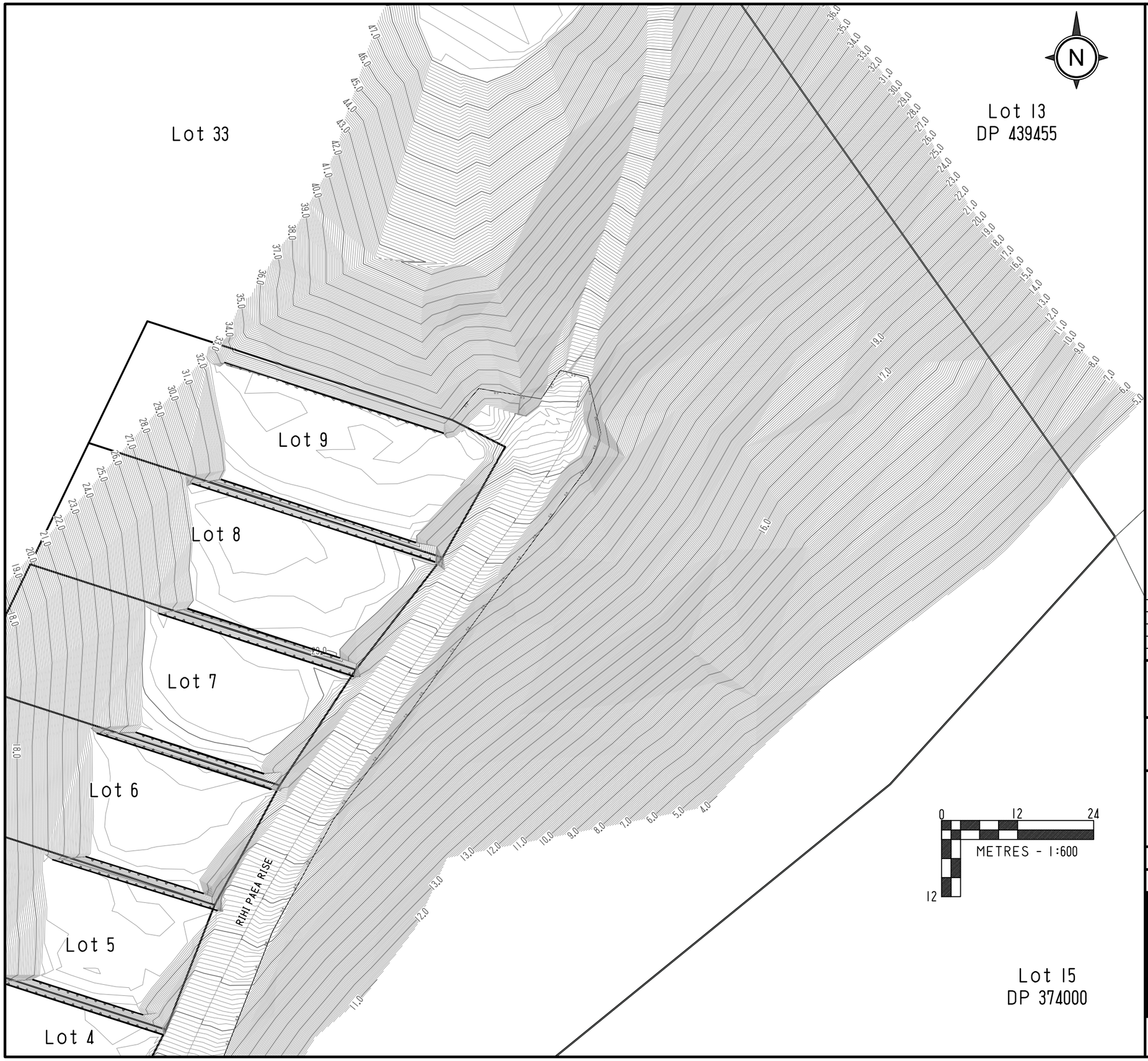
DRAWING REF. EWA16042 | SHEET 16 OF 19 | REV C



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MAJOR CONTOURS @ 1.0m INTERVALS
MINOR CONTOURS @ 0.1m INTERVALS
RETAINING WALL : MAX HEIGHT - 1m

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
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DESCRIPTION
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TITLE
EARTHWORKS ASBUILT
FINAL CONTOURS LAYOUT

SCALE : 1:600 @A3

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DRAWING REF. EWA16042 | SHEET 17 OF 19 | REV C

Date Plotted: 22/09/2022 File Path: P:¥16000 - 16999¥16042 - Traverse Limited¥Drawings¥As-built Plans¥EWA16042 - Traverse - C.dwg

0 12 24

METRES - 1:600

12

Lot 2
DP 390702

Lot 13
DP 439455

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MAJOR CONTOURS @ 1.0m INTERVALS
MINOR CONTOURS @ 0.1m INTERVALS

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

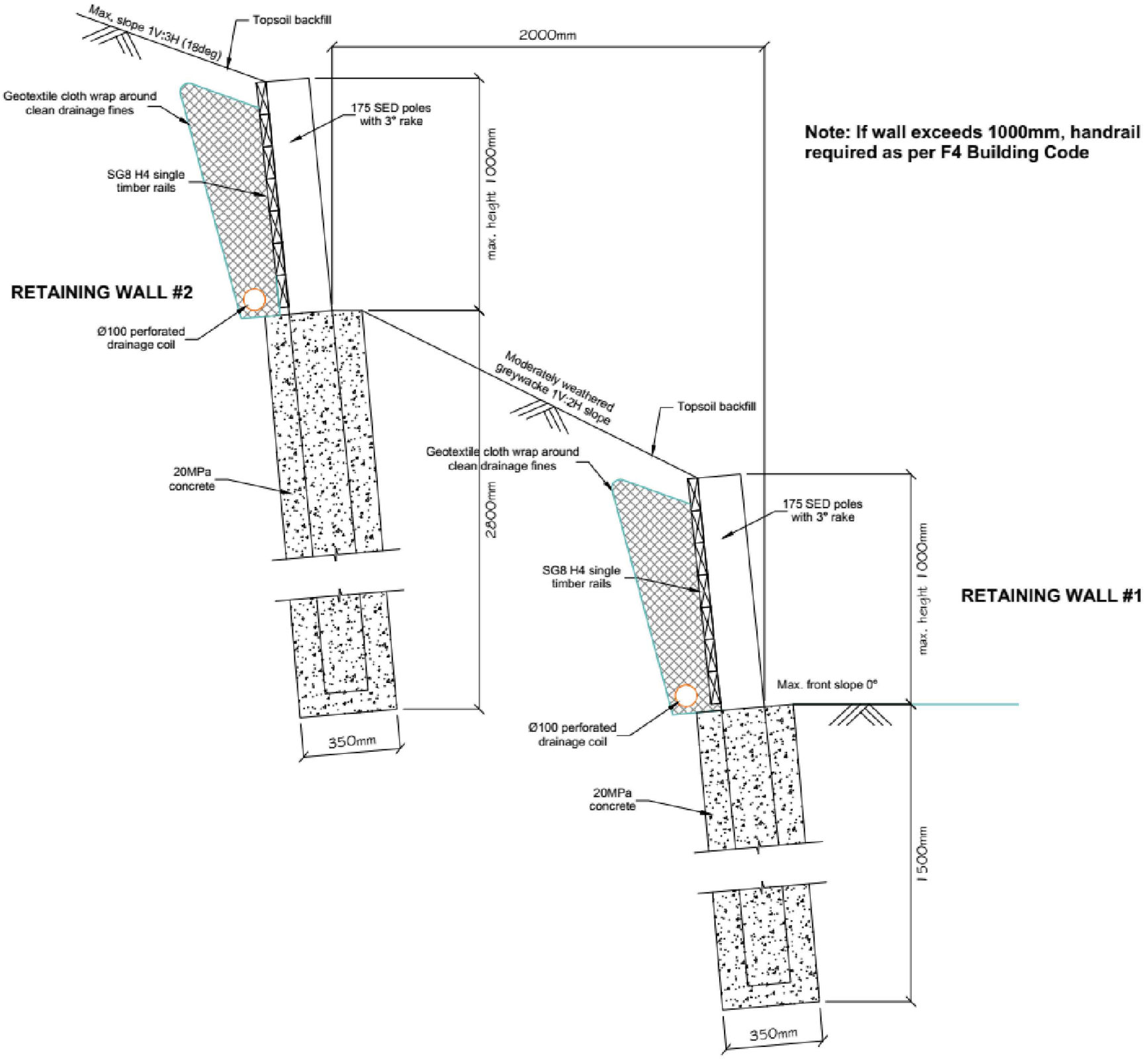
TITLE
EARTHWORKS ASBUILT
FINAL CONTOURS LAYOUT

SCALE: 1:600 @A3

COUNCIL REFERENCE: SL2100003 AND P117722

reyburn & bryant
Ph: 09 438 3563
PO Box 191, Whangarei 0140
7 Selwyn Ave, Whangarei
www.reyburnandbryant.co.nz

DRAWING REF.	SHEET	REV
EWA16042	18 OF 19	C



Note: If wall exceeds 1000mm, handrail required as per F4 Building Code

RETAINING WALL #1

CAUTION:

THIS DRAWING SHOULD NOT BE AMENDED MANUALLY AND IS COPYRIGHT TO REYBURN & BRYANT (1999) LIMITED. DO NOT SCALE OFF DRAWINGS.

——— MAJOR CONTOURS @ 1.0m INTERVALS
——— MINOR CONTOURS @ 0.1m INTERVALS

REV	DATE	AMENDMENTS
C	22.09.22	RETAINING WALL DETAILS - CK/PD
B	02.09.22	RETAINING WALLS - CK/CC
A	18.08.22	FIRST ISSUE - CK/PD

CLIENT
TRAVERSE LIMITED
51 TE MAIKA ROAD, NGUNGURU

DESCRIPTION
LOTS 1 - 24 BEING A PROPOSED SUBDIVISION OF LOT 14 DP 374000

TITLE
EARTHWORKS ASBUILT
CORE RETAINING WALL DETAILS

N.T.S.

COUNCIL REFERENCE: SL2100003 AND P117722

reyburn & bryant
Ph: 09 438 3563
7 Selwyn Ave, Whangarei
PO Box 191, Whangarei 0140
www.reyburnandbryant.co.nz

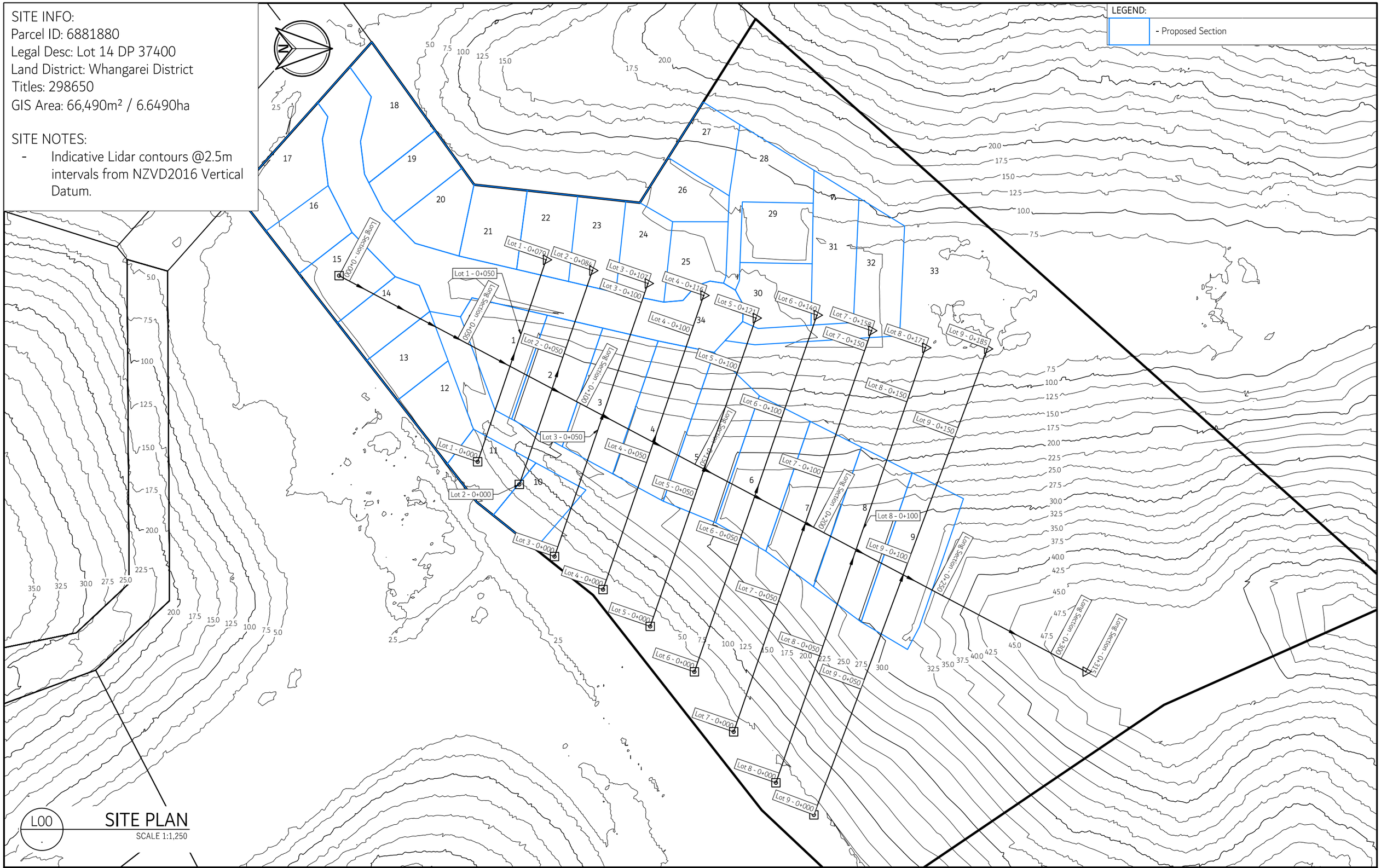
DRAWING REF. EWA16042 | SHEET 19 OF 19 | REV C

APPENDIX 4 – CORE ENGINEERING SOLUTIONS LTD DRAWINGS SET

SITE INFO:
Parcel ID: 6881880
Legal Desc: Lot 14 DP 37400
Land District: Whangarei District
Titles: 298650
GIS Area: 66,490m² / 6.6490ha

SITE NOTES:
- Indicative Lidar contours @2.5m intervals from NZVD2016 Vertical Datum.

LEGEND:
- Proposed Section



L00 SITE PLAN
SCALE 1:1,250

CORE Consulting Engineers
ENGINEERING SOLUTIONS
Structural | Geotechnical | Civil

T: 09 553 3660
jobs@coreeng.nz
Level 1, 31 Vine Street,
Whangarei 0110

Rev	Date	Notes
A	16/08/22	Original Issue

CLIENT: Traverse Ltd

LOCATION: 51 Te Maika Road, Ngunguru

PROJECT DESCRIPTION: PROPOSED SUBDIVISION

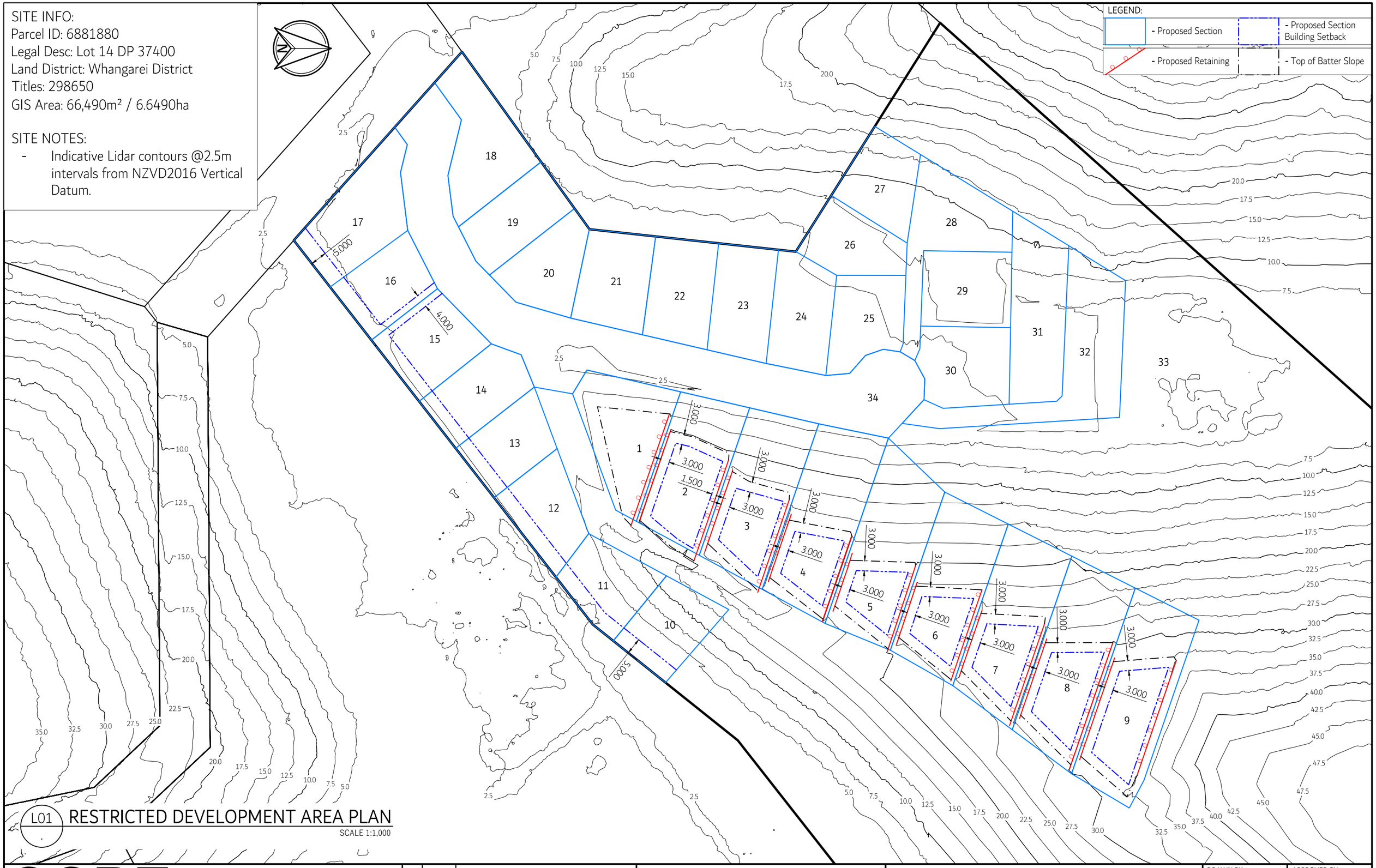
SHEET TITLE: SITE PLAN

DRAWN BY:	APPROVED BY:
LJM	DL
ORIGINAL: A3	SCALE: 1:1,250
FILE: 20-0078	SHEET: L00

SITE INFO:
Parcel ID: 6881880
Legal Desc: Lot 14 DP 37400
Land District: Whangarei District
Titles: 298650
GIS Area: 66,490m² / 6.6490ha

SITE NOTES:
- Indicative Lidar contours @2.5m intervals from NZVD2016 Vertical Datum.

LEGEND:
- Proposed Section
- Proposed Section Building Setback
- Proposed Retaining
- Top of Batter Slope



L01 RESTRICTED DEVELOPMENT AREA PLAN
SCALE 1:1,000

CORE ENGINEERING SOLUTIONS
Consulting Engineers
Structural | Geotechnical | Civil

T: 09 553 3660
jobs@coreeng.nz
Level 1, 31 Vine Street,
Whangarei 0110

Rev	Date	Notes
A	16/08/22	Original Issue

CLIENT: Traverse Ltd

LOCATION: 51 Te Maika Road, Ngunguru

PROJECT DESCRIPTION: PROPOSED SUBDIVISION

SHEET TITLE: RESTRICTED DEVELOPMENT AREA PLAN

DRAWN BY:	APPROVED BY:
LJM	DL
ORIGINAL: A3	SCALE: 1:1,000
FILE: 20-0078	SHEET: L01

SITE INFO:
Parcel ID: 6881880
Legal Desc: Lot 14 DP 37400
Land District: Whangarei District
Titles: 298650
GIS Area: 66,490m² / 6.6490ha

SITE NOTES:
- Indicative Lidar contours @2.5m intervals from NZVD2016 Vertical Datum.

LEGEND:
- Proposed Section
- Proposed Retaining
- Proposed Section Building Setback
- SED Build Area

L03 STAGE 2 PLAN
SCALE 1:1,000

CORE Consulting Engineers
ENGINEERING SOLUTIONS
Structural | Geotechnical | Civil
T: 09 553 3660
jobs@coreeng.nz
Level 1, 31 Vine Street,
Whangarei 0110

Rev	Date	Notes
A	16/08/22	Original Issue

CLIENT: Traverse Ltd
LOCATION: 51 Te Maika Road, Ngunguru
PROJECT DESCRIPTION: PROPOSED SUBDIVISION
SHEET TITLE: STAGE 2 PLAN
DRAWN BY: LJM
APPROVED BY: DL
ORIGINAL: A3
SCALE: 1:1,000
FILE: 20-0078
SHEET: L03

SITE INFO:
Parcel ID: 6881880
Legal Desc: Lot 14 DP 37400
Land District: Whangarei District
Titles: 298650
GIS Area: 66,490m² / 6.6490ha

SITE NOTES:
- Indicative Lidar contours @2.5m intervals from NZVD2016 Vertical Datum.

LEGEND:
- Proposed Section
- Proposed Section Building Setback

Surface Analysis: Elevation Ranges

Number	Color	Minimum Elevation (m)	Maximum Elevation (m)	2D Area (m²)
1		-8.000	-6.001	58.1
2		-6.000	-4.001	897.9
3		-4.000	-2.001	4823.8
4		-2.000	-0.001	17742.2
5		0.001	2.000	17292.9
6		2.001	4.000	2370.3
7		4.001	6.000	190.3
8		6.001	8.000	1.6

L05 EARTHWORKS PLAN
SCALE 1:1,000

CORE ENGINEERING SOLUTIONS
Consulting Engineers
Structural | Geotechnical | Civil
T: 09 553 3660
jobs@coreeng.nz
Level 1, 31 Vine Street, Whangarei 0110

Rev	Date	Notes
A	16/08/22	Original Issue

CLIENT: Traverse Ltd
LOCATION: 51 Te Maika Road, Ngunguru
PROJECT DESCRIPTION: PROPOSED SUBDIVISION
SHEET TITLE: EARTHWORKS PLAN

DRAWN BY:	APPROVED BY:
LJM	DL
ORIGINAL: A3	SCALE: 1:1,000
FILE: 20-0078	SHEET: L05

LEGEND:

CESCPT#	- CORE Engineering Solutions CPT Location	RCPT#	- Riley Consultants CPT Location
CESHA#	- CORE Engineering Solutions Hand Auger Location	RHA#	- Riley Consultants Hand Auger Location
CESTP#	- CORE Engineering Solutions Test Pit Location	RTP#	- Riley Consultants Test Pit Location
SCS#	- CORE Engineering Soil Classification Sample Location	DPSH#	- CORE Engineering Solutions DPSH Location
	- Proposed Section		

SITE INFO:
Parcel ID: 6881880
Legal Desc: Lot 14 DP 37400
Land District: Whangarei District
Titles: 298650
GIS Area: 66,490m² / 6.6490ha

SITE NOTES:
- Indicative Lidar contours @2.5m intervals from NZVD2016 Vertical Datum.

L06 TESTING MAP
SCALE 1:1,250

CORE ENGINEERING SOLUTIONS
Consulting Engineers
Structural | Geotechnical | Civil
T: 09 553 3660
jobs@coreeng.nz
Level 1, 31 Vine Street,
Whangarei 0110

Rev	Date	Notes
A	16/08/22	Original Issue

CLIENT:	Traverse Ltd
LOCATION:	51 Te Maika Road, Ngunguru
PROJECT DESCRIPTION:	PROPOSED SUBDIVISION
SHEET TITLE:	TESTING MAP

DRAWN BY: LJM	APPROVED BY: DL
ORIGINAL: A3	SCALE: 1:1,250
FILE: 20-0078	SHEET: L06

APPENDIX 5 – TESTING RESULTS

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: CESHA25

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737439mE, 6056587mN

START DATE: 22/09/2022

END DATE: 22/09/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL; light brown. Moist; high plasticity.		0.0	TS TA	2 4 6 8 10 12 14 16 18	50 100 150 200		
Silty CLAY; orange. Moist; high plasticity.		0.2				221+	
		0.4				-	
		0.6				166	
		0.8				35	
		1.0				110	
		1.2				32	
		1.4				158	
EOH: 1.40m		1.6				76	
		1.8					

Groundwater Not Encountered

PHOTO(S)

REMARKS

BH Lot 3

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: CESHA26

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737480mE, 6056637mN

START DATE: 22/09/2022

END DATE: 22/09/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL; light brown. Moist; high plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	50 100 150 200	158 63	Groundwater Not Encountered
Silty CLAY; orange tan brown. Moist; high plasticity; 0.9m white flecks.		0.2				221+ -	
		0.4				145 39	
		0.6				174 38	
		0.8				161 47	
		1.0				205 60	
		1.2					
		1.4					
		1.6					
EOH: 3.00m		1.8					
		2.0					
		2.2					
		2.4					
		2.6					
		2.8					

PHOTO(S)

REMARKS

BH Lot 7

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

CORE ENGINEERING SOLUTIONS

INVESTIGATION LOG

HOLE NO.: CESHA27

CLIENT: TRAVERSE LTD

PROJECT: TE MAIKA RD, NGUNGURU - SUBDIVISION

JOB NO.: 20-0078

SITE LOCATION: TE MAIKA RD, NGUNGURU

CO-ORDINATES: 1737501mE, 6056680mN

START DATE: 22/09/2022

END DATE: 22/09/2022

LOGGED BY: RL

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: V03	Values	WATER
TOPSOIL; light brown. Moist; high plasticity.		0.0		2 4 6 8 10 12 14 16 18	50 100 150 200		
Silty CLAY; orange and white with black flecks. Moist; high plasticity.		0.2				193	
		0.4				39	
		0.6				205	
		0.8				44	
		1.0				158	
Silty CLAY; tan brown/orange. Moist; high plasticity; 1.7 UTP.		1.2				44	
		1.4				221+	
		1.6				-	
EOH: 1.70m		1.8				221+	
						-	

Groundwater Not Encountered

PHOTO(S)

REMARKS

BH Lot 9

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

Whangarei Laboratory
166 Bank Street,
Whangarei
M: 021 0263 7711
E: martin@geocivil.co.nz

TEST REPORT

Lab Job No: 8690-001

Your ref.: -

Date of Issue: 12/07/2022

Date of Re-Issue: -

Page: 1 of 9

Test Report No. WRE8690-001-R001

PROJECT: **Te Maika Road - Soil Classification Testing**

CLIENT: Core Engineering Solutions
Level 1, 31 Vine Street

ATTENTION: Stuart Gemmell

TEST METHODS: Determination of the liquid & plastic limits, plasticity index and water content
NZS 4402:1986 Tests 2.1,2.2,2.3,2.4
Determination of the Linear Shrinkage
NZS 4402:1986 Test 2.6

SAMPLING METHOD: Sampled by client – Sampling not accredited

TEST RESULTS: As per attached sheets

A. Agnew
Laboratory Technician

D. Krissansen
Approved Signatory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Geocivil Laboratory
Northland - Wellington - Christchurch - Otago
P: 09 438 4417
E: info@geocivil.co.nz

DETERMINATION OF THE LIQUID & PLASTIC LIMITS, PLASTICITY INDEX & WATER CONTENT

NZS 4402:1986 Test 2.2,2.3,2.4

Lab Job No:	8690-001	**Sample No.:**	WRE8690-001-S001
Client:	Core Engineering Solutions	**Tested By:**	N.K
Location:	Te Maika Road Sample 1	**Date Tested:** **Checked By:**	1/07/2022 A.A
Date Received:	17/06/2022	**Date Checked:**	8/07/2022
Report No:	WRE8690-001-R001	**Page:**	2 of 9
REF:	-		
Sampling Method:	Sampled by client – Sampling not accredited	**Sampled By:**	Client
Date Sampled:	15/06/2022		

Test Details:

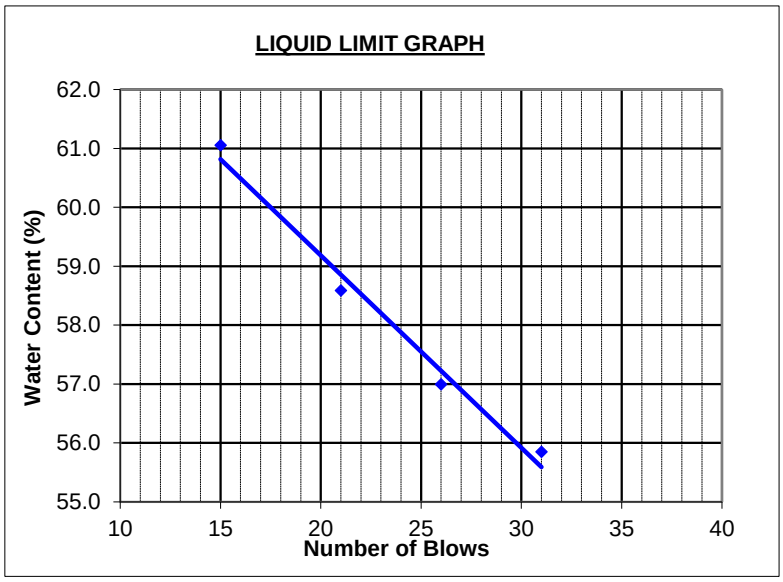
Test performed on: Fraction passing 425μm sieve

Sample history: Natural state

Description of Sample: Clayey SILT, minor fine sands to 2mm, light red mottled brown and grey, moist

	Liquid Limit				Plastic Limit	
No. of blows	15	21	26	31		
Water content (%)	61.1	58.6	57.0	55.8	34.7	34.5

NWC	**41.2**
Liquid Limit	**58**
Plastic Limit	**35**
Plasticity Index	**23**



D. Krissansen
Approved Signatory

Geocivil Laboratory
Northland - Wellington - Christchurch - Otago
P: 09 438 4417
E: info@geocivil.co.nz

DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S001
Client:	Core Engineering Solutions	**Tested By:**	N.K
Location:	Te Maika Road Sample 1	**Date:** **Checked By:**	1/07/2022 A.A
Date Received:	17/06/2022	**Date:**	8/07/2022
Report No:	WRE8690-001-R001	**Page:**	3 of 9
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: Natural state

Description of Sample: Clayey SILT, minor fine sands to 2mm, light red mottled brown and grey, moist

Linear shrinkage	**13**

D. Krissansen
Approved Signatory

Whangarei Laboratory
166 Bank Street,
Whangarei
M: 021 0263 7711
E: martin@geocivil.co.nz

TEST REPORT

Lab Job No: 8690-001

Your ref.: -

Date of Issue: 27/09/2022

Date of Re-Issue: -

Test Report No. WRE8690-001-R002

PROJECT: **Te Maika Road - Soil Classification Testing**

CLIENT: Core Engineering Solutions
Level 1, 31 Vine Street

ATTENTION: Stuart Gemmell

TEST METHODS: Determination of the liquid & plastic limits, plasticity index and water content
NZS 4402:1986 Tests 2.1,2.2,2.3,2.4
Determination of the Linear Shrinkage
NZS 4402:1986 Test 2.6

SAMPLING METHOD: Sampled by client – Sampling not accredited

TEST RESULTS: As per attached sheets

N. Krissansen
Laboratory Technician

D. Krissansen
Approved Signatory

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Geocivil Laboratory
Northland - Wellington - Christchurch - Otago
P: 09 438 4417
E: info@geocivil.co.nz

DETERMINATION OF THE LIQUID & PLASTIC LIMITS, PLASTICITY INDEX & WATER CONTENT

NZS 4402:1986 Test 2.2,2.3,2.4

Lab Job No:	8690-001	**Sample No.:**	WRE8690-001-S007
Client:	Core Engineering Solutions	**Tested By:**	A.A/ N.K
Location:	Te Maika Road Lot 7 Stage 2	**Date Tested:** **Checked By:**	22/09/2022 N.K.
Date Received:	6/09/2022	**Date Checked:**	27/09/2022
Report No:	WRE8690-001-R002	**Page:**	2 of 5
REF:	-		

Sampling Method:	Sampled by client – Sampling not accredited	**Sampled By:**	Client
Date Sampled:	Unknown		

Test Details:

Test performed on: Fraction passing 425μm sieve

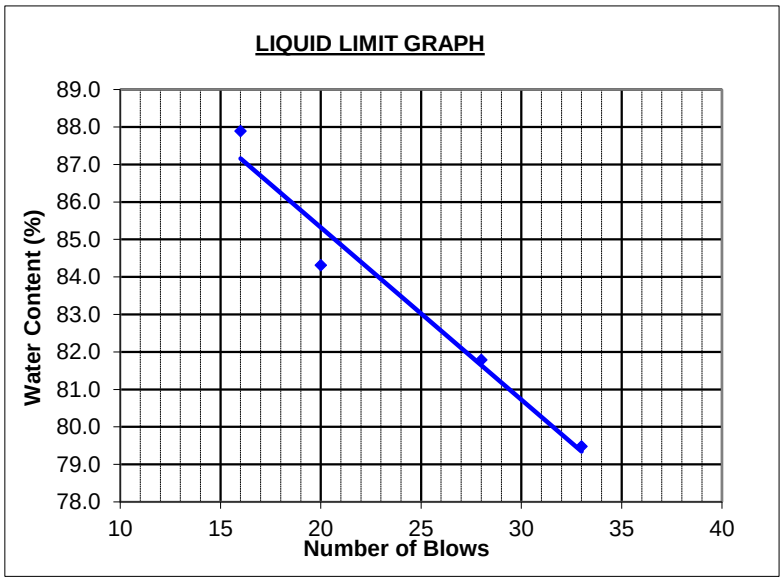
Sample history: As received

Description of Sample: Clayey SILT, minor fine sands, light red mottled orange,yellow and grey, moist

	Liquid Limit			
No. of blows	16	20	28	33
Water content (%)	87.9	84.3	81.8	79.5

Plastic Limit	
38.9	38.6

NWC	**38.9**
Liquid Limit	**83**
Plastic Limit	**39**
Plasticity Index	**44**



D.Krissansen
Approved Signatory

Geocivil Laboratory
Northland - Wellington - Christchurch - Otago
P: 09 438 4417
E: info@geocivil.co.nz

DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S007
Client:	Core Engineering Solutions	**Tested By:**	A.A
Location:	Te Maika Road Lot 7 Stage 2	**Date:** **Checked By:**	22/09/2022 N.K.
Date Received:	6/09/2022	**Date:**	27/09/2022
Report No:	WRE8690-001-R002	**Page:**	3 of 5
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: As received

Description of Sample: Clayey SILT, minor fine sands, light red mottled orange,yellow and grey, moist

Linear shrinkage	**17**

D.Krissansen
Approved Signatory

Geocivil Laboratory
Northland - Wellington - Christchurch - Otago
P: 09 438 4417
E: info@geocivil.co.nz

DETERMINATION OF THE LIQUID & PLASTIC LIMITS, PLASTICITY INDEX & WATER CONTENT

NZS 4402:1986 Test 2.2,2.3,2.4

Lab Job No:	8690-001	**Sample No.:**	WRE8690-001-S008
Client:	Core Engineering Solutions	**Tested By:**	A.A/N.K
Location:	Te Maika Road Lot 4, Stage 2	**Date Tested:** **Checked By:**	22/09/2022 N.K.
Date Received:	6/09/2022	**Date Checked:**	27/09/2022
Report No:	WRE8690-001-R002	**Page:**	4 of 5
REF:	-		
Sampling Method:	Sampled by client – Sampling not accredited	**Sampled By:**	Client
Date Sampled:	Unknown		

Test Details:

Test performed on: Fraction passing 425μm sieve

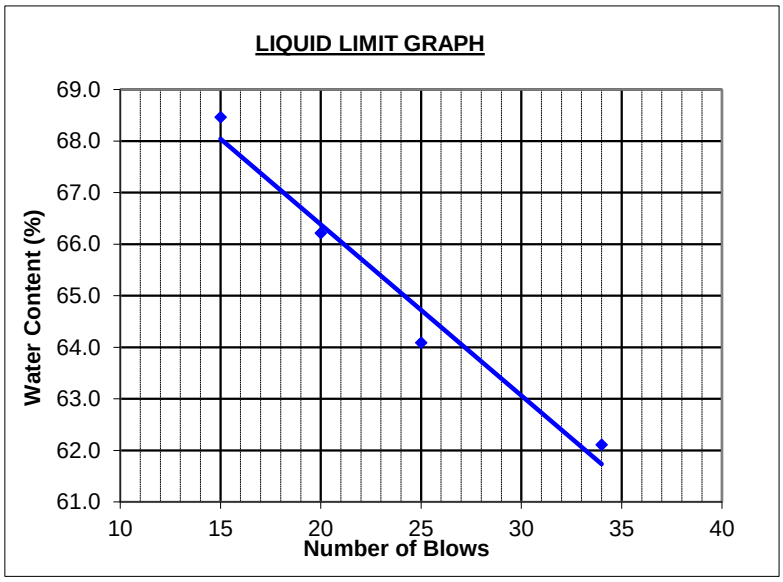
Sample history: As received

Description of Sample: Clayey SILT, traces of fine sands and rootlets, light red brown with black veins, moist

	Liquid Limit			
No. of blows	15	20	25	34
Water content (%)	68.5	66.2	64.1	62.1

Plastic Limit	
38.0	38.6

NWC	**46.5**
Liquid Limit	**65**
Plastic Limit	**38**
Plasticity Index	**27**



D.Krissansen
Approved Signatory

Geocivil Laboratory
Northland - Wellington - Christchurch - Otago
P: 09 438 4417
E: info@geocivil.co.nz

DETERMINATION OF THE LINEAR SHRINKAGE

NZS 4402:1986 Test 2.6

Lab Job No:	8690-001	**Sample No:**	WRE8690-001-S008
Client:	Core Engineering Solutions	**Tested By:**	A.A
Location:	Te Maika Road Lot 4, Stage 2	**Date:**	22/09/2022
		Checked By:	N.K.
Date Received:	6/09/2022	**Date:**	27/09/2022
Report No:	WRE8690-001-R002	**Page:**	5 of 5
REF:	-		

Test performed on: Fraction passing 425mm sieve
History: As received

Description of Sample: Clayey SILT, traces of fine sands and rootlets, light red brown with black veins, moist

Linear shrinkage	**11**

D.Krissansen
Approved Signatory

APPENDIX 6 – GEOTECHNICAL PRODUCER STATEMENT PS4 FOR RETAINING WALLS

Building Code Clause(s) B1

PRODUCER STATEMENT – PS4 – CONSTRUCTION REVIEW

ISSUED BY: Core Engineering Solutions Ltd
(Construction Review Firm)

TO: Traverse Ltd
(Owner/Developer)

TO BE SUPPLIED TO: Whangarei District Council (WDC)
(Building Consent Authority)

IN RESPECT OF: Retaining Walls within Subdivision Works
(Description of Building Work)

AT: 51 Te Maika Road,
(Address)

Town/City: Ngunguru **LOT** 14 **DP** 374000 **SO**
(Address)

We Core Engineering Solutions Ltd have been engaged by
(Construction Review Firm)

To provide ☐ CM1 ☐ CM2 ☐ CM3 ☐ CM4 ☐ CM5 (Engineering Categories) or ■ observation as per agreement with owner/developer Traverse Ltd

or ■ other Construction Monitoring of construction of retaining walls services
(Extent of Engagement)

in respect of clause(s) B1 of the Building Code for the building work described in documents relating to Building Consent No. Exempt works approved by WDC and those relating to Building Consent Amendment(s) Nos. - issued during the course of the works. ~~We have sighted these Building Consents and the conditions of attached to them.~~

Authorised instructions/variations(s) No. - (copies attached)
~~or by the attached Schedule ☐ have been issued during the course of the works.~~

On the basis of ☐ this review ■ these review(s) and information supplied by the contractor during the course of the works and **on behalf of the firm** undertaking this Construction Review, **I believe on reasonable grounds** that ■ All or ☐ Part only of the building works have been completed in accordance with the relevant requirements of the Building Consent and Building Consent Amendments identified above, with respect to Clause(s) B1 of the Building Code. I also believe on reasonable grounds that the persons who have undertaken this construction review have the necessary competency to do so.

I, David Andrew Leslie am: ■ CPEng 1017108 # ☐ Reg Arch #
(Name of Construction Review Professional)

I am a member of: ■ Engineering New Zealand ☐ NZIA and hold the following qualifications BEng,DipCivil,MEMgt,CPEng
The Construction Review Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.
The Construction Review Firm is a member of ACENZ: ☐

SIGNED BY David Andrew Leslie (Signature)
(Name of Construction Review Professional)

ON BEHALF OF Core Engineering Solutions Ltd Date 16/08/2022
(Construction Review Firm)

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form is to accompany **Forms 6 or 8 of the Building (Form) Regulations 2004** for the issue of a Code Compliance Certificate.

GUIDANCE ON USE OF PRODUCER STATEMENTS

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects, Institution of Professional engineers New Zealand (now Engineering New Zealand), Association of Consulting Engineers New Zealand in consultation with the Building Officials Institute of New Zealand. The original suit of producer statements has been revised at the date of this form as a result of enactment of the Building Act (2004) by these organisations to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with reasonable grounds for the issue of a Building Consent or a Code Compliance Certificate, without having to duplicate design or construction checking undertaken by others.

PS1 Design Intended for use by a suitably qualified independent design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 Design Review Intended for use by a suitably qualified independent design professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 Construction Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011[2]

PS4 Construction Review Intended for use by a suitably qualified independent design professional who undertakes construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACENZ, Engineering NZ and NZIA to interpret the Producer Statement.

Competence of Design Professional

This statement is made by a Design Firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its designers.

A competent design professional will have a professional qualification and proven current competence through registration on a national competence based register, either as a Chartered Professional Engineer (CPEng) or a Registered Architect.

Membership of a professional body, such as Engineering New Zealand (formerly IPENZ) or the New Zealand Institute of Architects (NZIA), provides additional assurance of the designer's standing within the profession. If the design firm is a member of the Association of Consulting Engineers New Zealand (ACENZ), this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent design professional".

*Professional Indemnity Insurance

As part of membership requirements, ACENZ requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard, small projects. If the parties deem this inappropriate for large projects the minimum may be up to $500,000.

Professional Services during Construction Phase

There are several levels of service which a Design Firm may provide during the construction phase of a project (CM1-CM5 for Engineers[3]). The Building Consent Authority is encouraged to require that the service to be provided by the Design Firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design firm's engagement.

Attached Particulars

Attached particulars referred to in this producer statement refer to supplementary information appended to the producer statement.

Refer Also:

1 Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013

2 NZIA Standard Conditions of Contract SCC 2011

3 Guideline on the Briefing & Engagement for Consulting Engineering Services (ACENZ/IPENZ 2004)

4 PN Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org
www.nzia.co.nz

ACENZ engineering new zealand Te Kāhui Whaihanga New Zealand Institute of Architects

APPENDIX 7 – SLOPE STABILITY ANALYSIS RESULTS

A stability assessment was undertaken to ensure the long-term slope stability of the site as required under Section 2.2.3.3 of the WDC EES and in accordance with the WDC Land Development Stabilisation – Technical Design Requirements (WDC LDS). As outlined in WDC LDS, a minimum factor of safety for land stabilisation design is required for the following design conditions;

- Normal Long Term Groundwater Conditions = 1.5 FOS
- Extreme Groundwater Conditions = 1.3 FOS
- Seismic Conditions in 500 year Return Period Event = 1.1 FOS

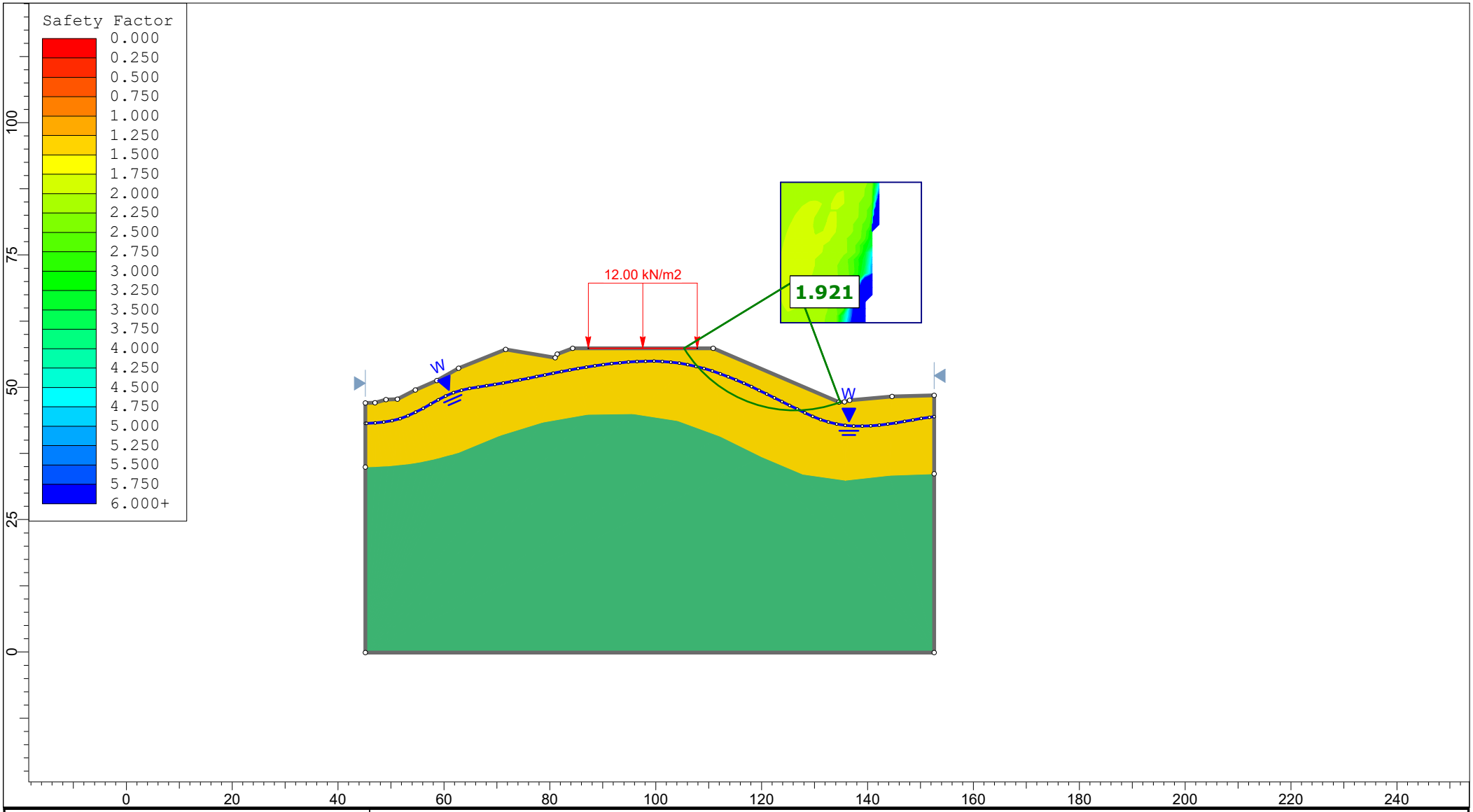
CES Ltd adopted extremely conservative groundwater levels for "SLIDE" Slope Stability parameters. Steeper slopes are marked on the WDC GIS Hazards Maps as being at a high risk for instability. For this reason, CES Ltd adopted a worst-case scenario.

The Morgenstern-Price method has been adopted for the calculation of the factor of safety.

From the above information and assessment of the geomorphology, a section through the site has been developed using the above design conditions as scenarios using limited equilibrium software "Slide" version 6 by Rocscience. The underlying geomorphology is completely to highly weathered greywacke which gradually becomes weathered at depth. To determine the transition of the weathered material, DPSH testing was conducted at the top end of the flanks. Allowance for residential housing and roading surcharges are to be applied as part of the assessment of post-development conditions. Back-analysis of the site has been undertaken at the pre-development stage using both site observations and previous assessments within similar Waipapa Group ground conditions to validate the soil parameters used for the stability assessment. From this and the back-analysis, the following soil parameters were adopted for the stability assessment;

Soil Unit	Soil Unit Density Weight (kN/m^3)	Angle of Internal Friction (ϕ')	Cohesion (kPa)
Completely Weathered GW	18	32	5
Highly Weathered GW	18	34	10

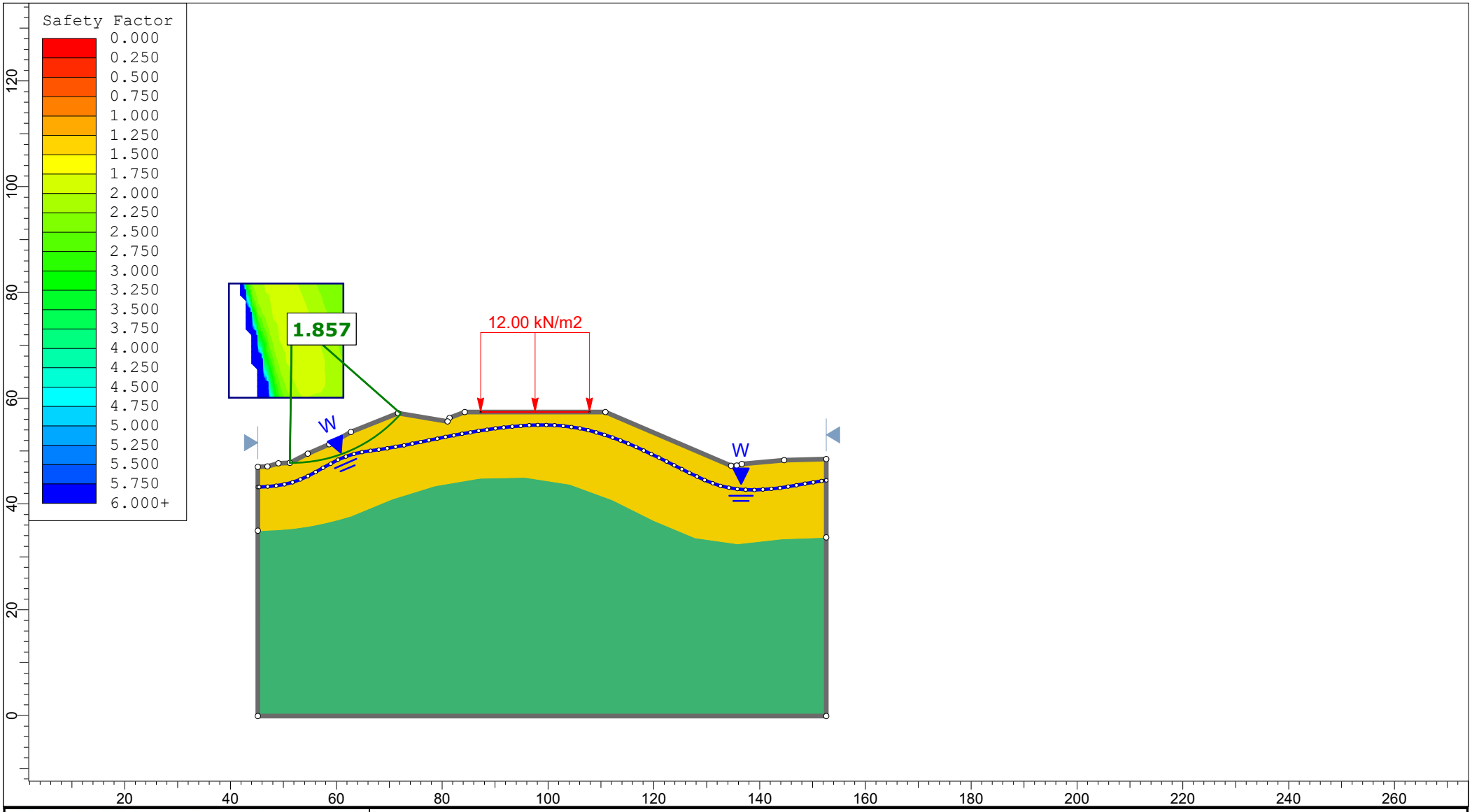
From our stability assessment, multiple sections through the site were analysed using the above parameters and design conditions set by WDC, and from this, compliant factors of safety (FoS) were achieved. From the assessment above, the following recommendations are proposed for this development;
3.0m setback to the ridgeline flanks to any buildings within this stage unless further site-specific assessment is undertaken by a Geo-Professional. (Ref: Appendix 4)



CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru			
Analysis Description	Lot 3 - LR		
Drawn By	Liam MacMenigall	*Scale* 1:1000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078



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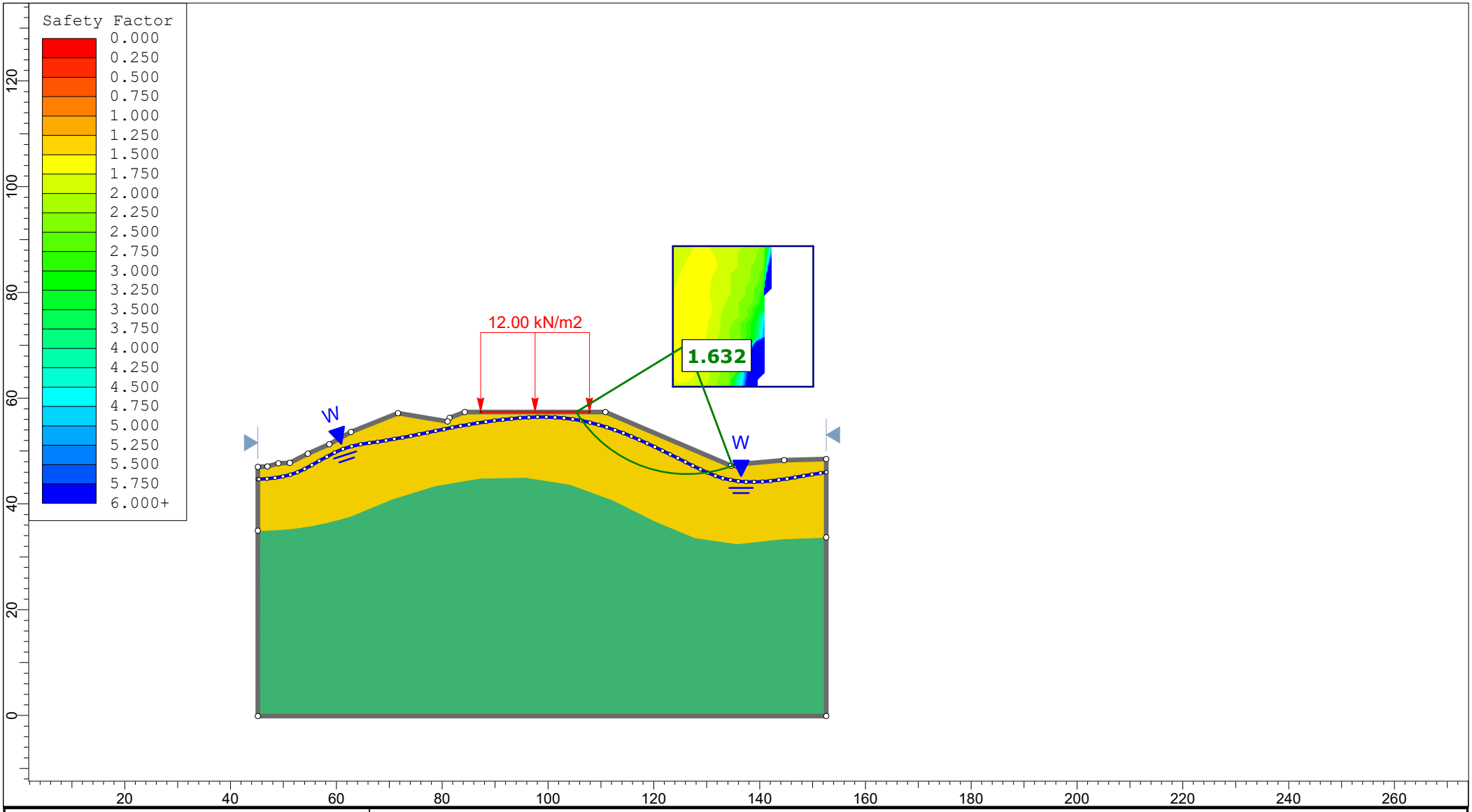

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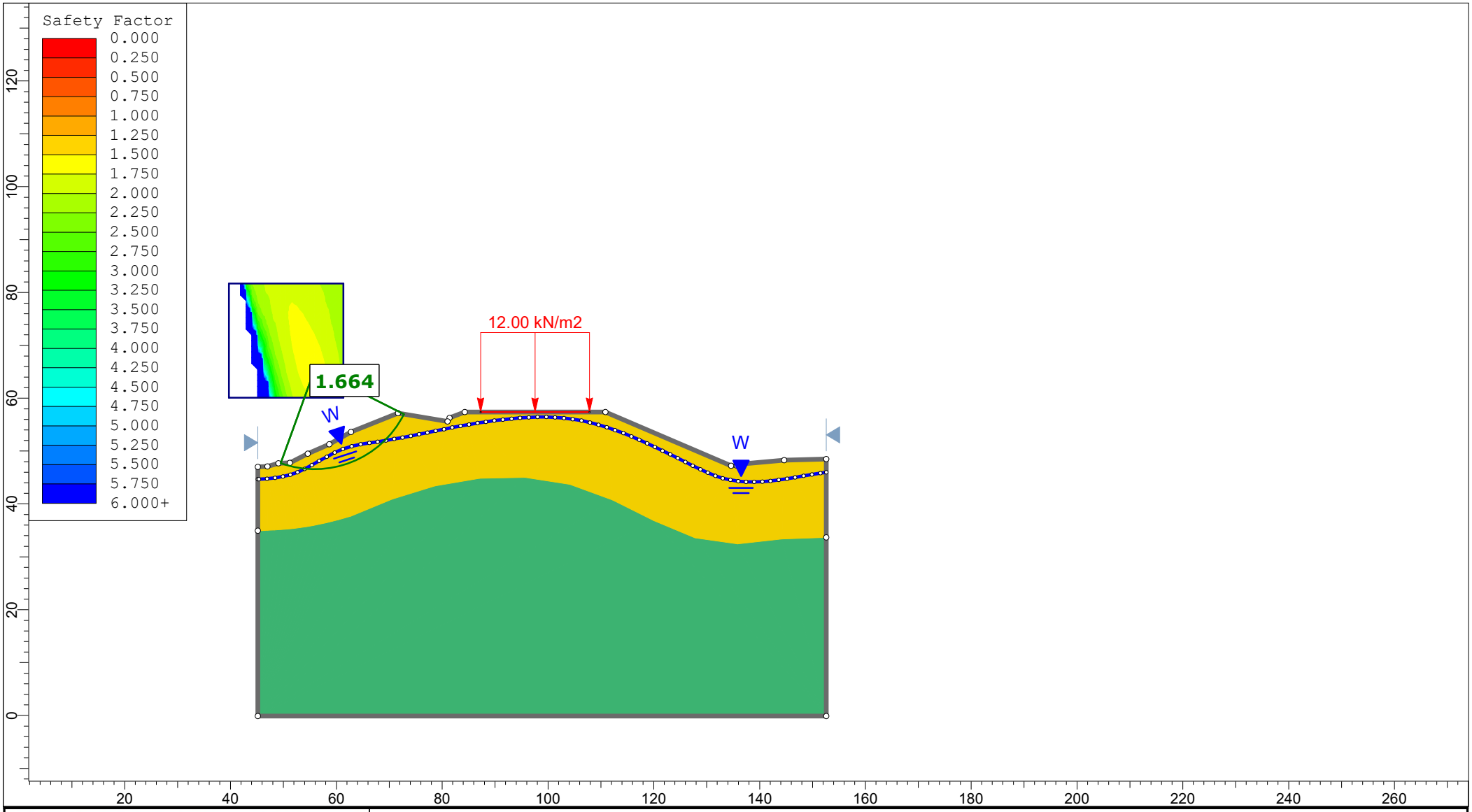

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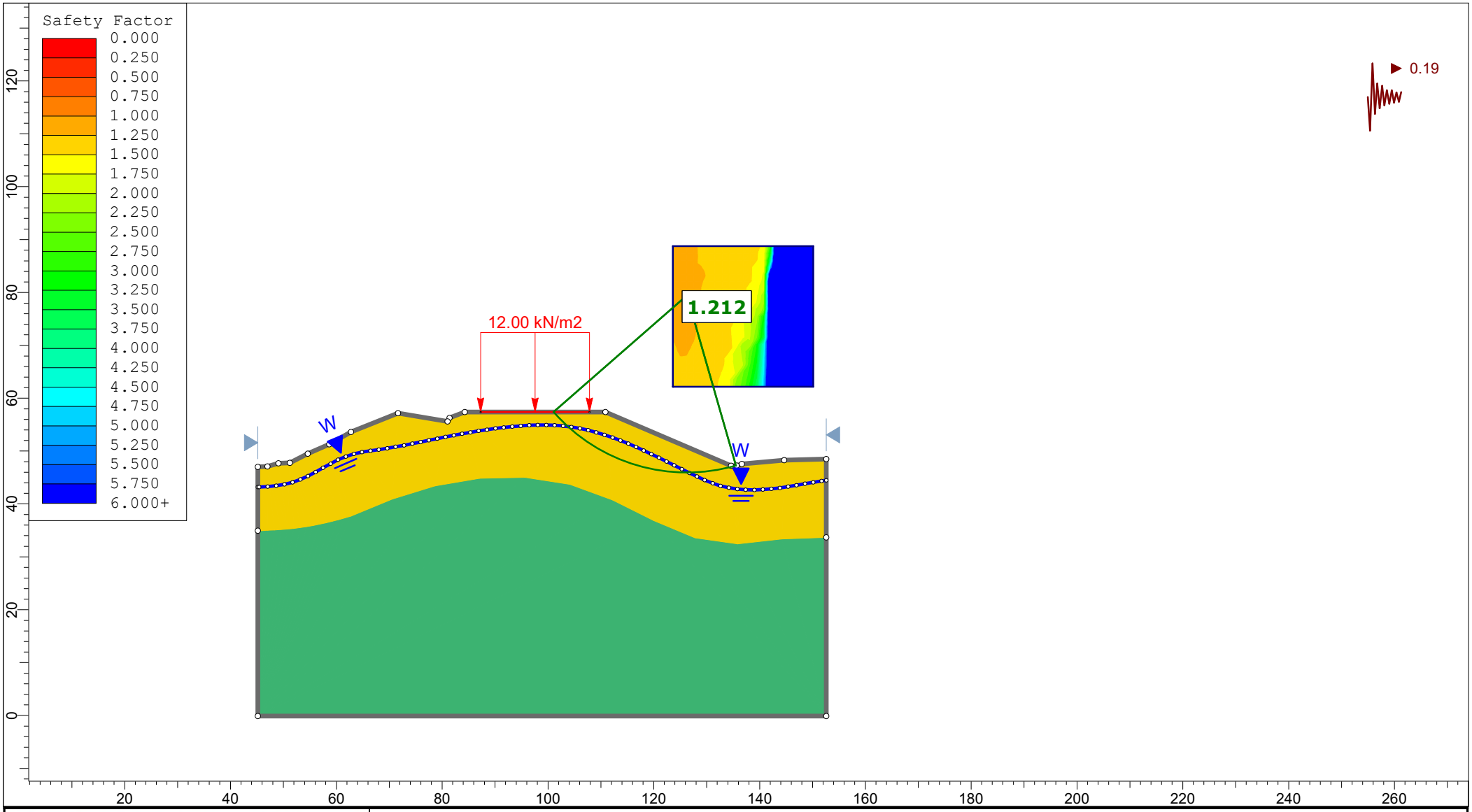

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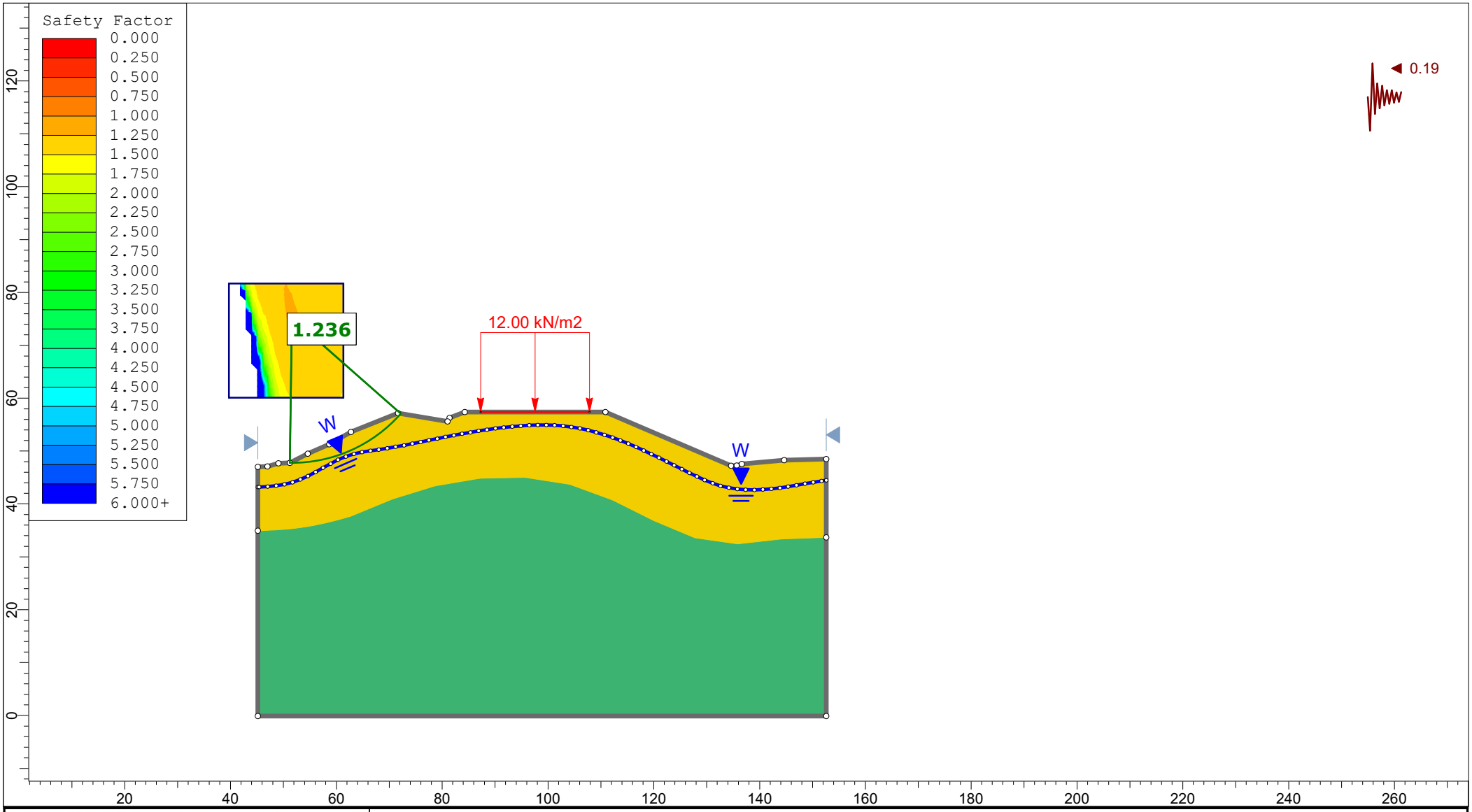

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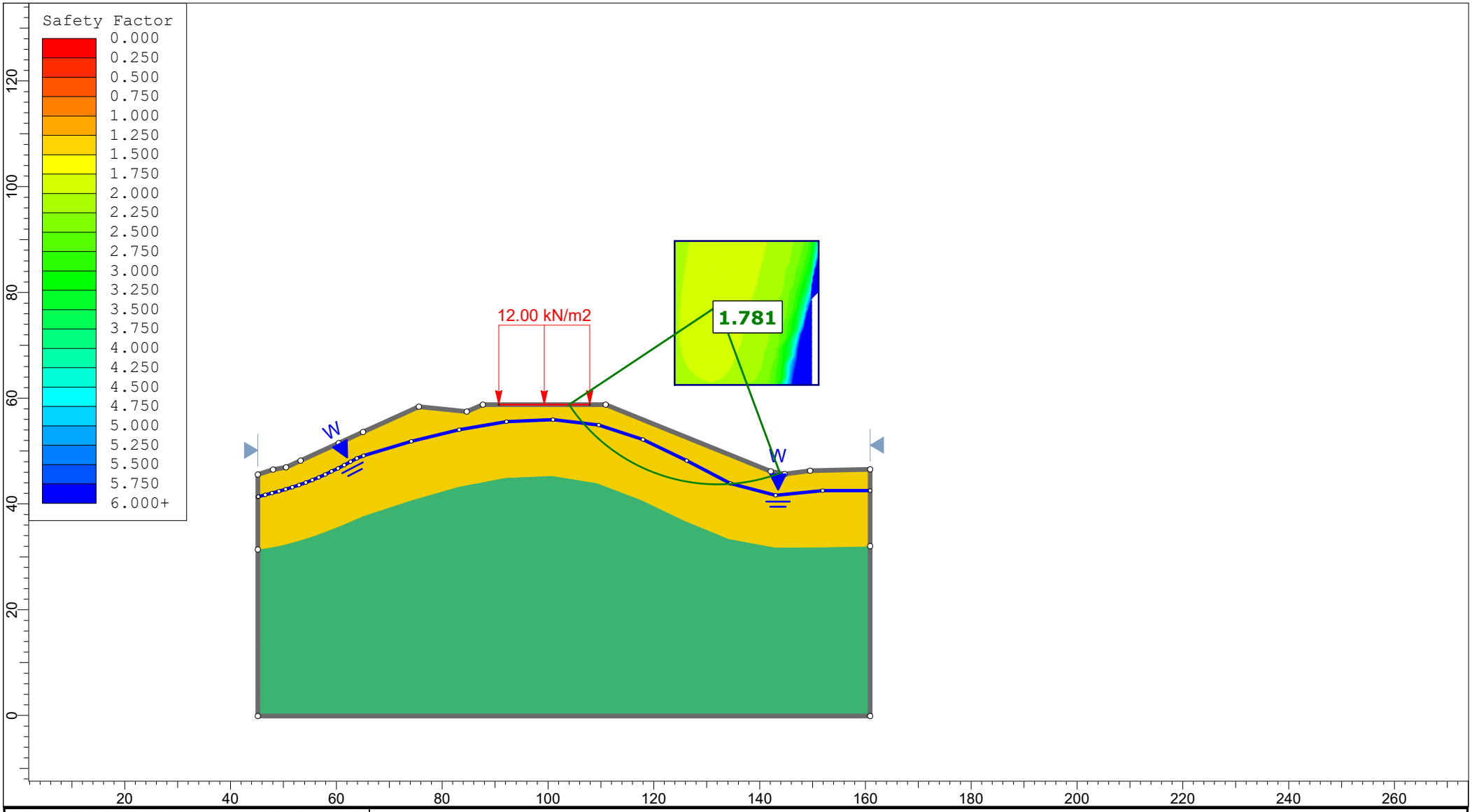

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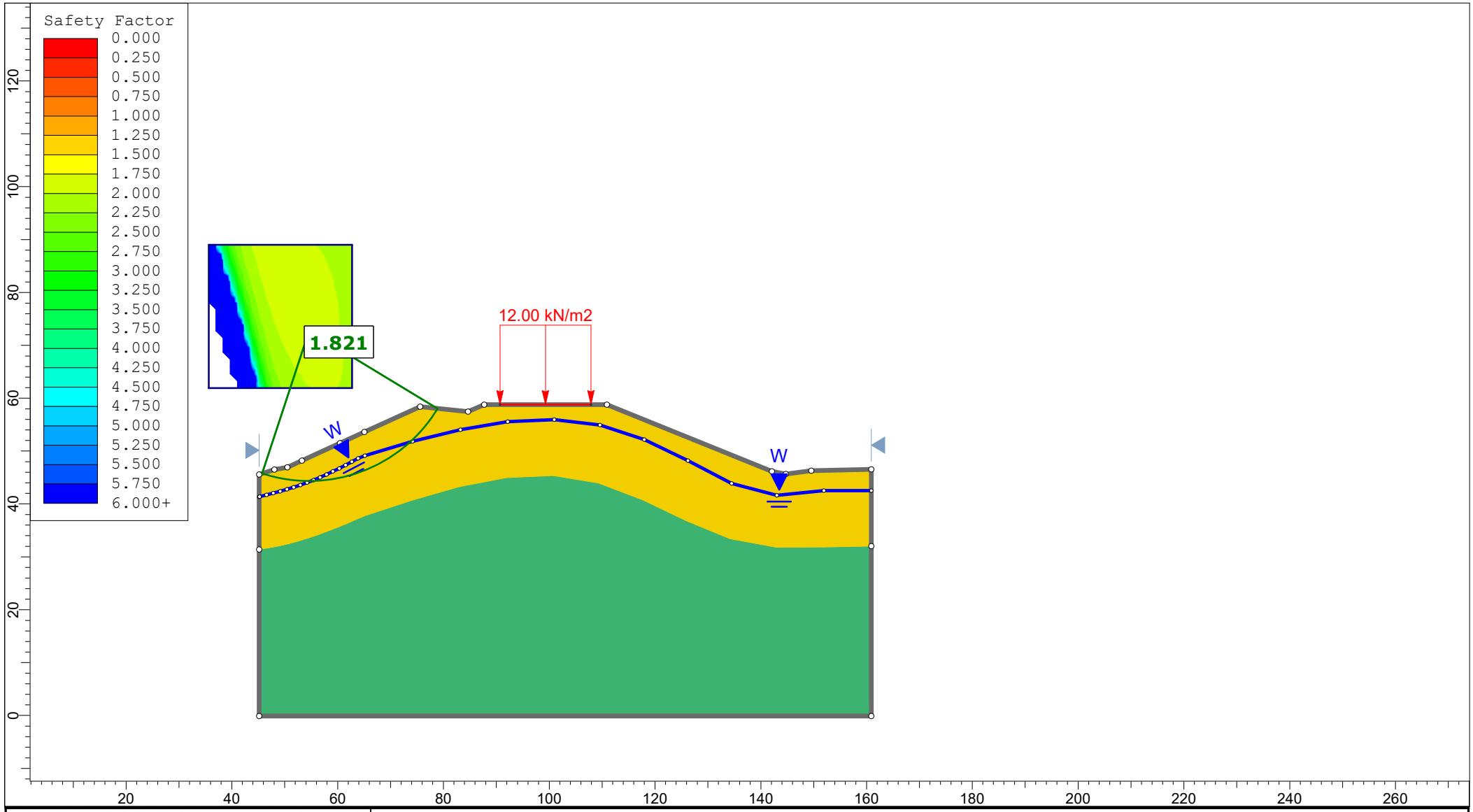

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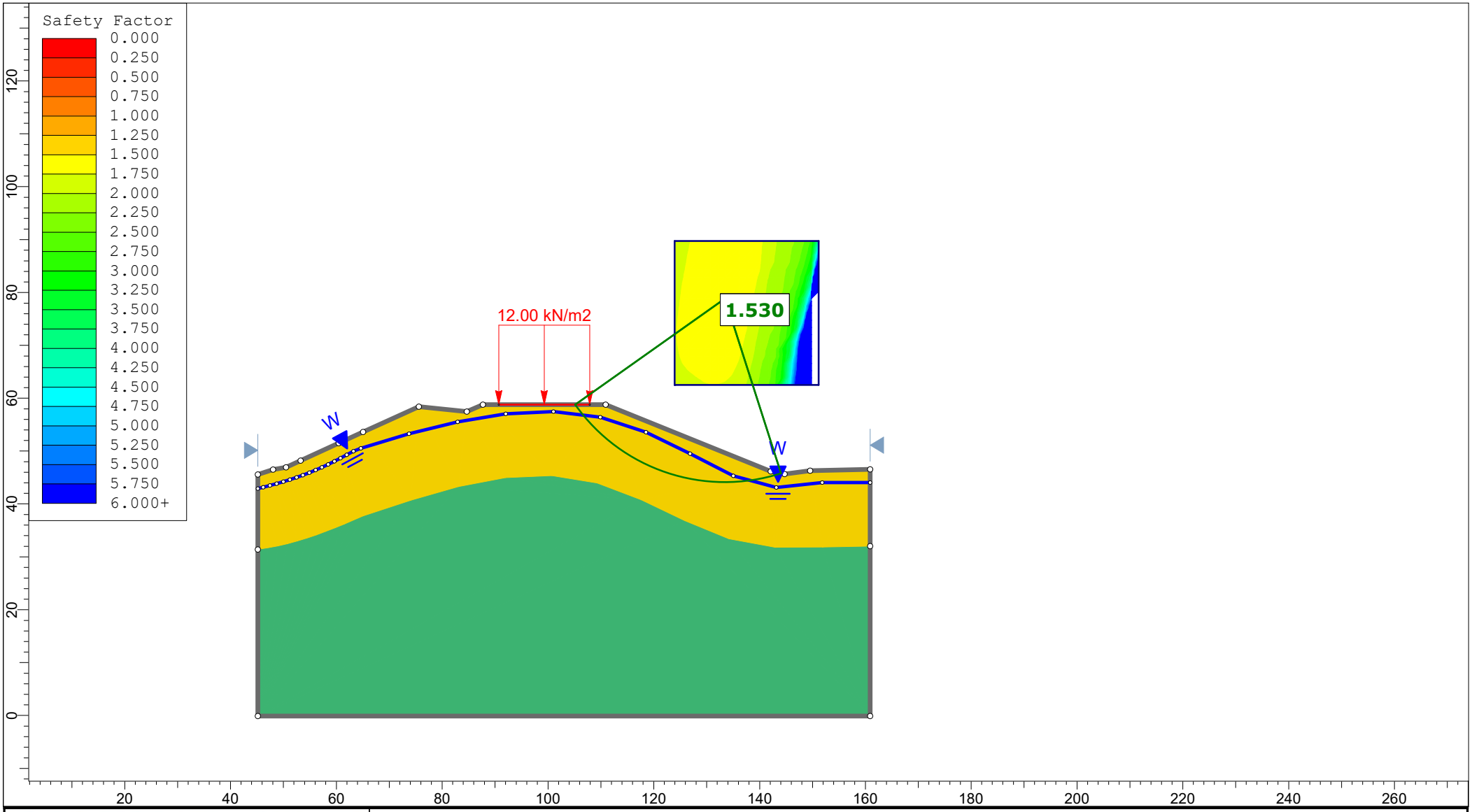

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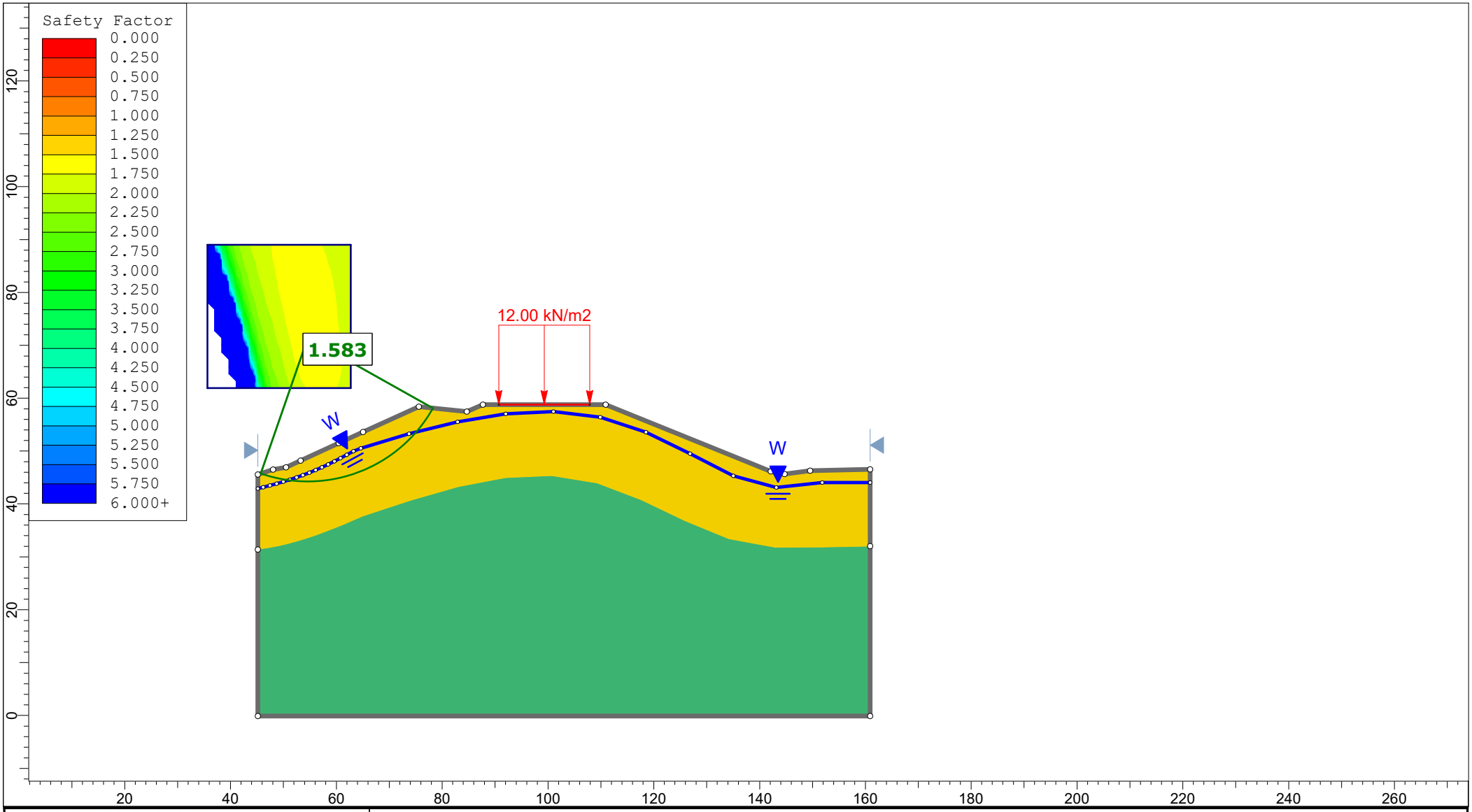

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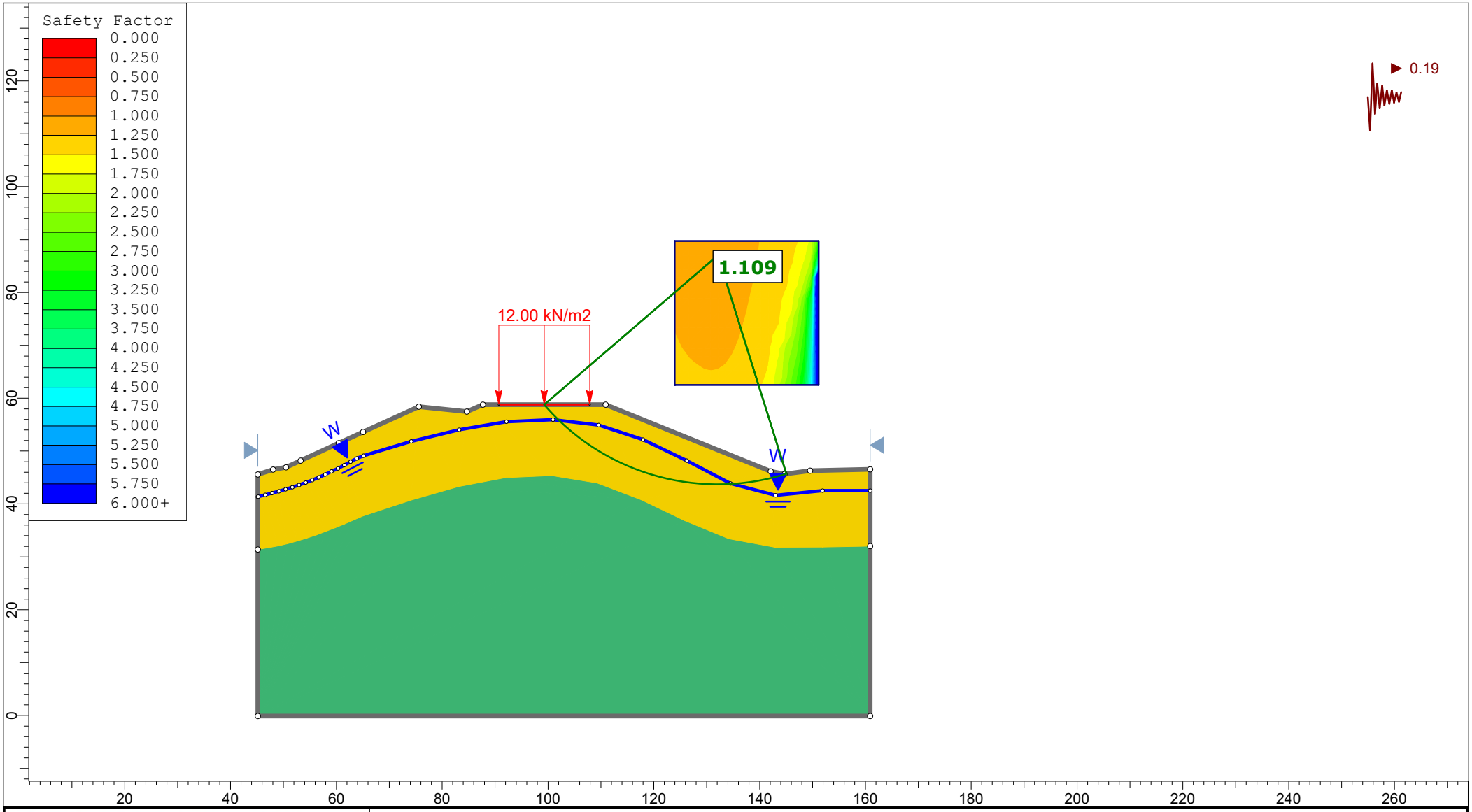

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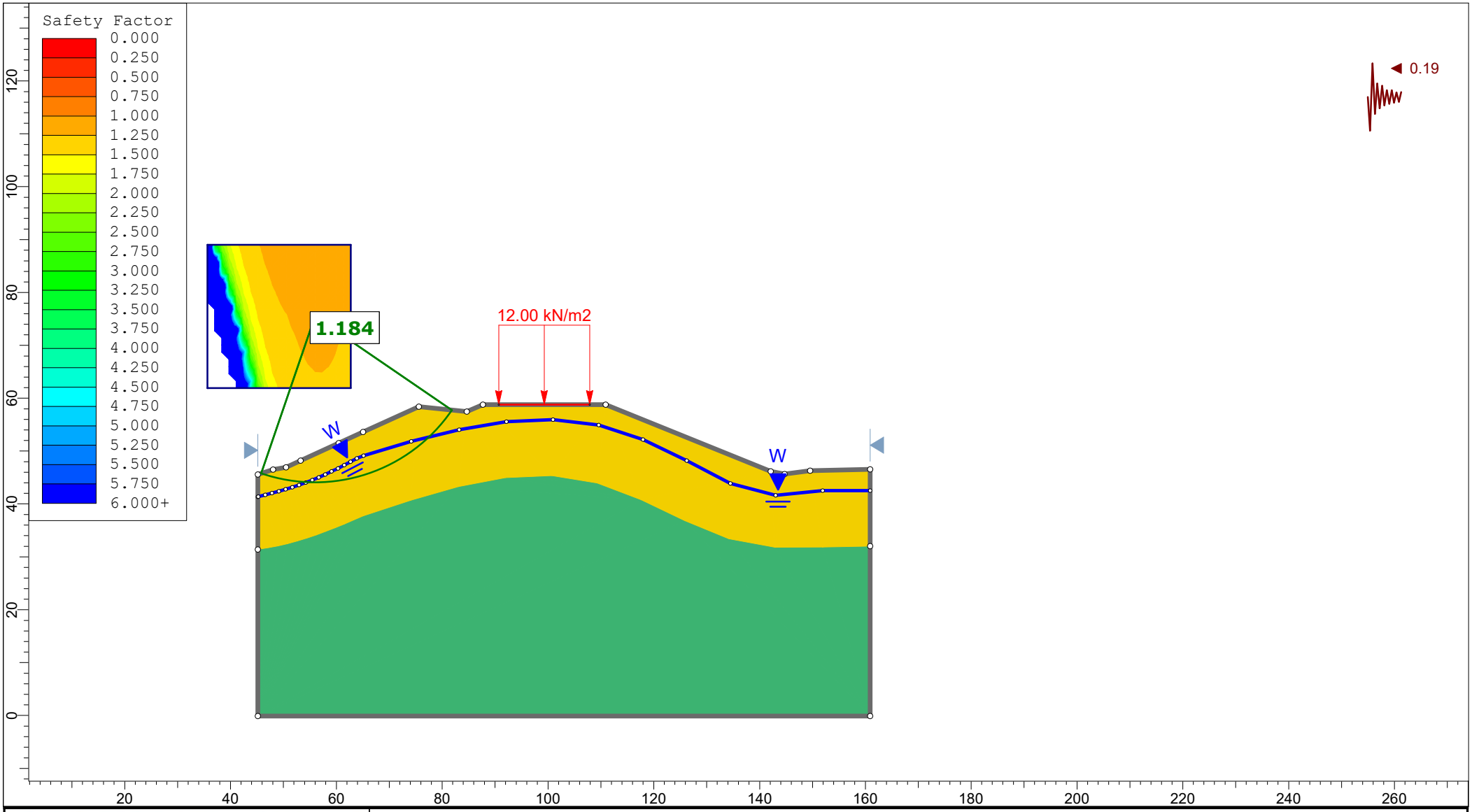

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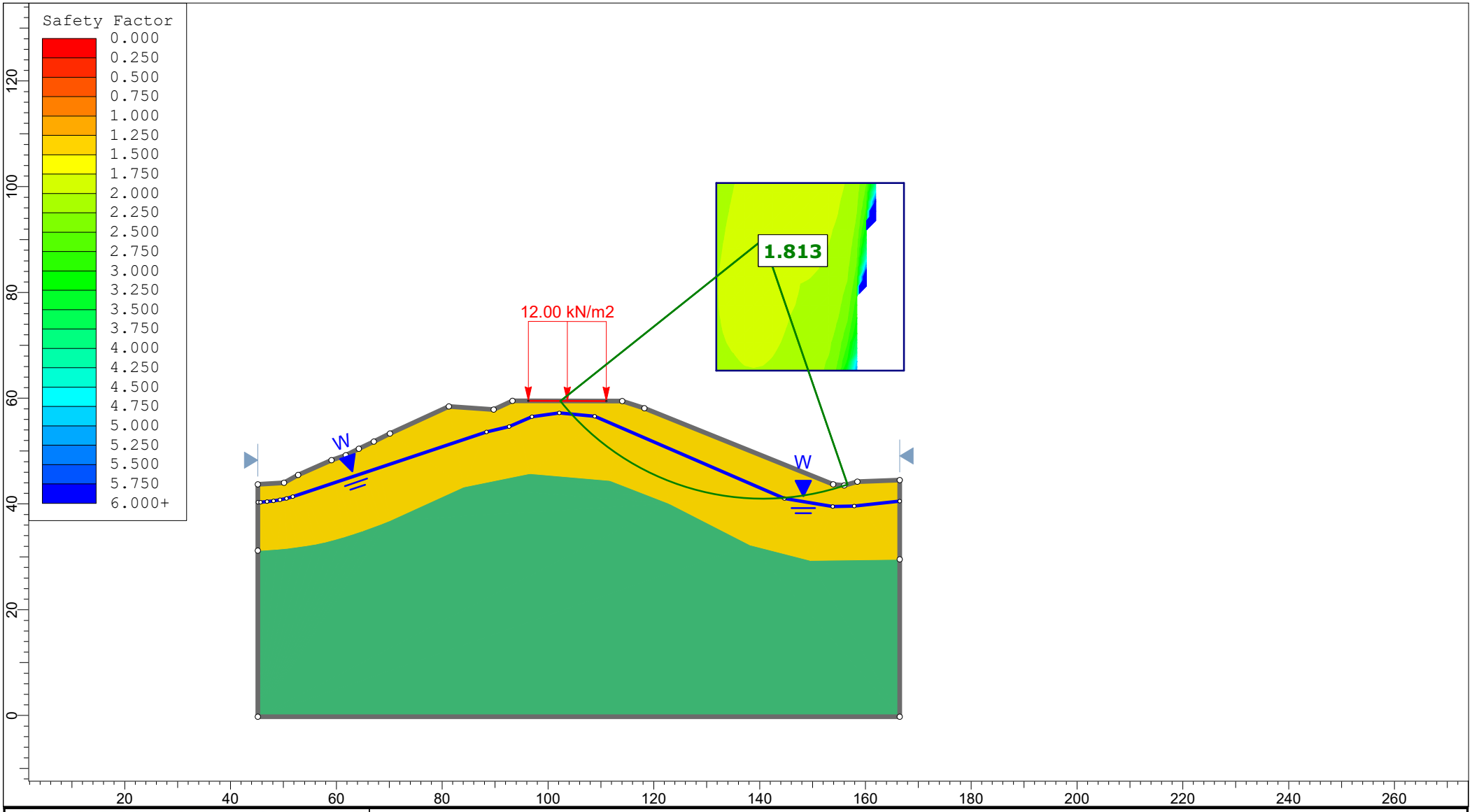

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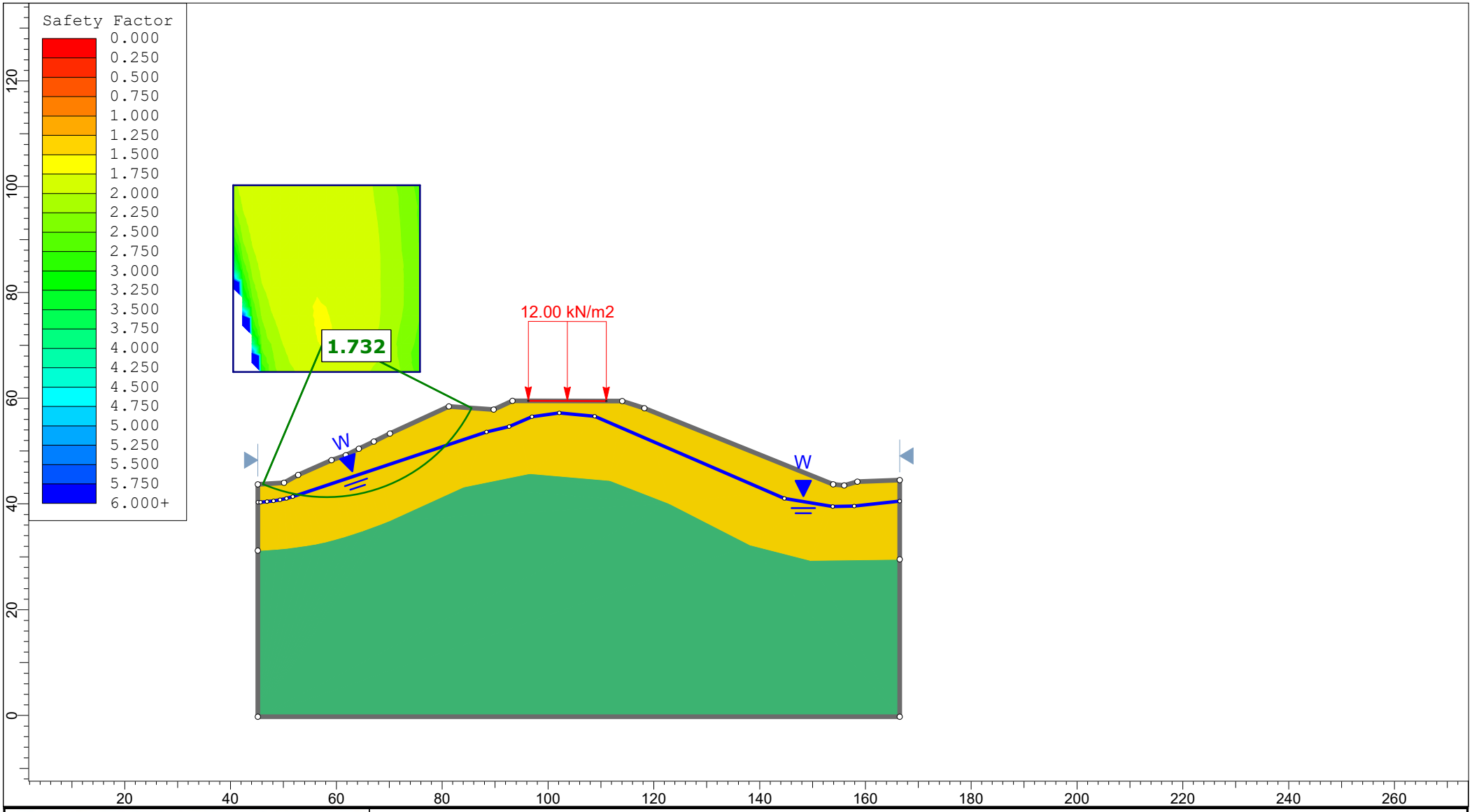

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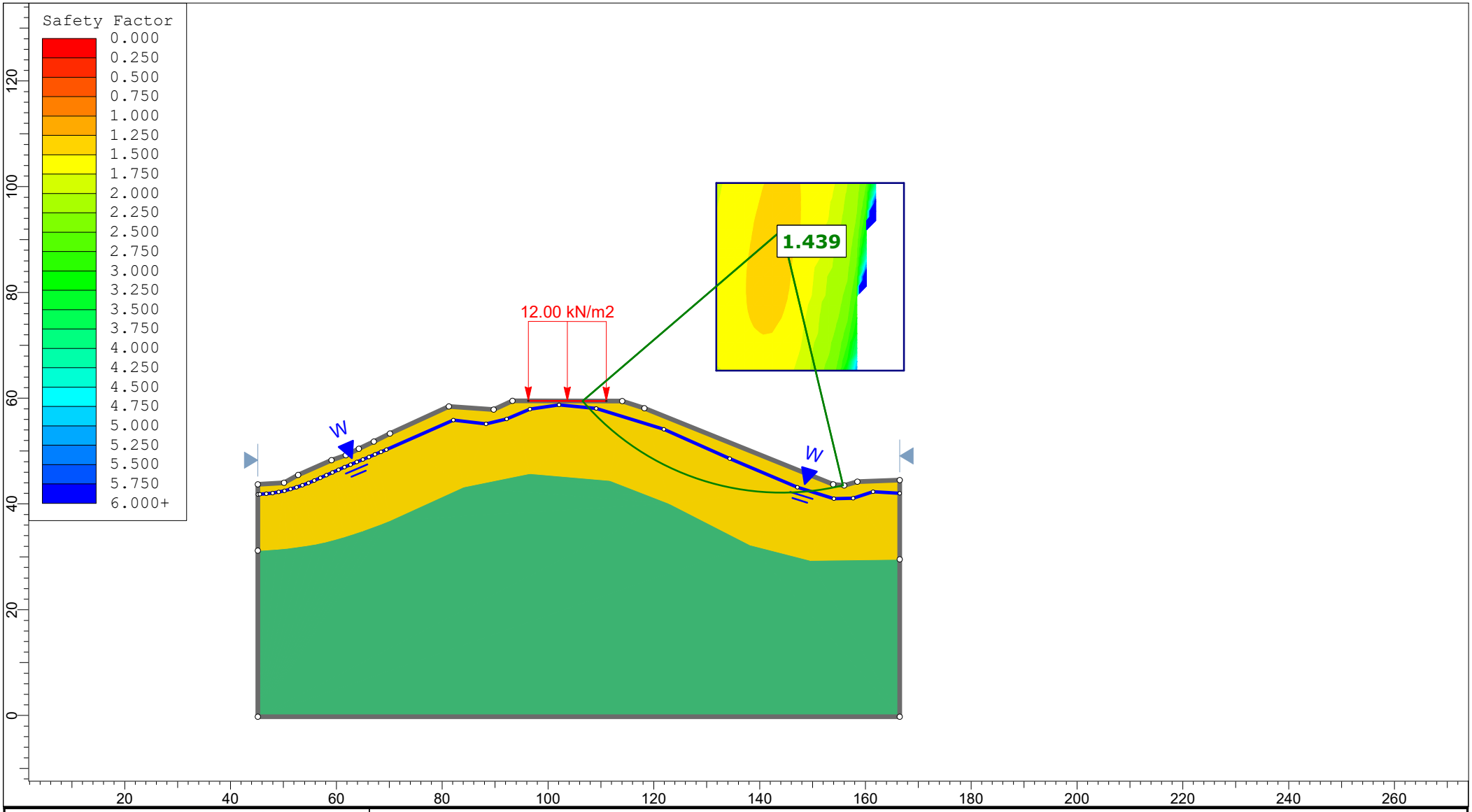

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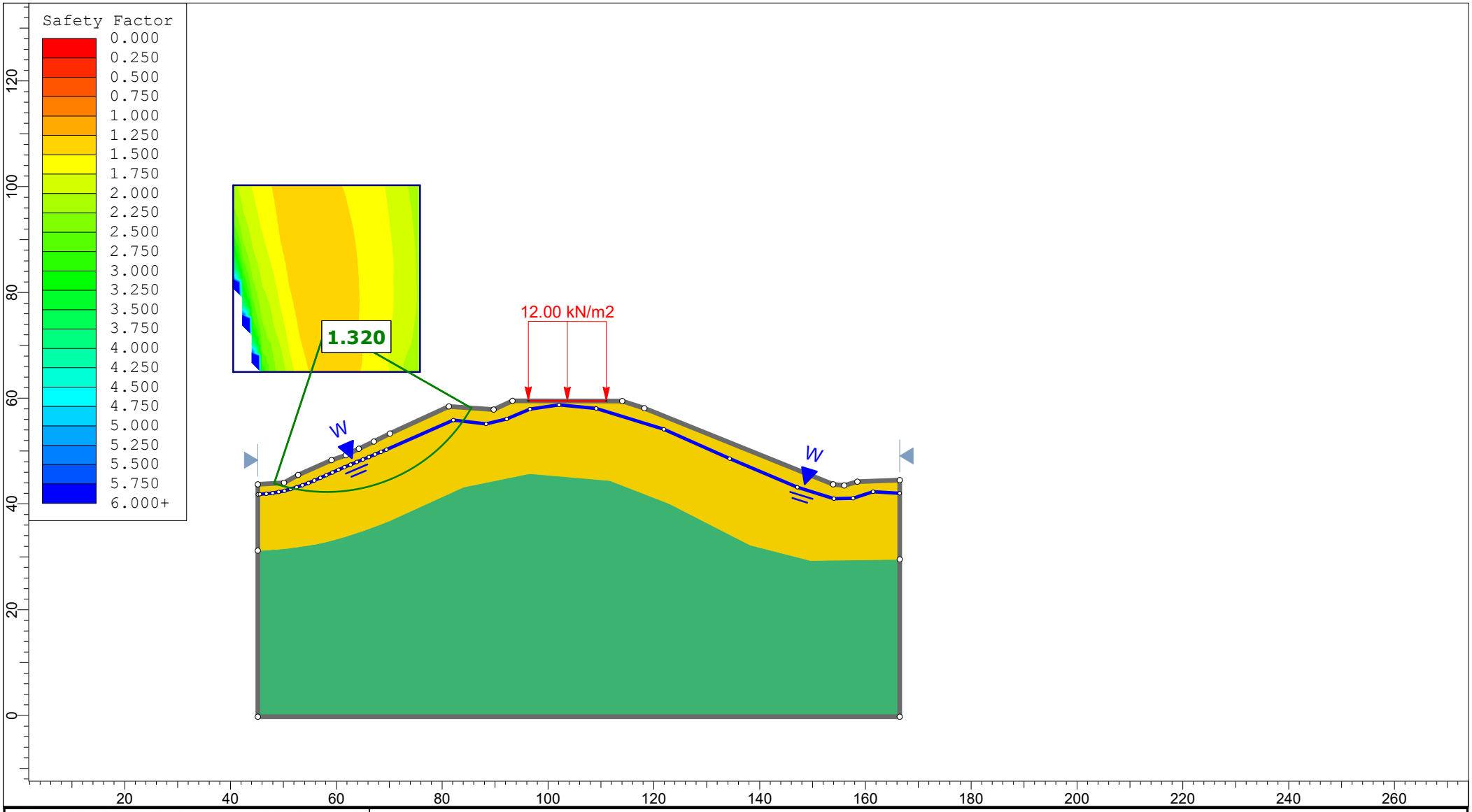

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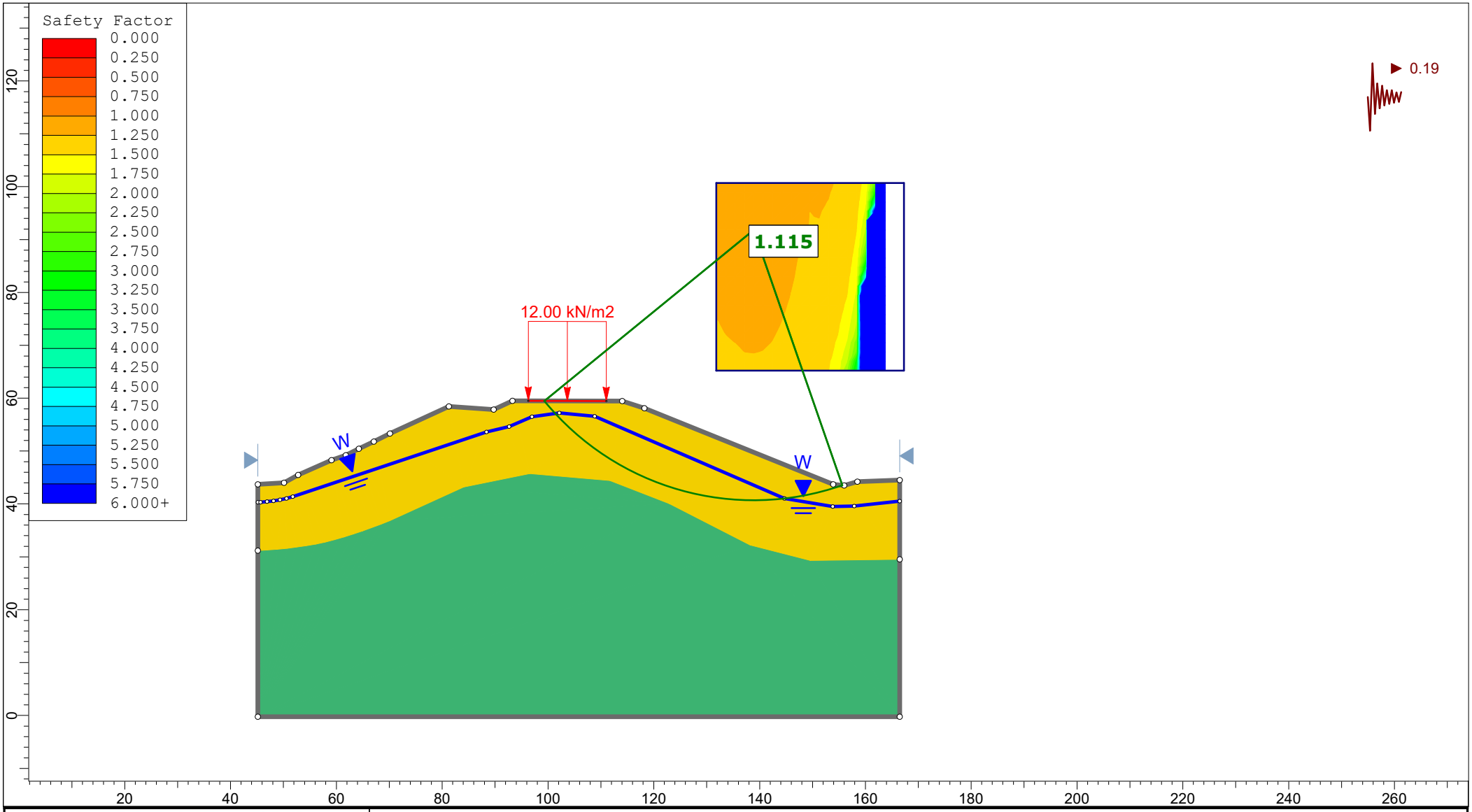

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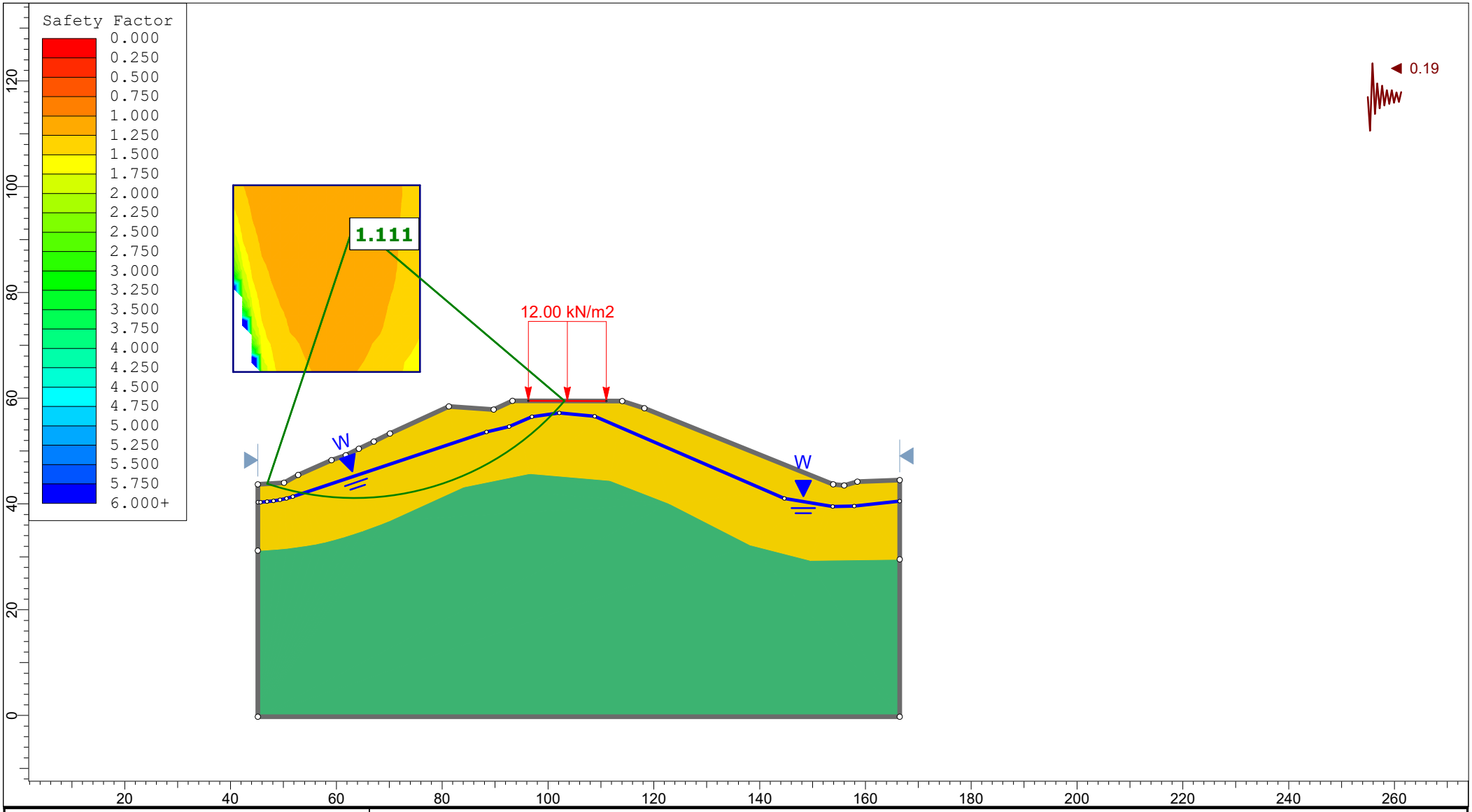

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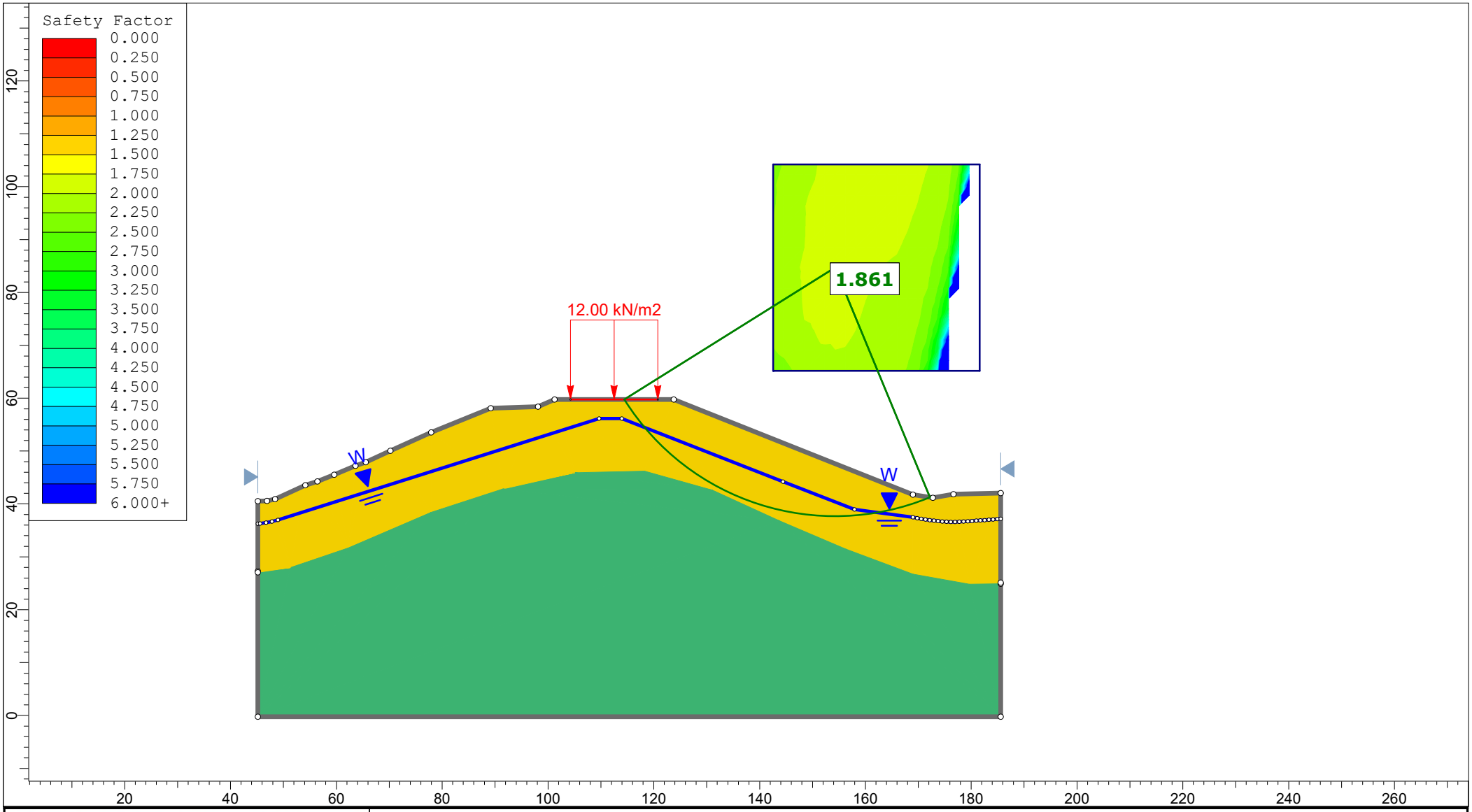

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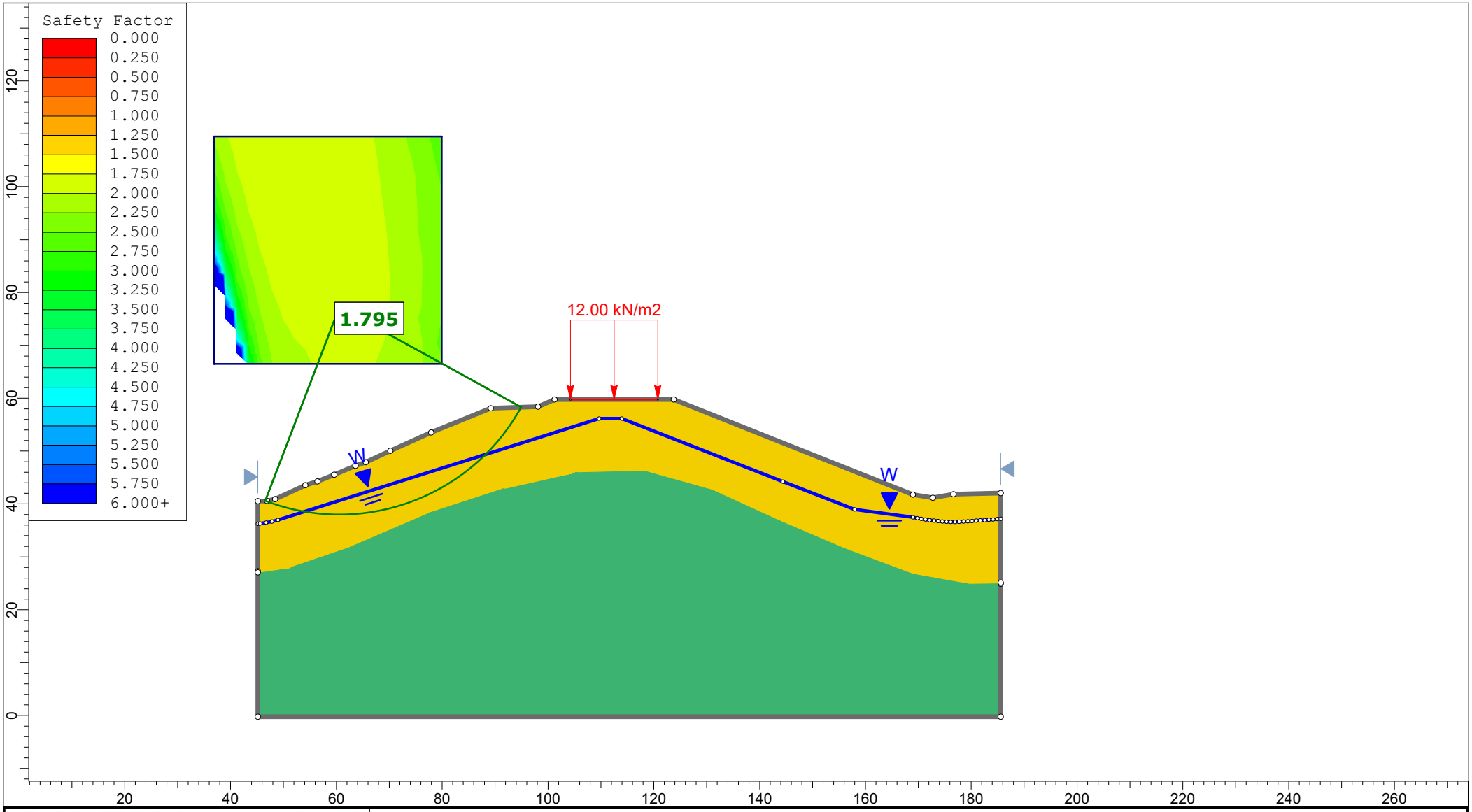

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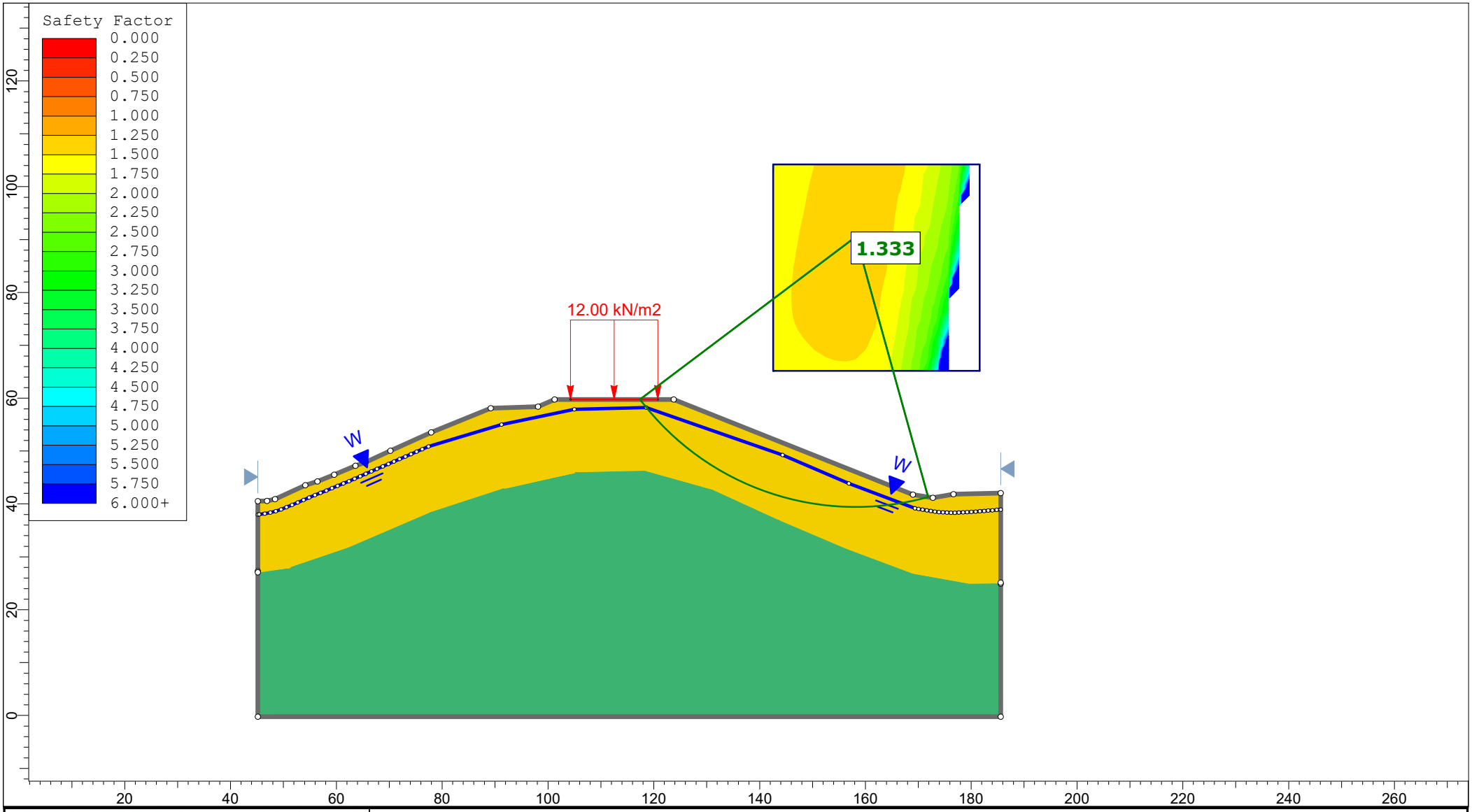

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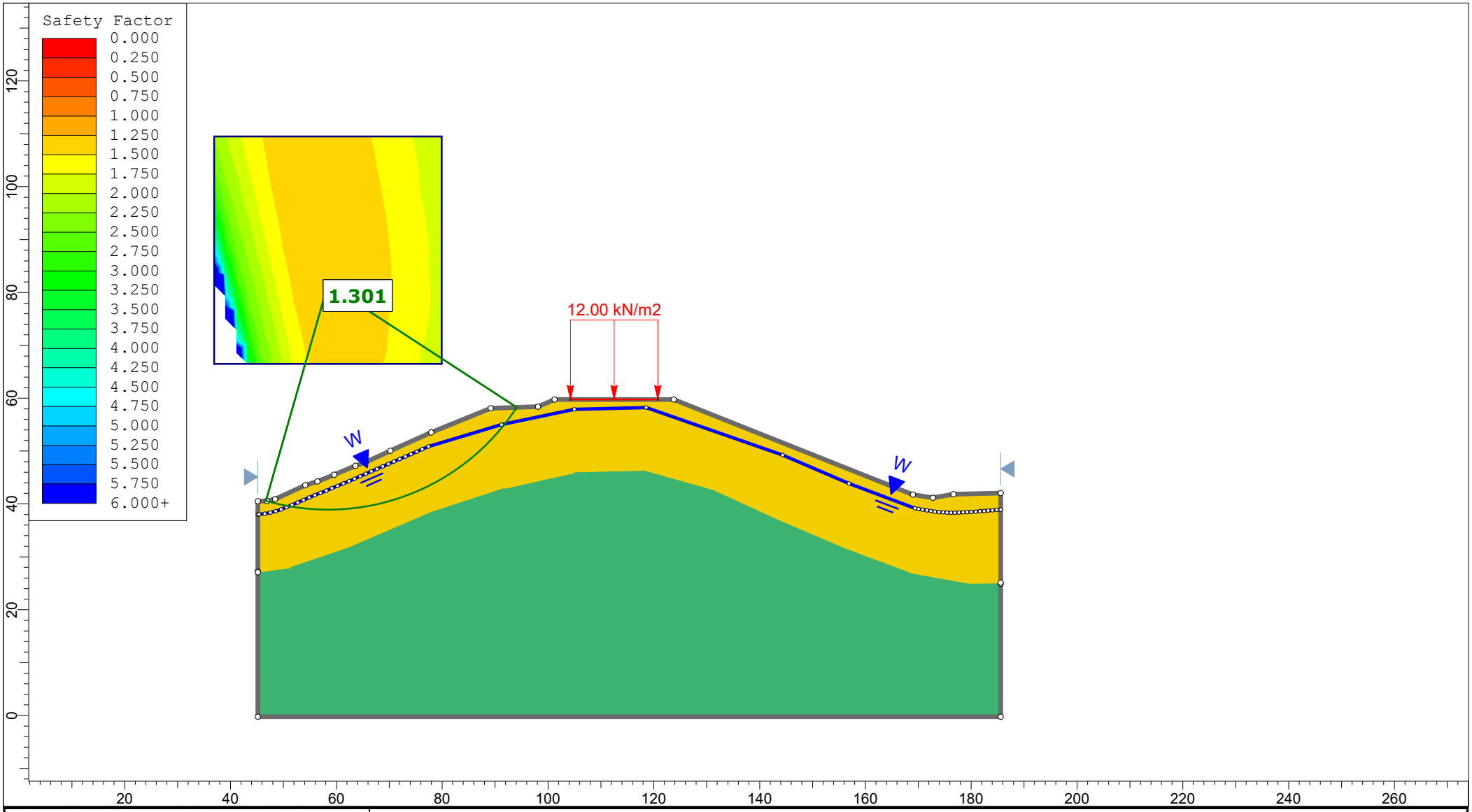

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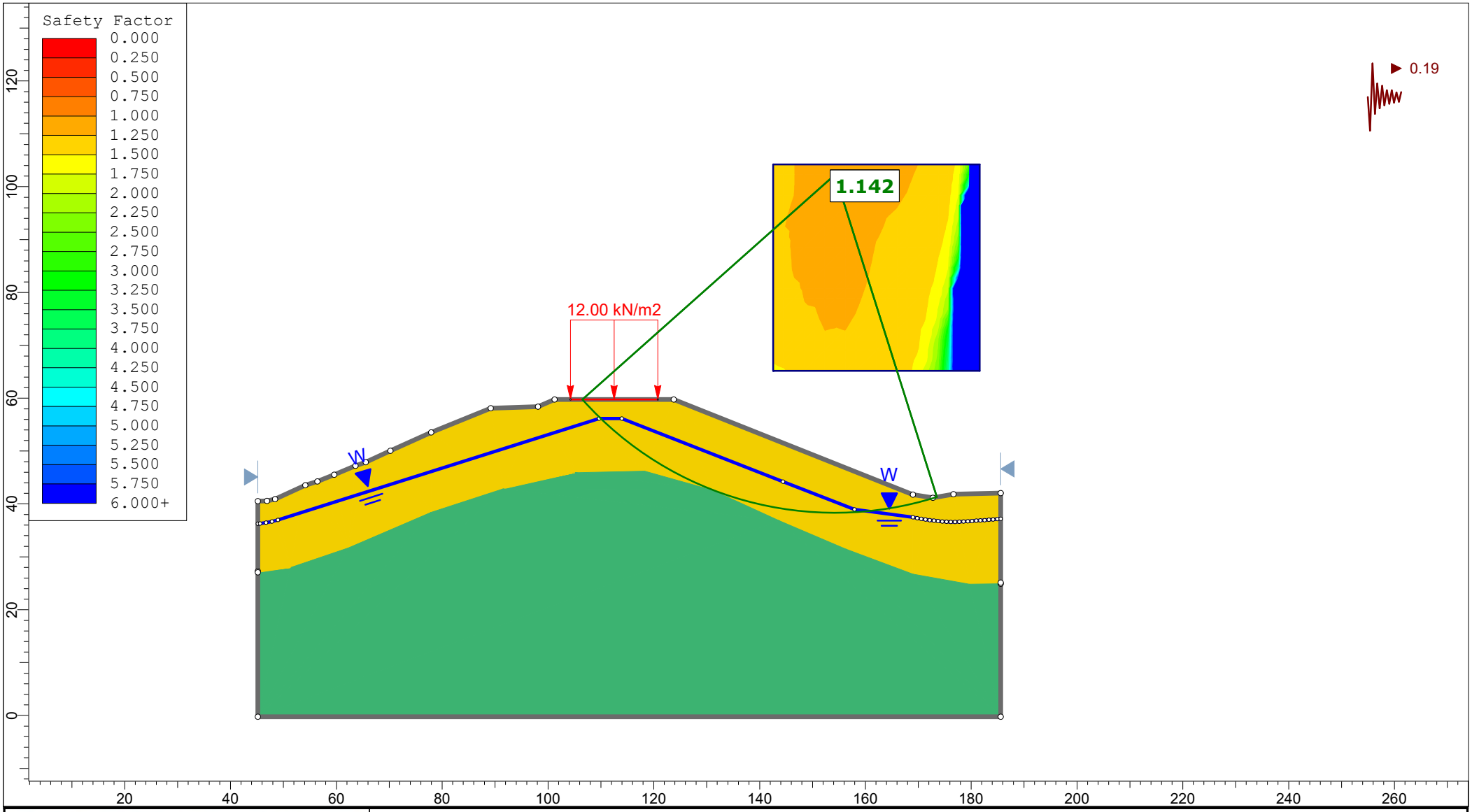

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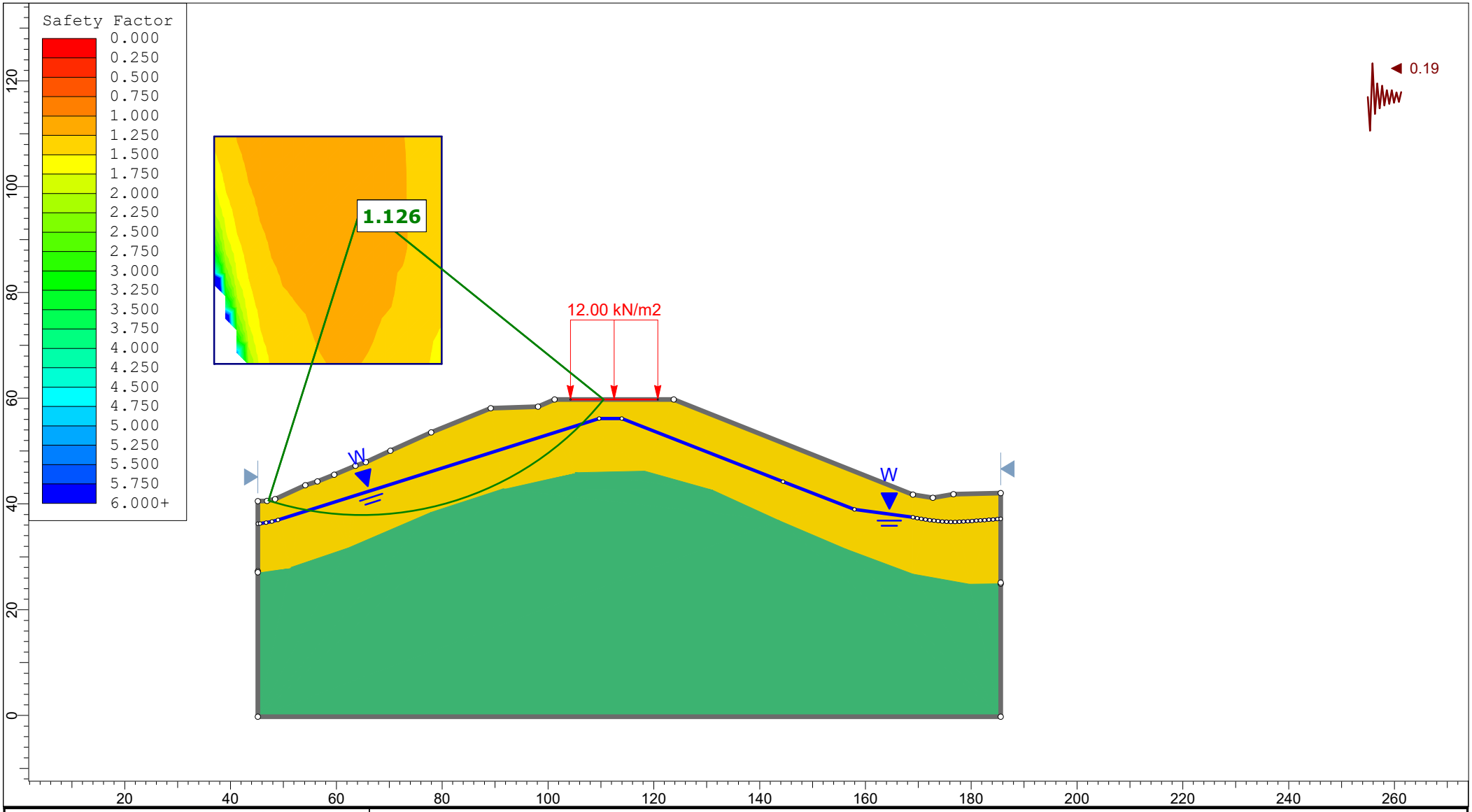

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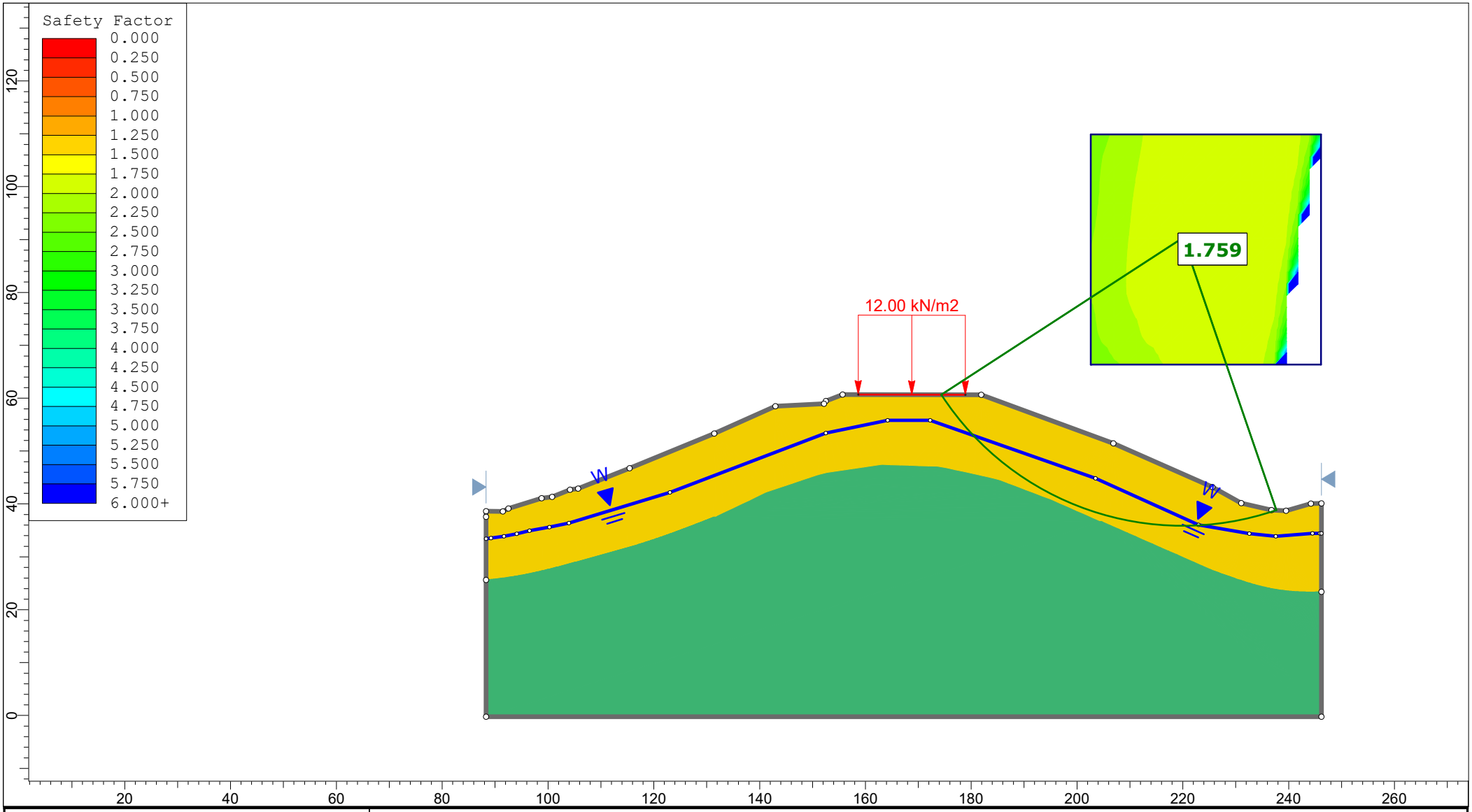

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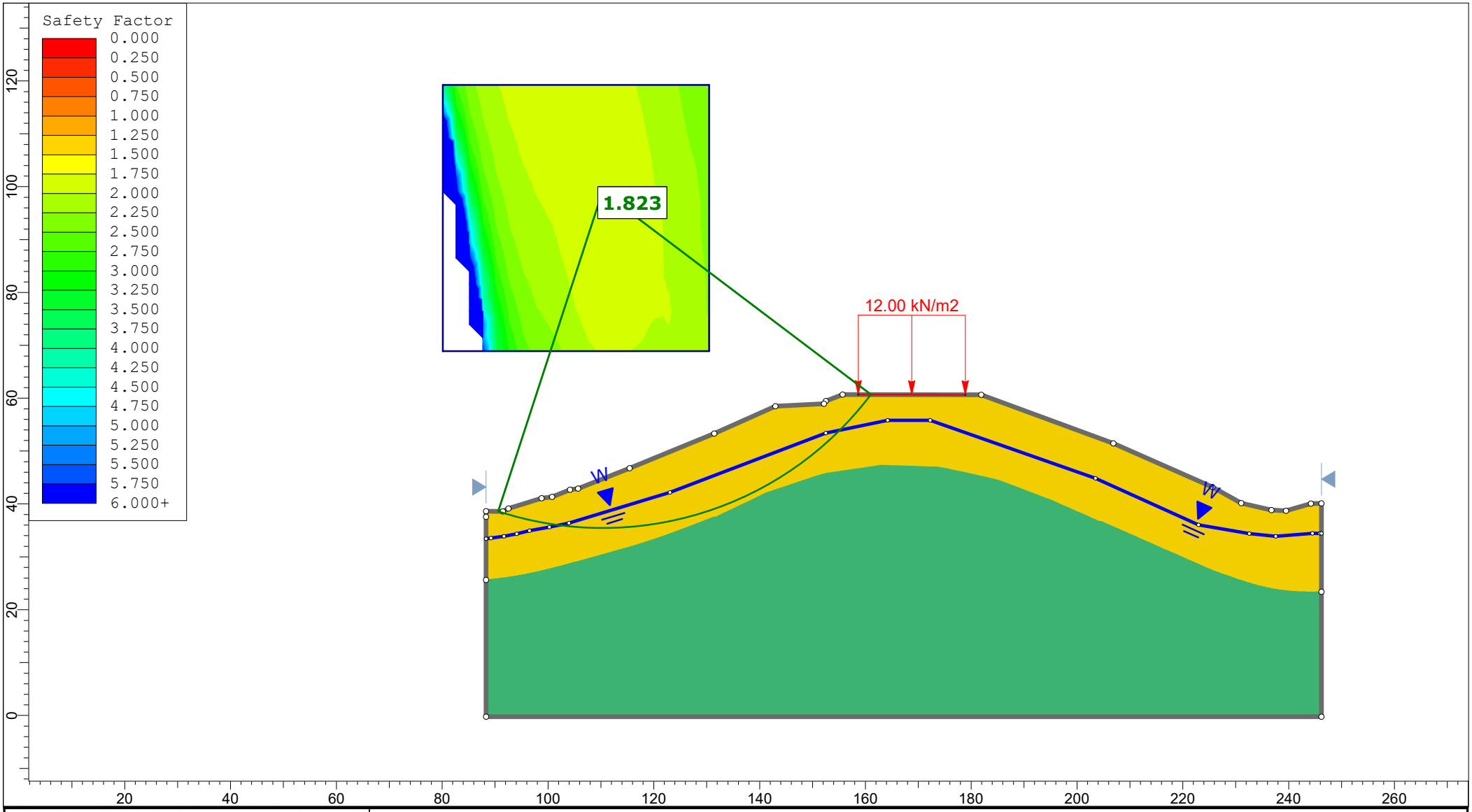

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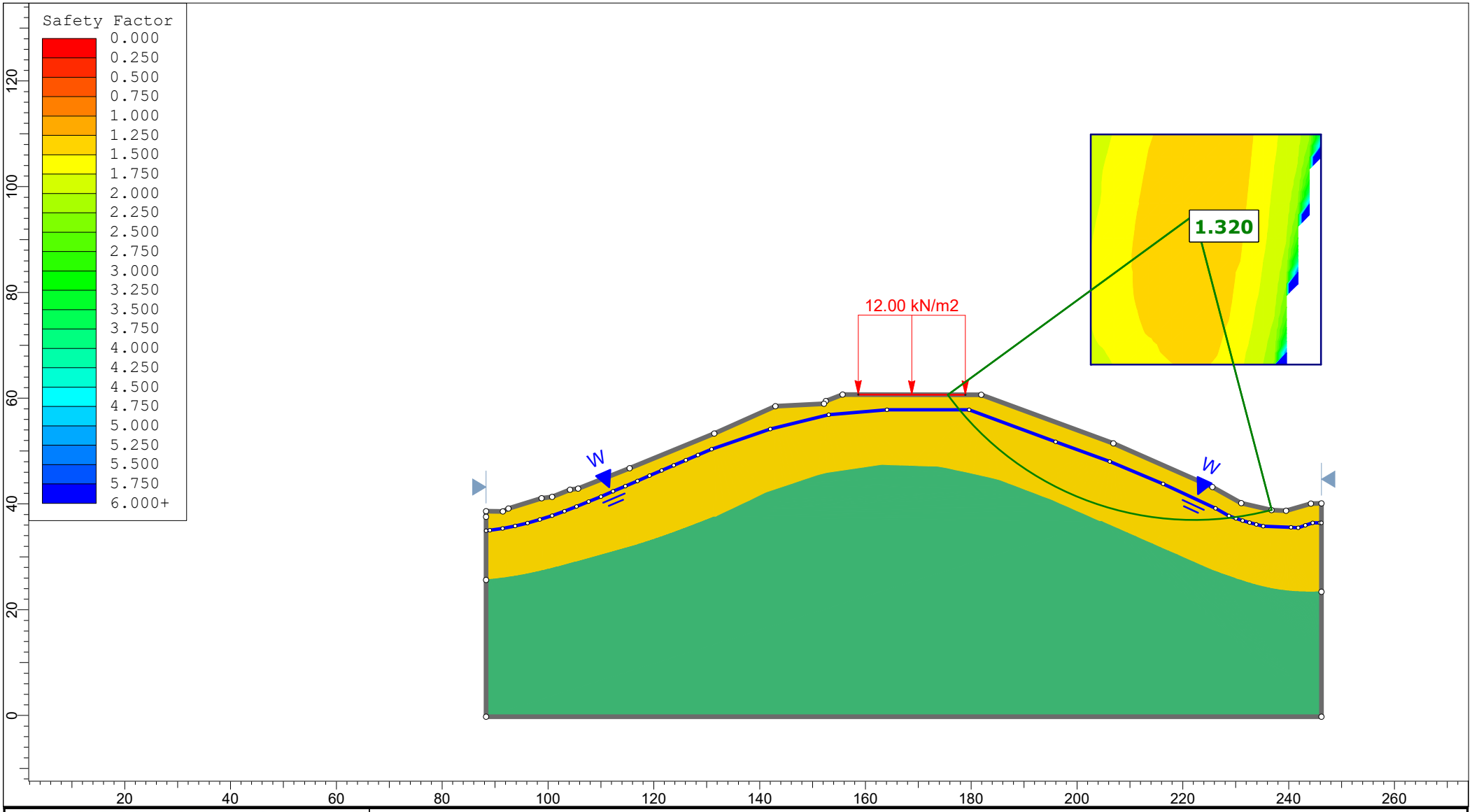

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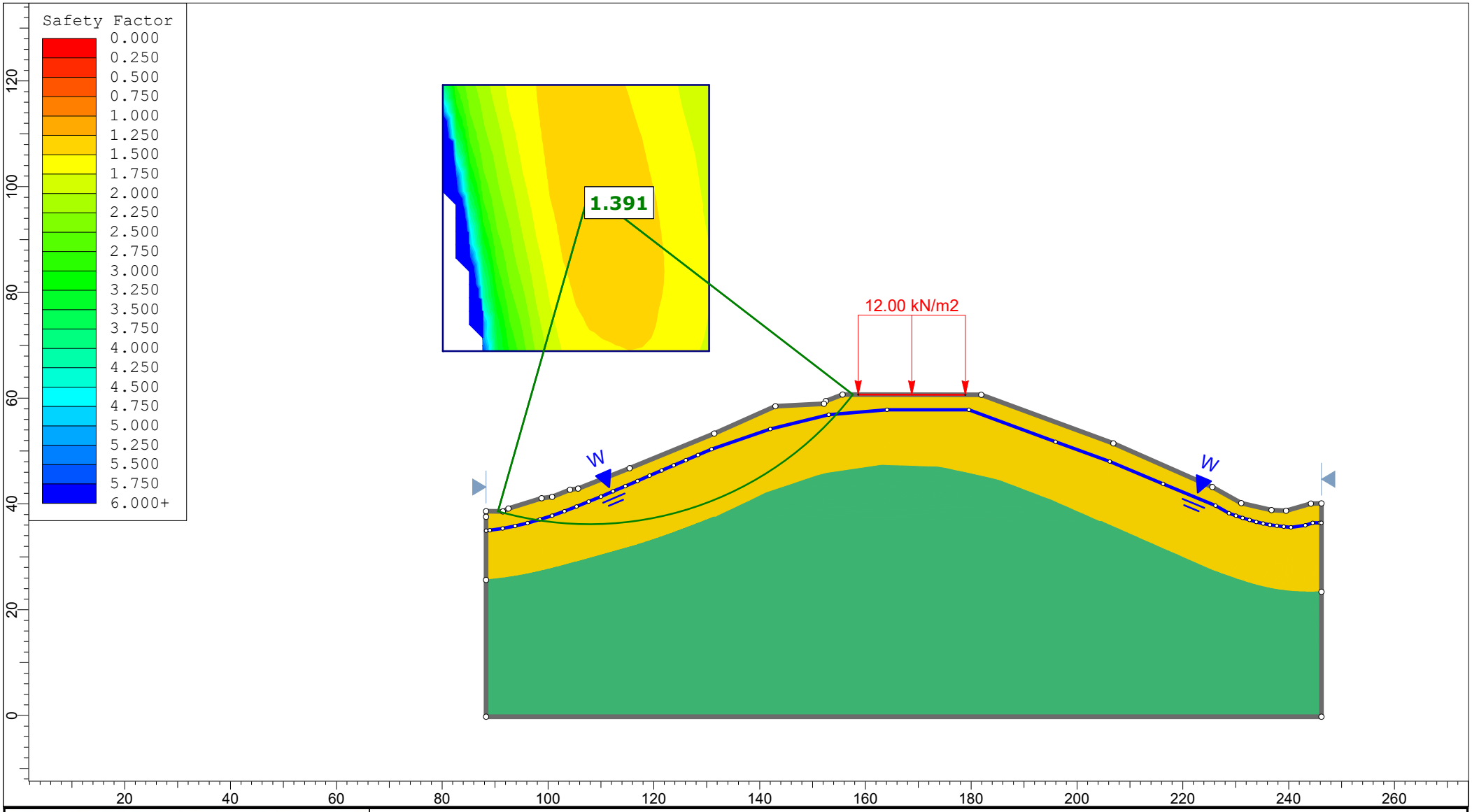

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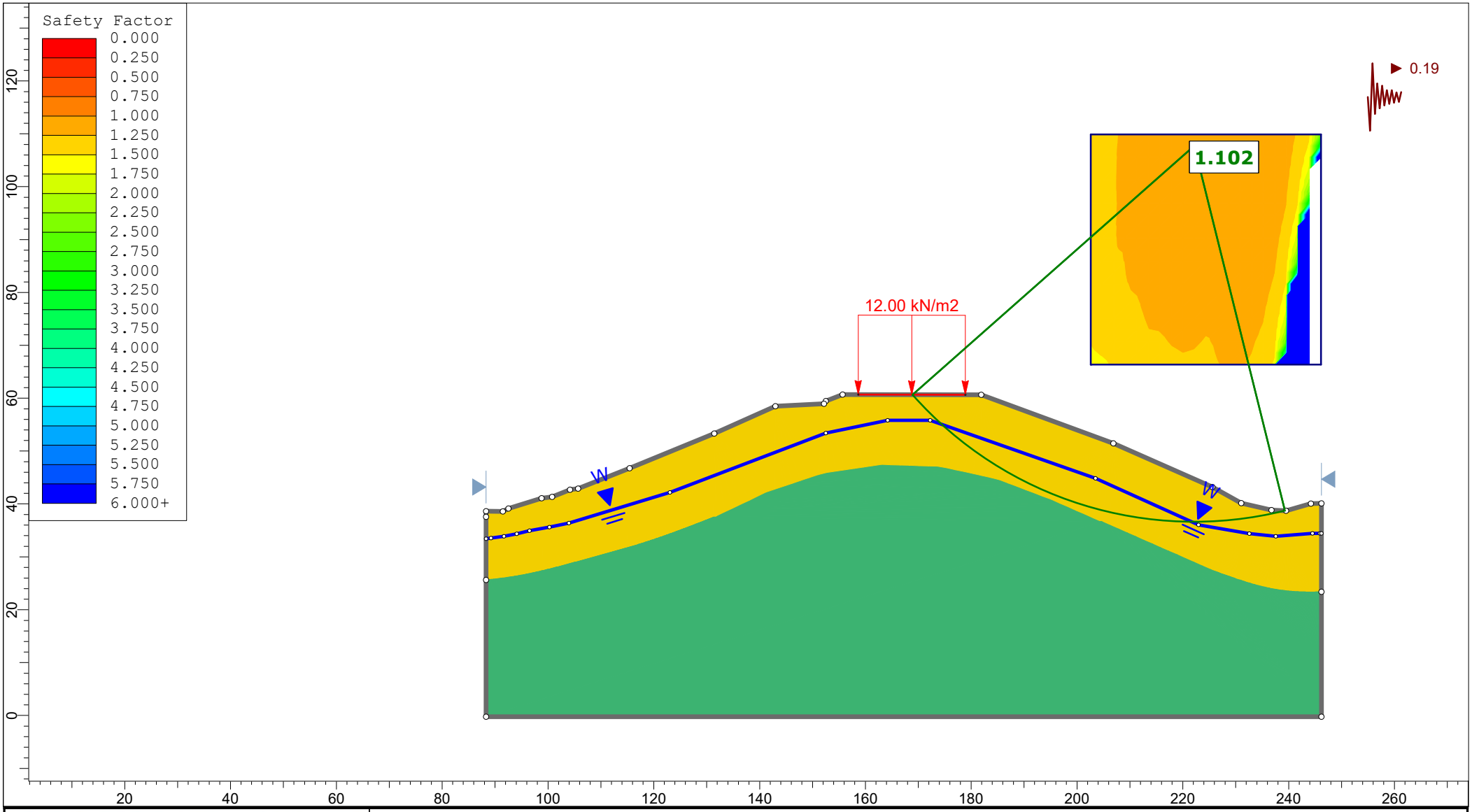

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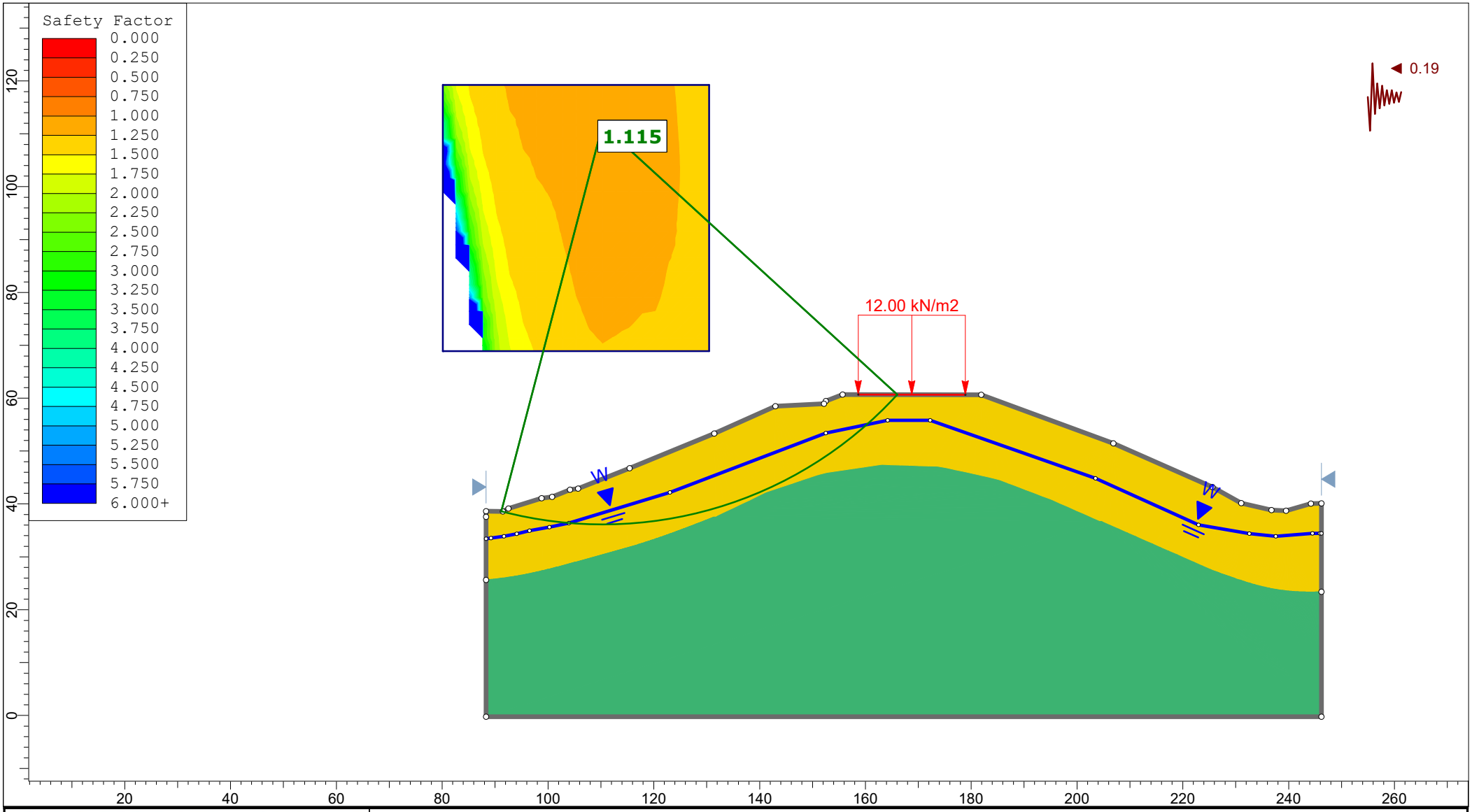

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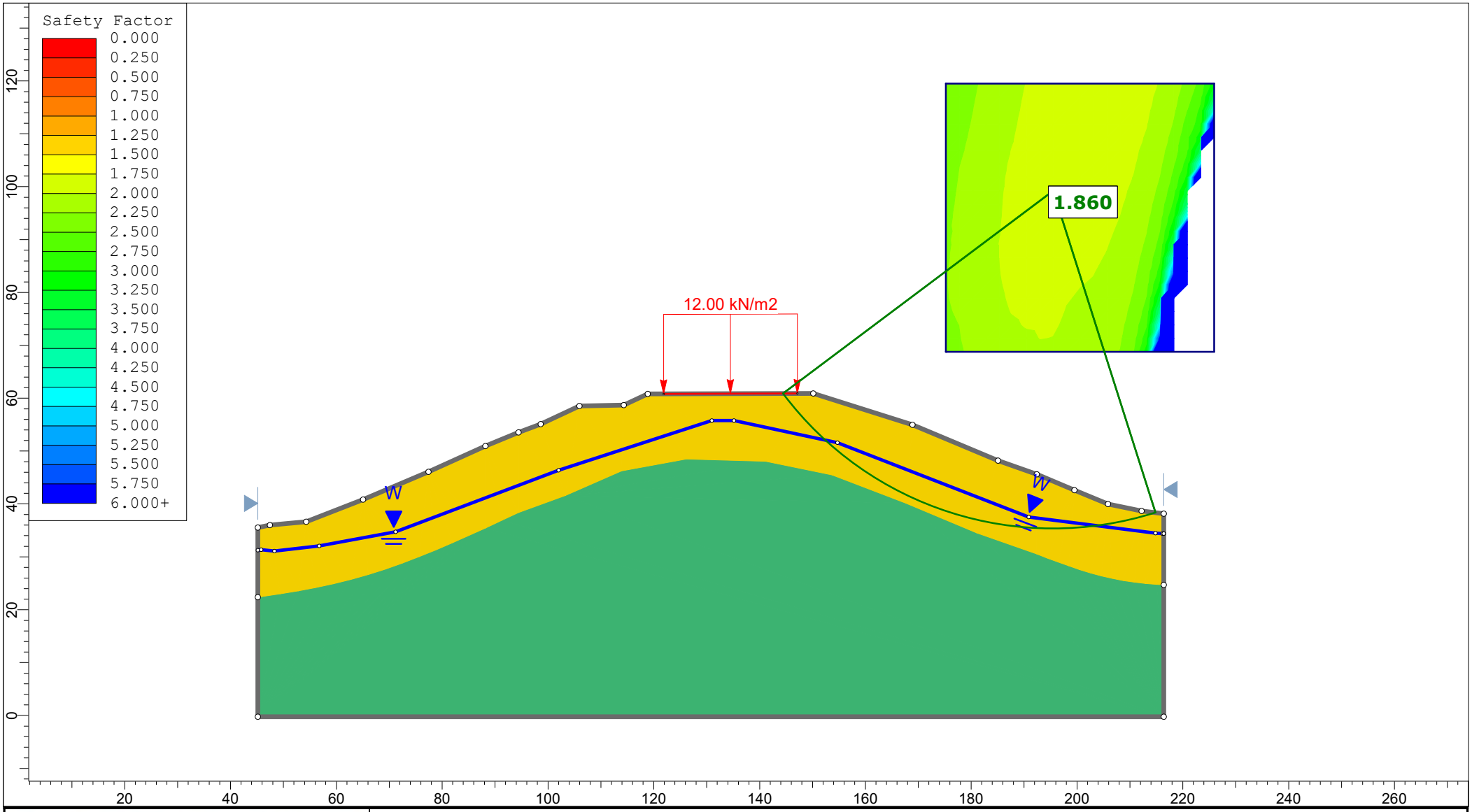
Date	29/09/2022		*Job No.* 20-0078

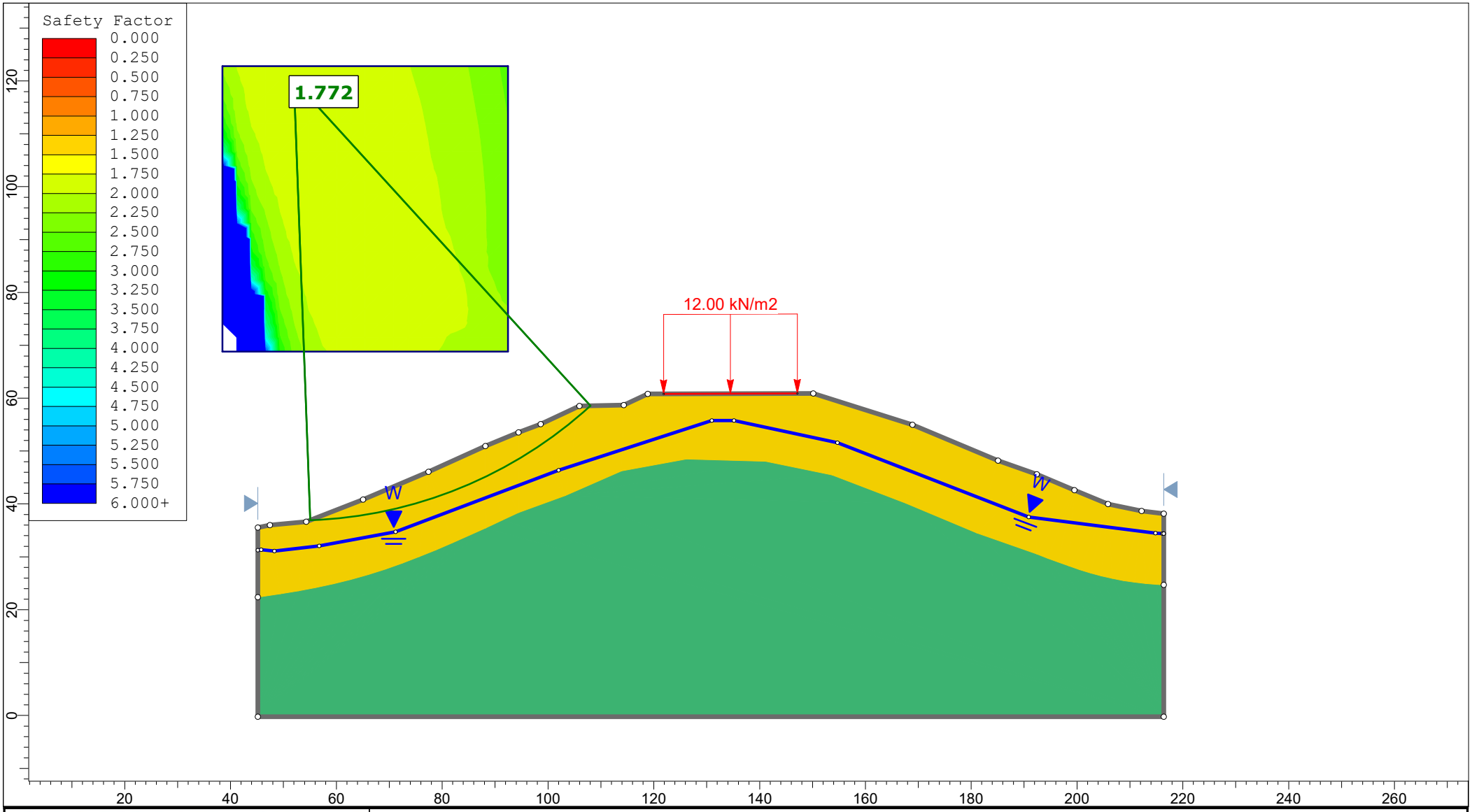


CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru

Analysis Description	Lot 8 - LR		
Drawn By	Liam MacMenigall	*Scale* 1:1000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078

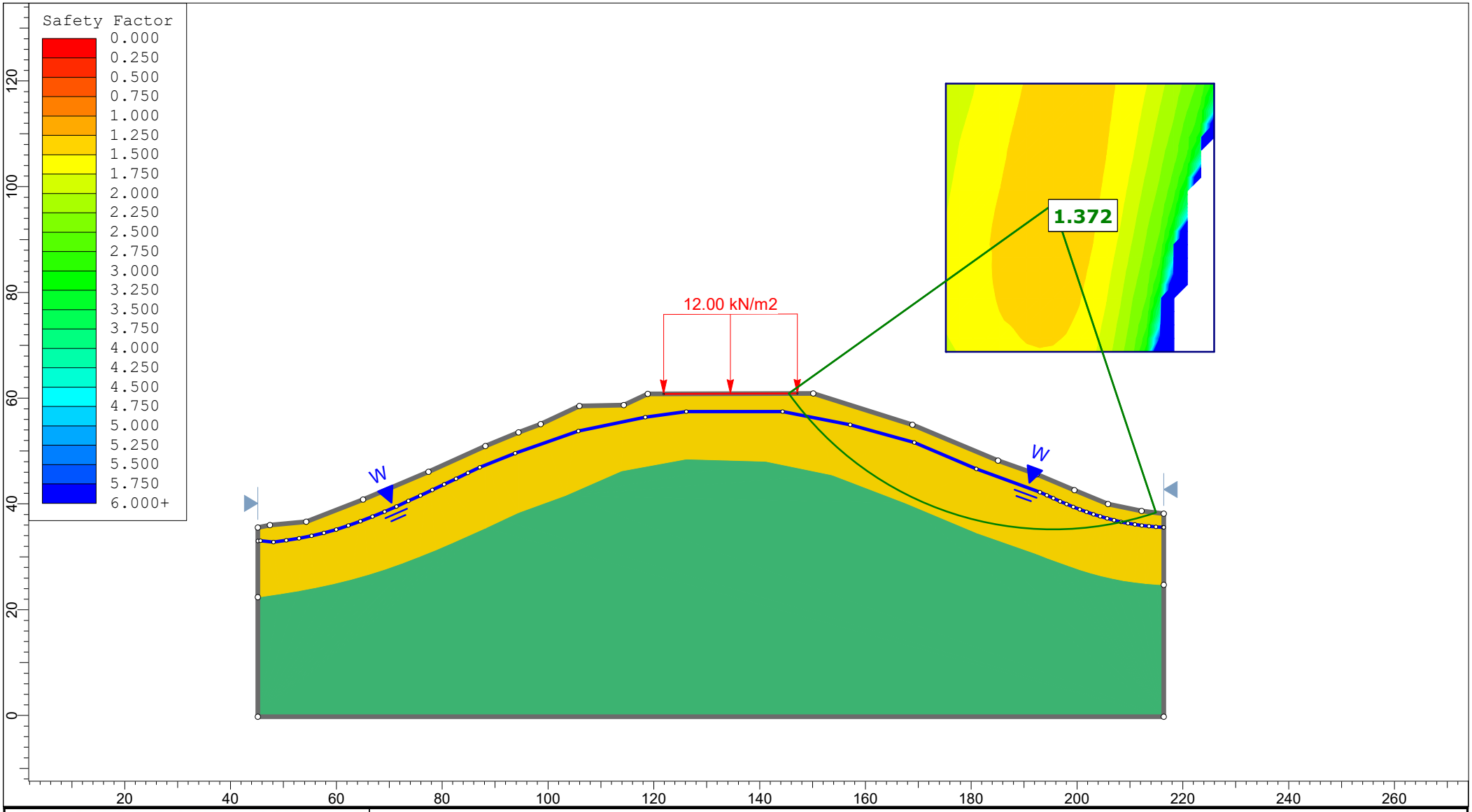


CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru

Analysis Description	Lot 8 - RL		
Drawn By	Liam MacMenigall	*Scale* 1:1000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078

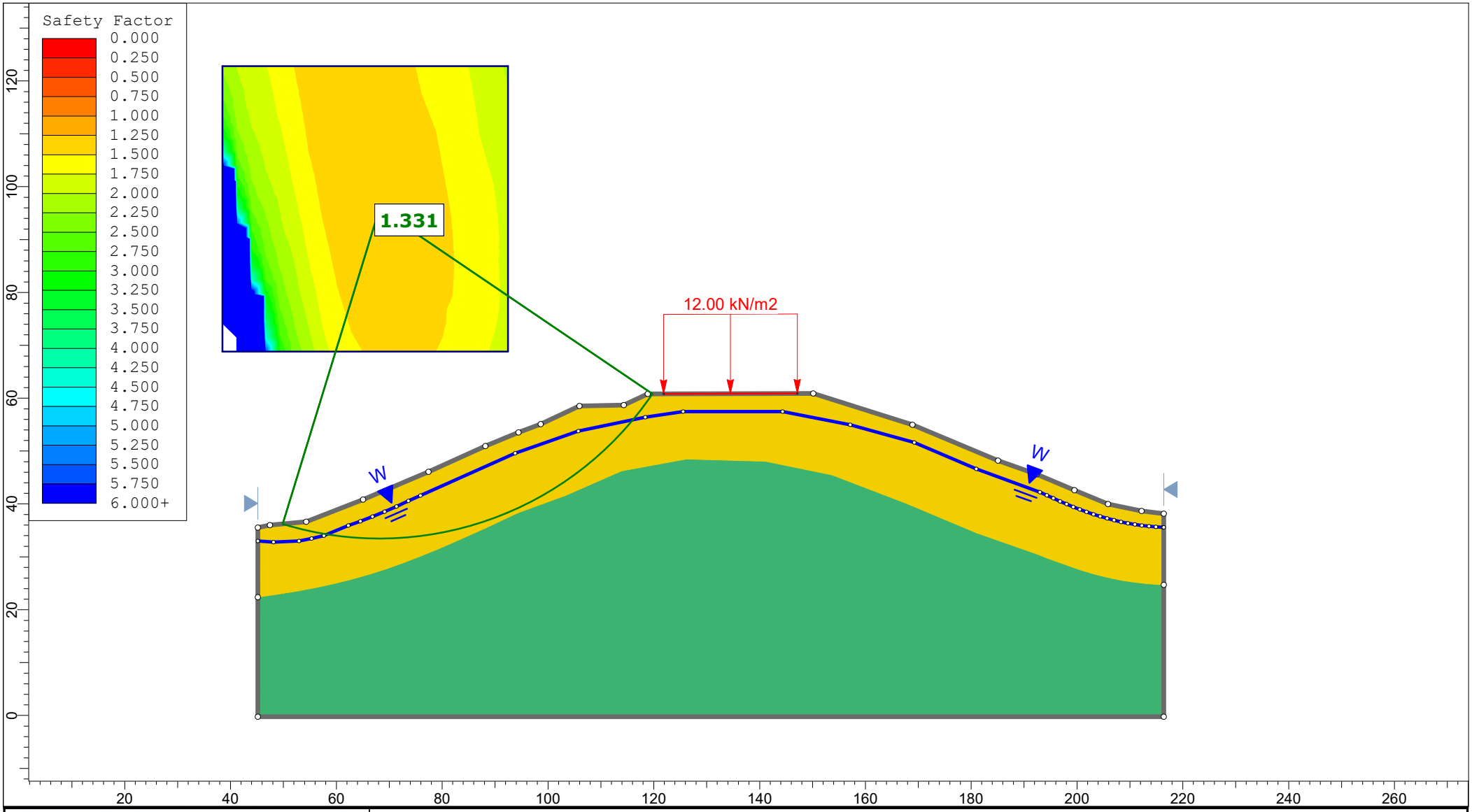


CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru

Analysis Description	Lot 8 - LR - EG		
Drawn By	Liam MacMenigall	*Scale* 1:1000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078

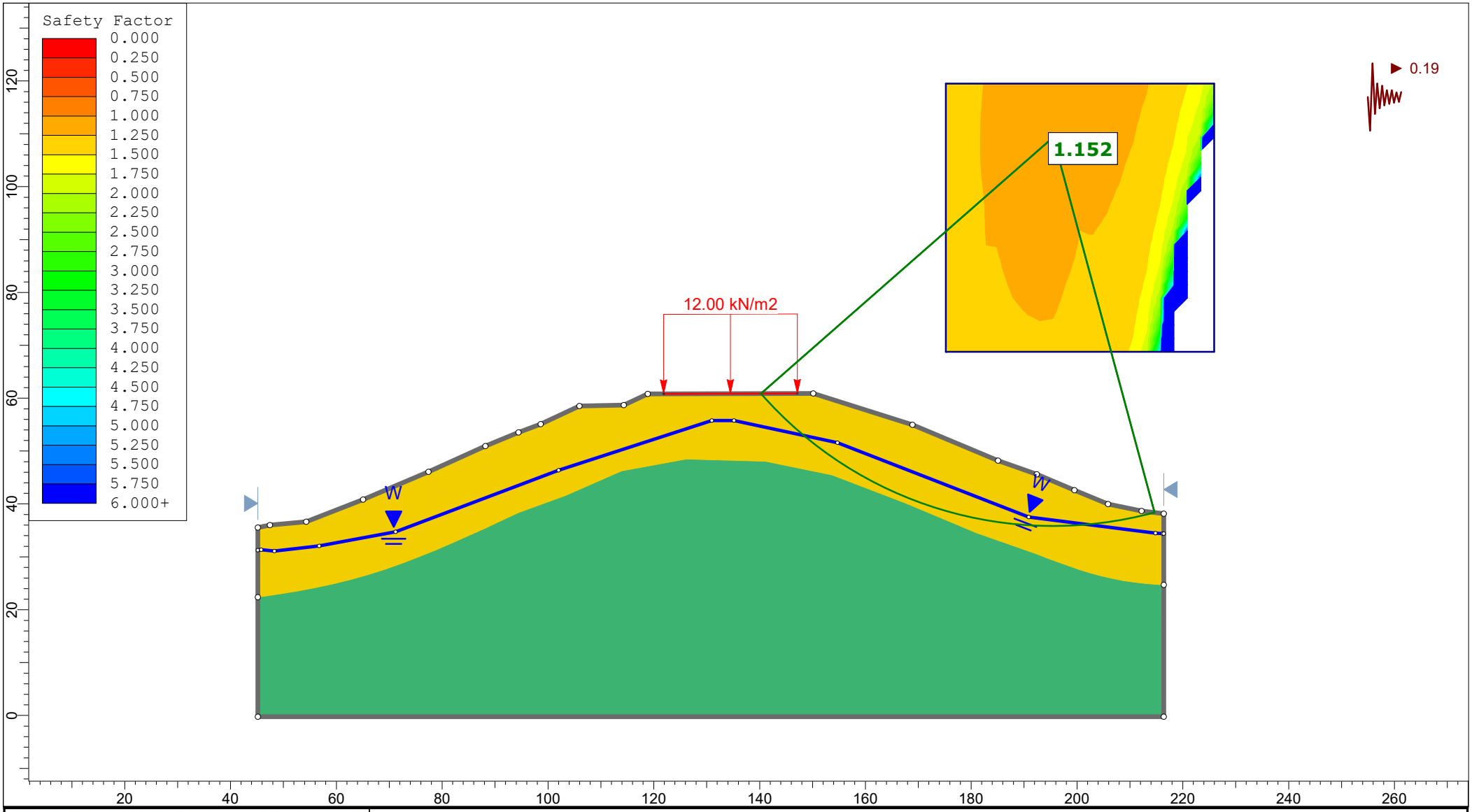


CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru

Analysis Description	Lot 8 - RL - EG		
Drawn By	Liam MacMenigall	*Scale* 1:1000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078

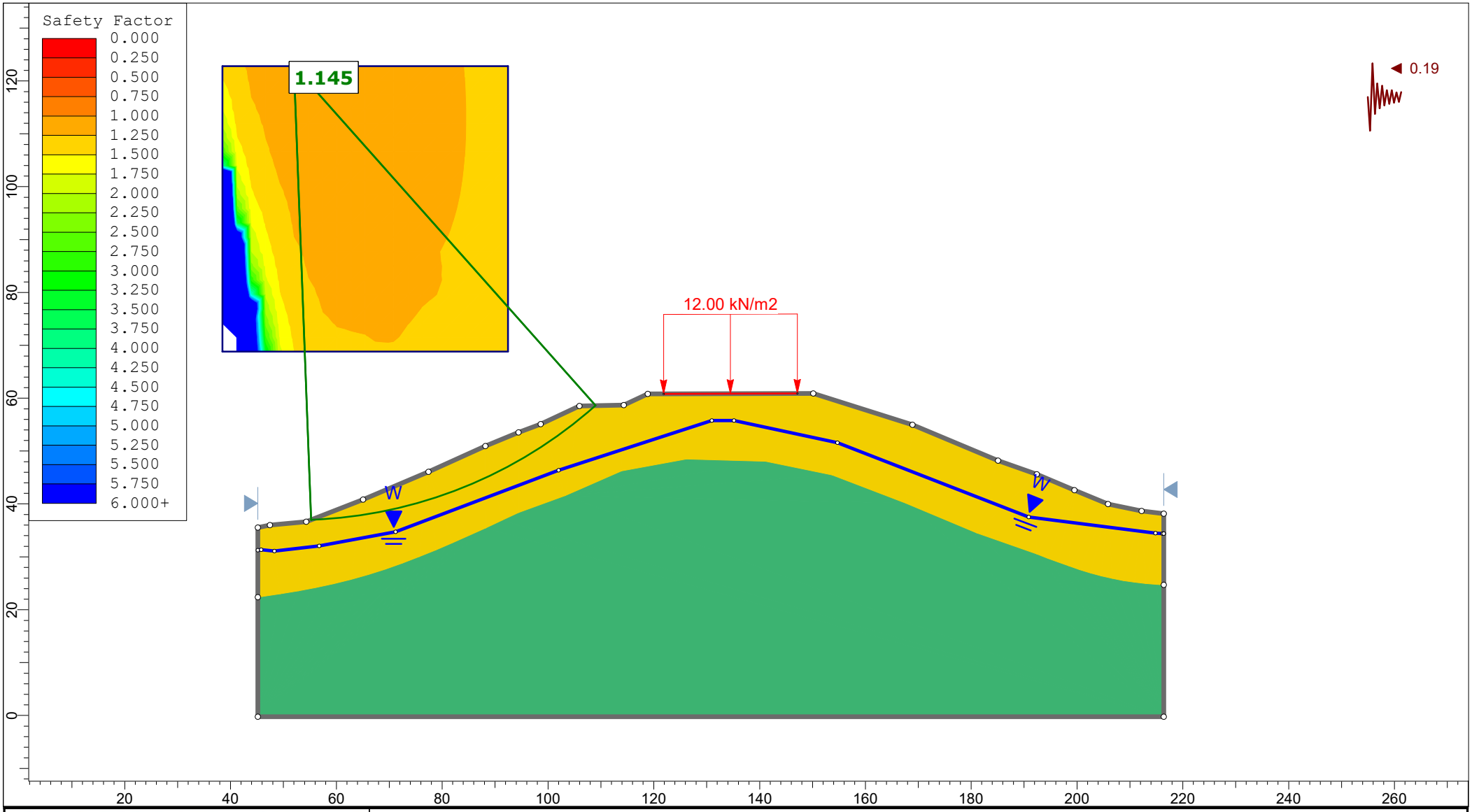


CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru

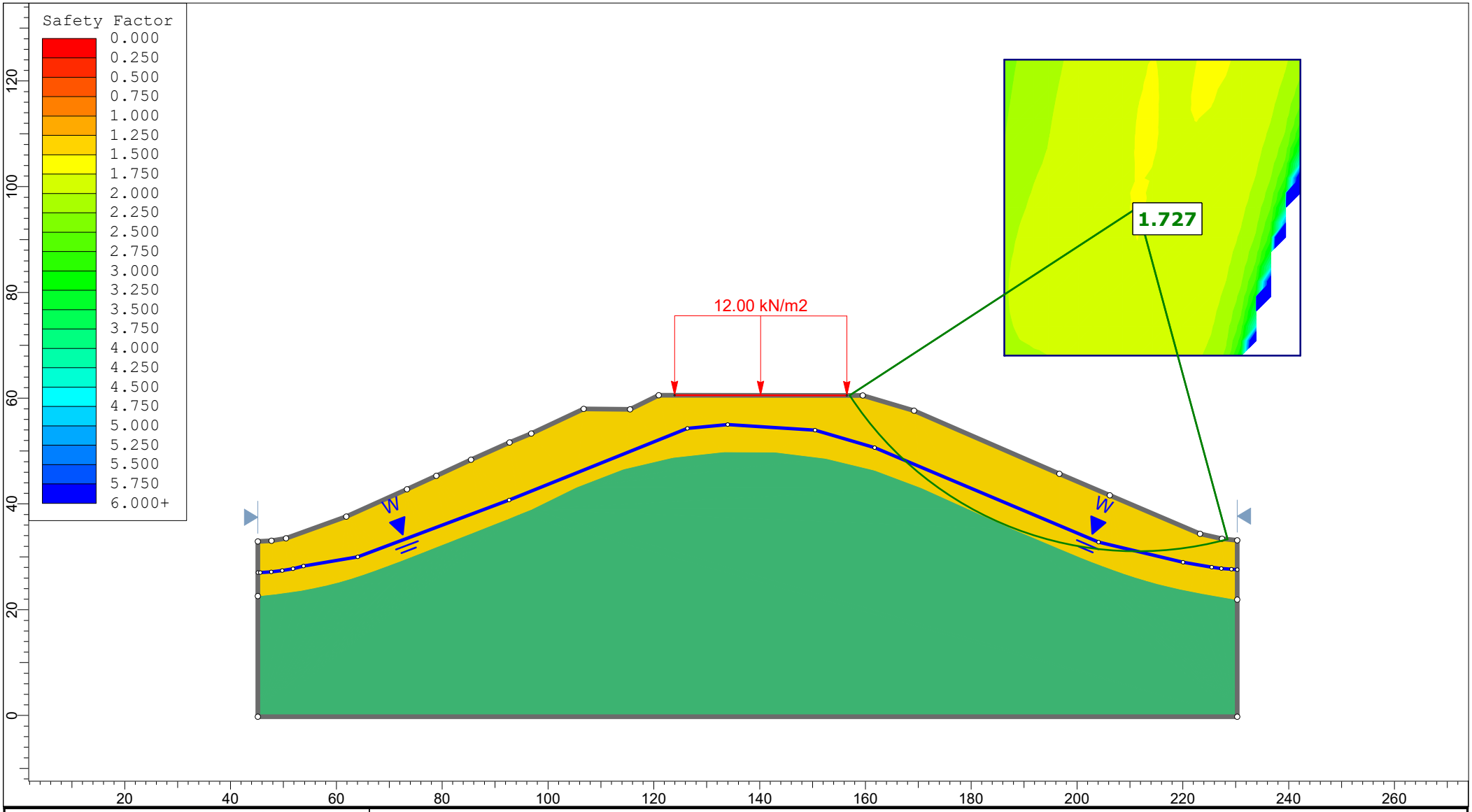
Analysis Description	Lot 8 - LR - Seismic		
Drawn By	Liam MacMenigall	*Scale* 1:1000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078



CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru			
Analysis Description	Lot 8 - RL - Seismic		
Drawn By	Liam MacMenigall	*Scale* 1:1000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078

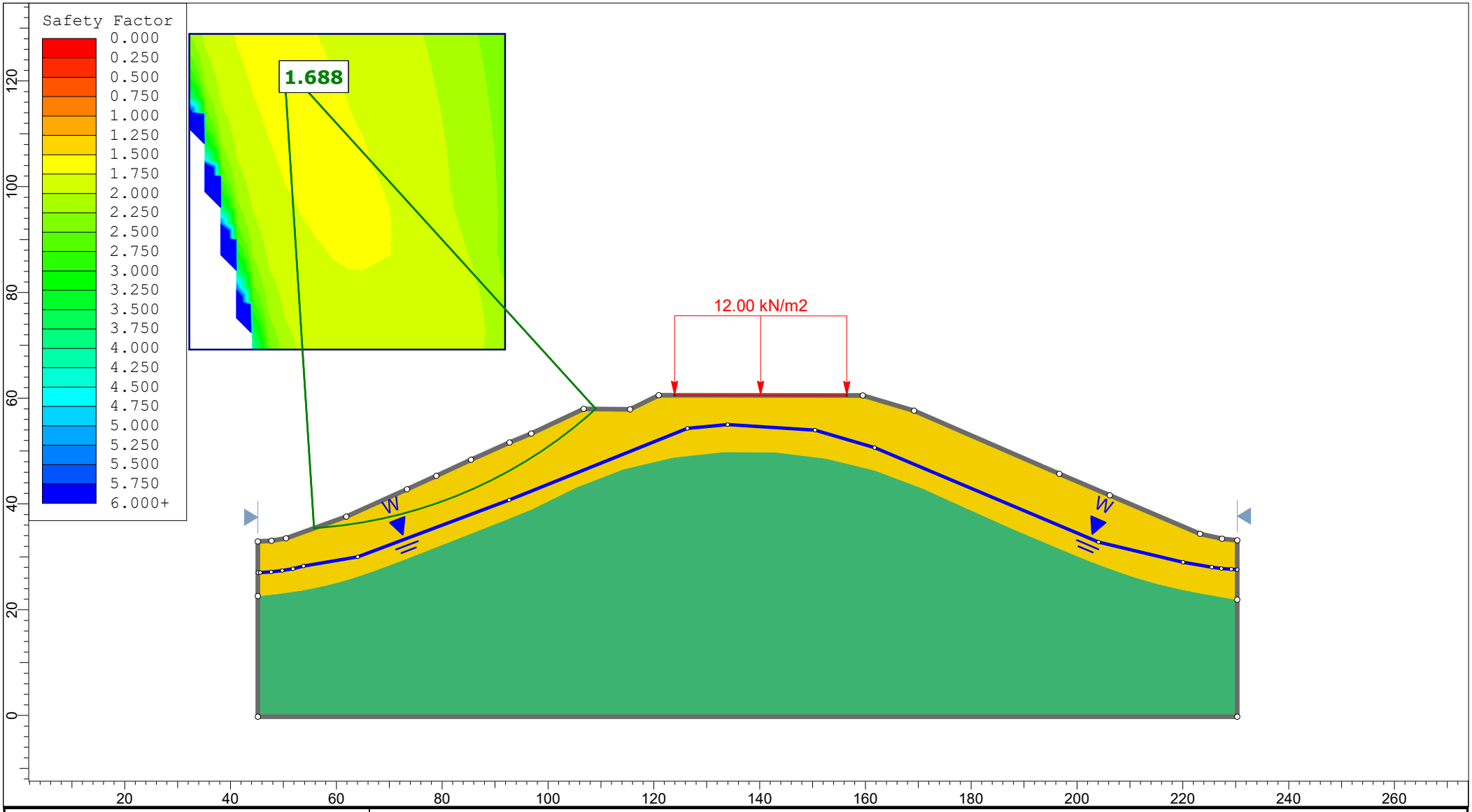


CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru

Analysis Description	Lot 9 - LR		
Drawn By	Liam MacMenigall	*Scale* 1:1000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078



CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru

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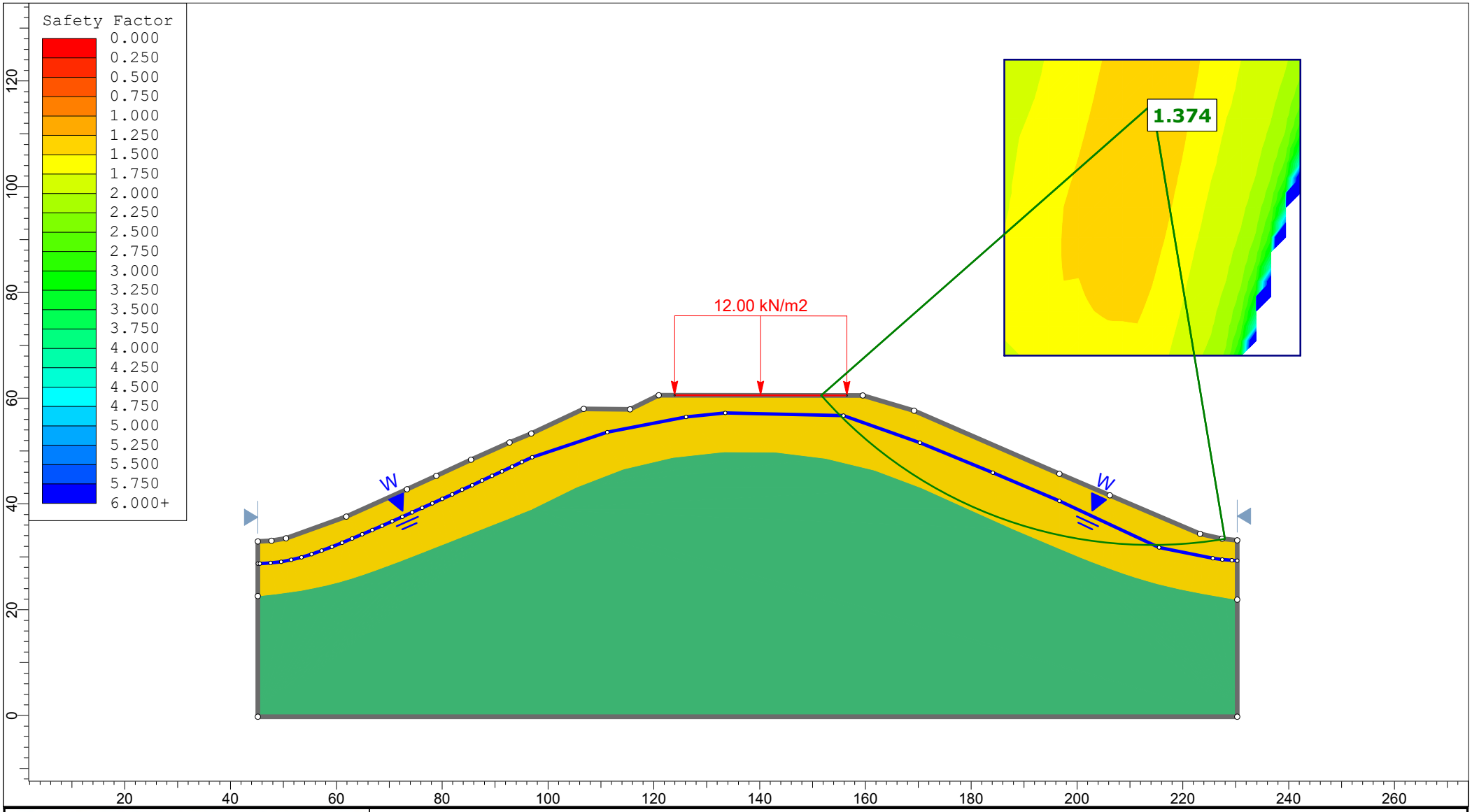
Date	29/09/2022		*Job No.* 20-0078

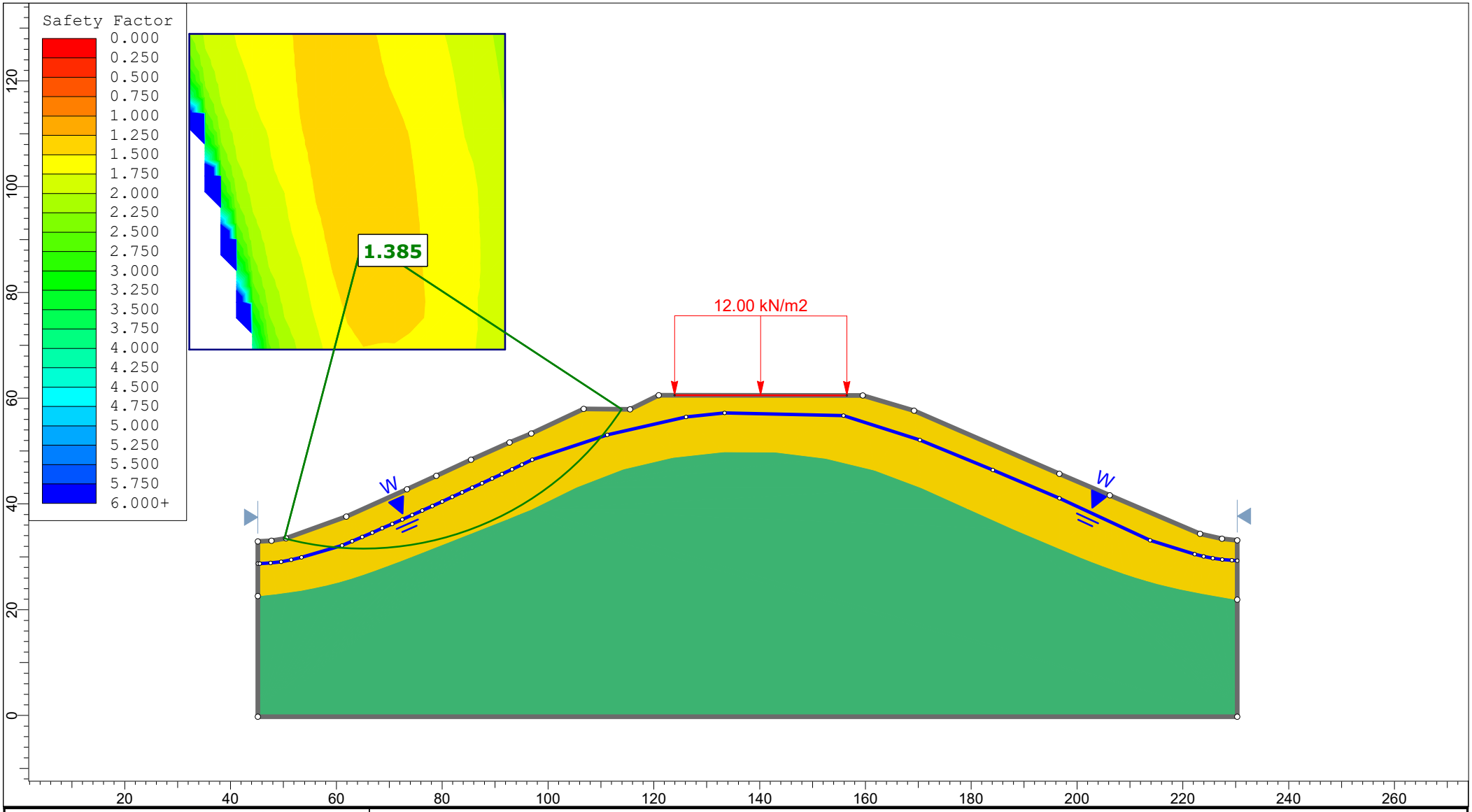


CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru

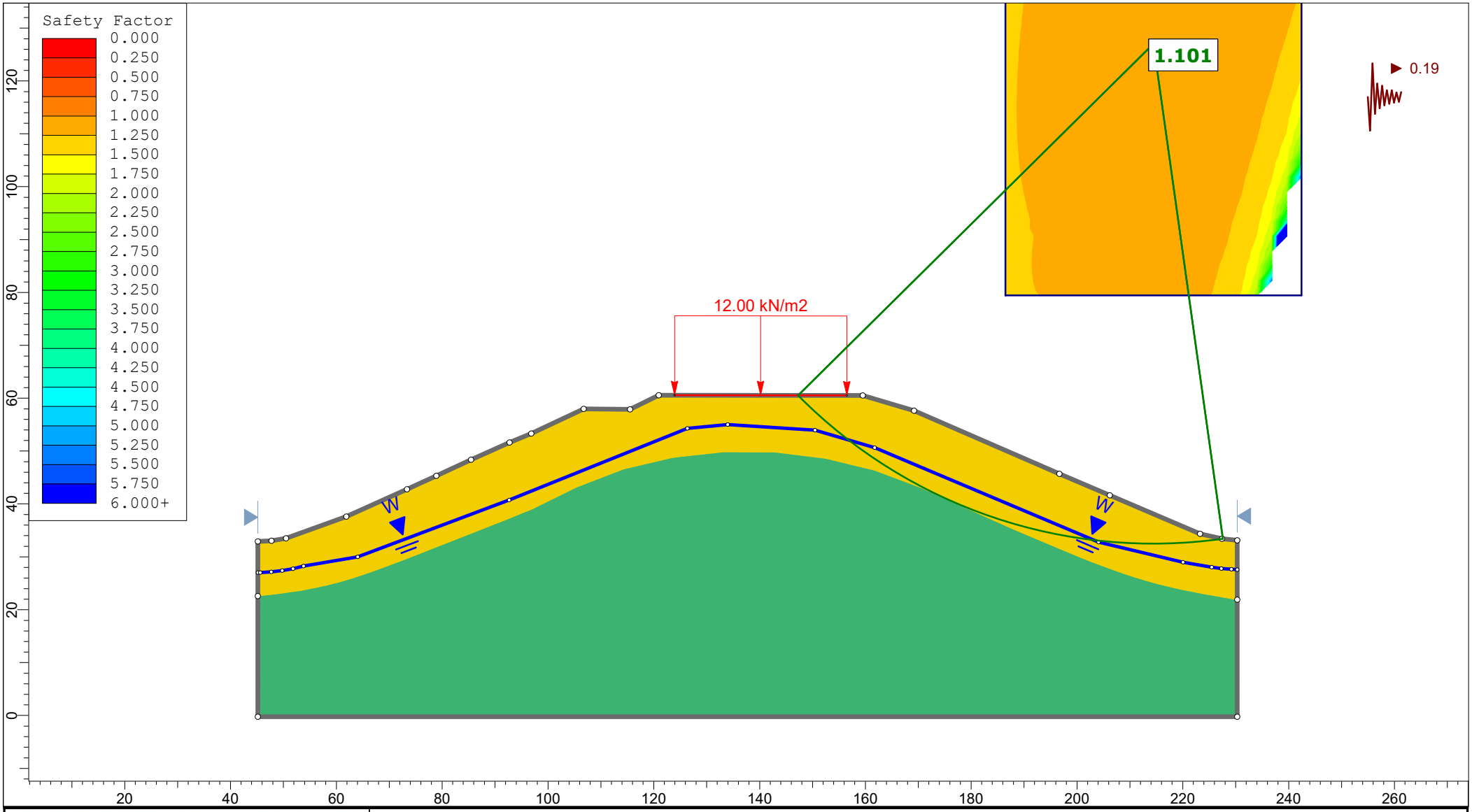
Analysis Description	Lot 9 - LR - EG		
Drawn By	Liam MacMenigall	*Scale* 1:1000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078



CORE ENGINEERING SOLUTIONS

51 Te Maika Road, Ngunguru			
Analysis Description	Lot 9 - RL - EG		
Drawn By	Liam MacMenigall	*Scale* 1:1000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078

SLIDEINTERPRET 9.019

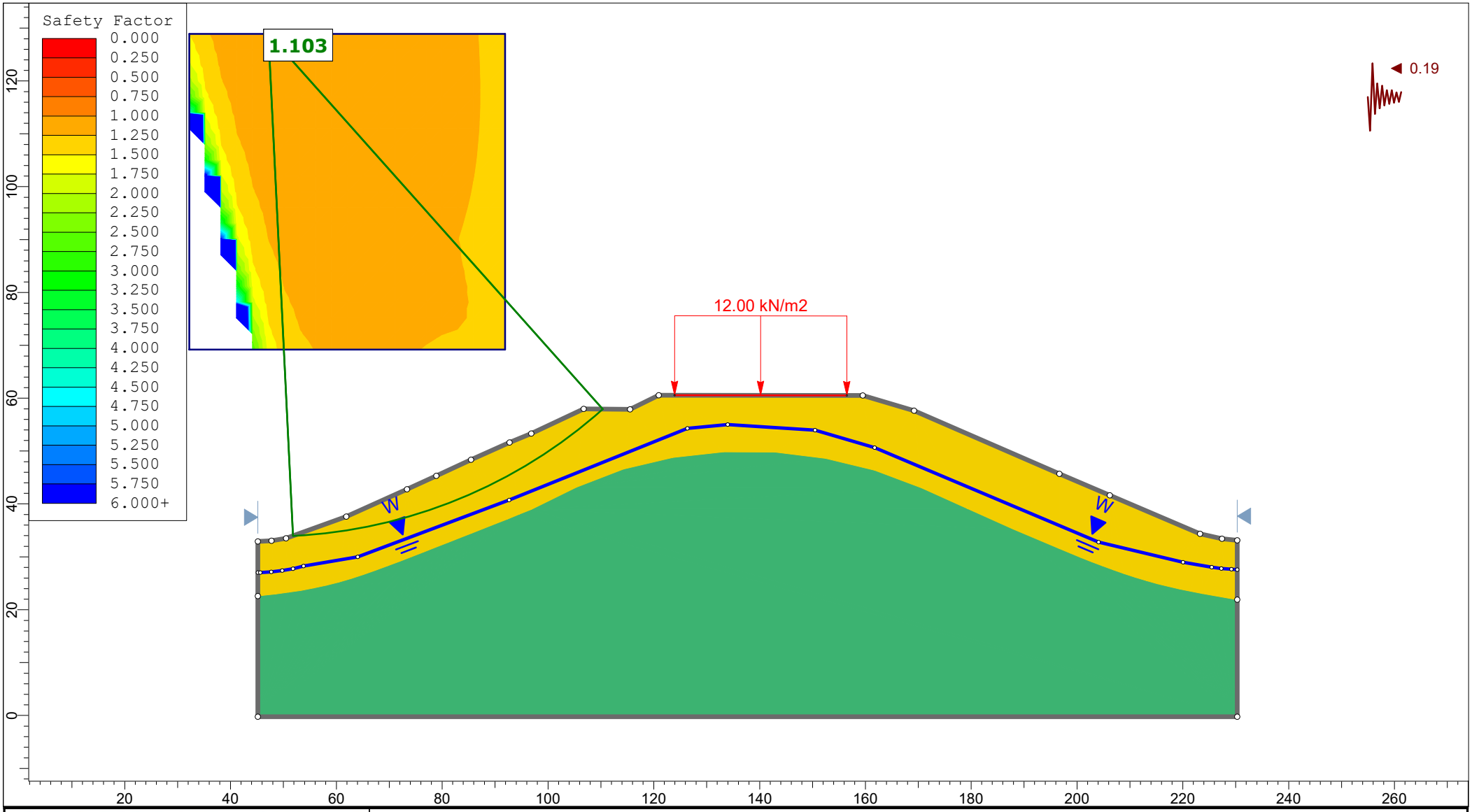


CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru

Analysis Description	Lot 9 - LR - Seismic		
Drawn By	Liam MacMenigall	*Scale* 1:1000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078

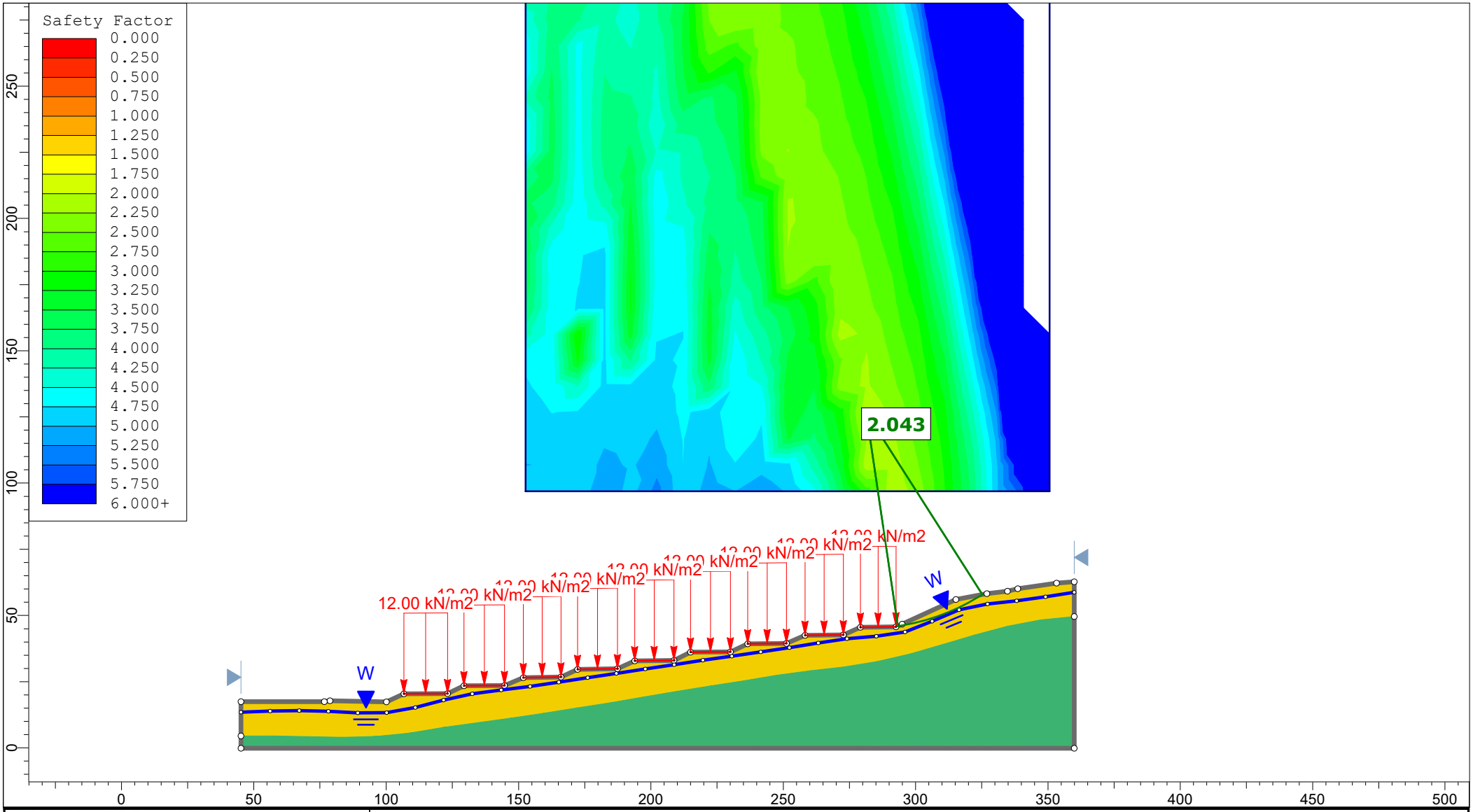


CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru

Analysis Description	Lot 9 - RL - Seismic		
Drawn By	Liam MacMenigall	*Scale* 1:1000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078

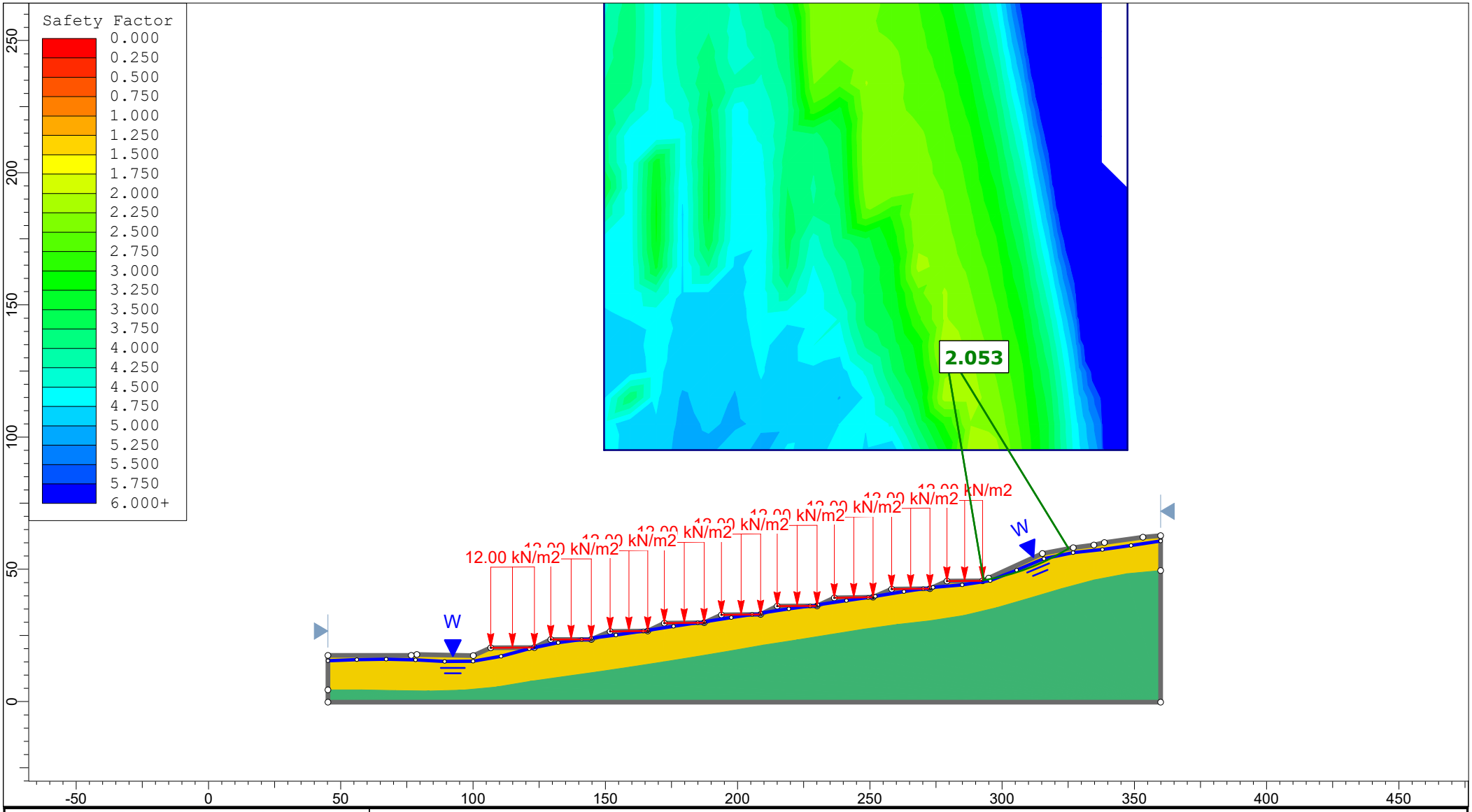


CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru

Analysis Description	Long Section - RL		
Drawn By	Liam MacMenigall	*Scale*	1:2000
Company	Core Engineering Solutions		
Date	29/09/2022	*Job No.*	20-0078

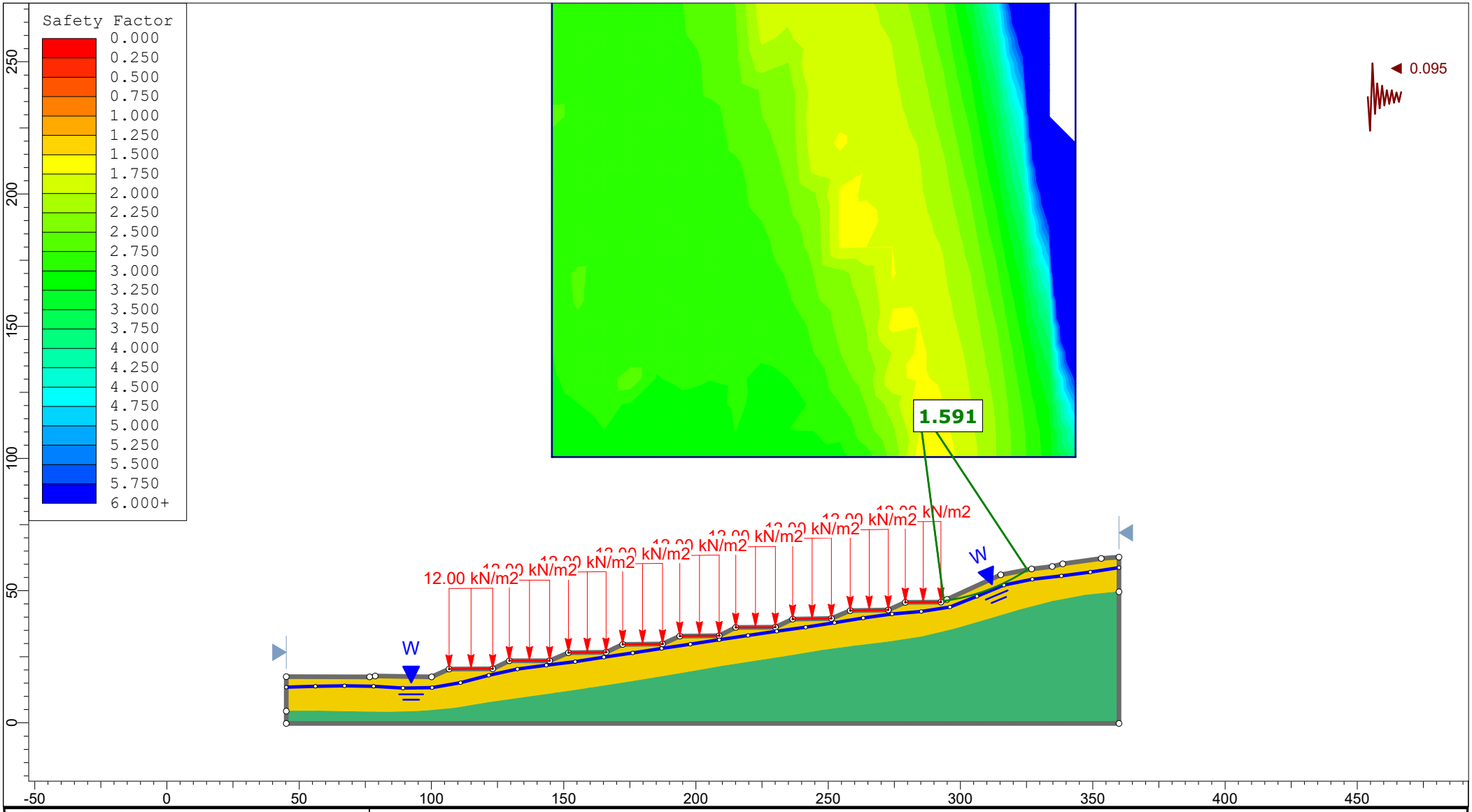


CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru

Analysis Description	Long Section - RL - EG		
Drawn By	Liam MacMenigall	*Scale* 1:2000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078



CORE ENGINEERING SOLUTIONS

SLIDEINTERPRET 9.019

51 Te Maika Road, Ngunguru			
Analysis Description	Long Section - RL - Seismic		
Drawn By	Liam MacMenigall	*Scale* 1:2000	*Company* Core Engineering Solutions
Date	29/09/2022		*Job No.* 20-0078

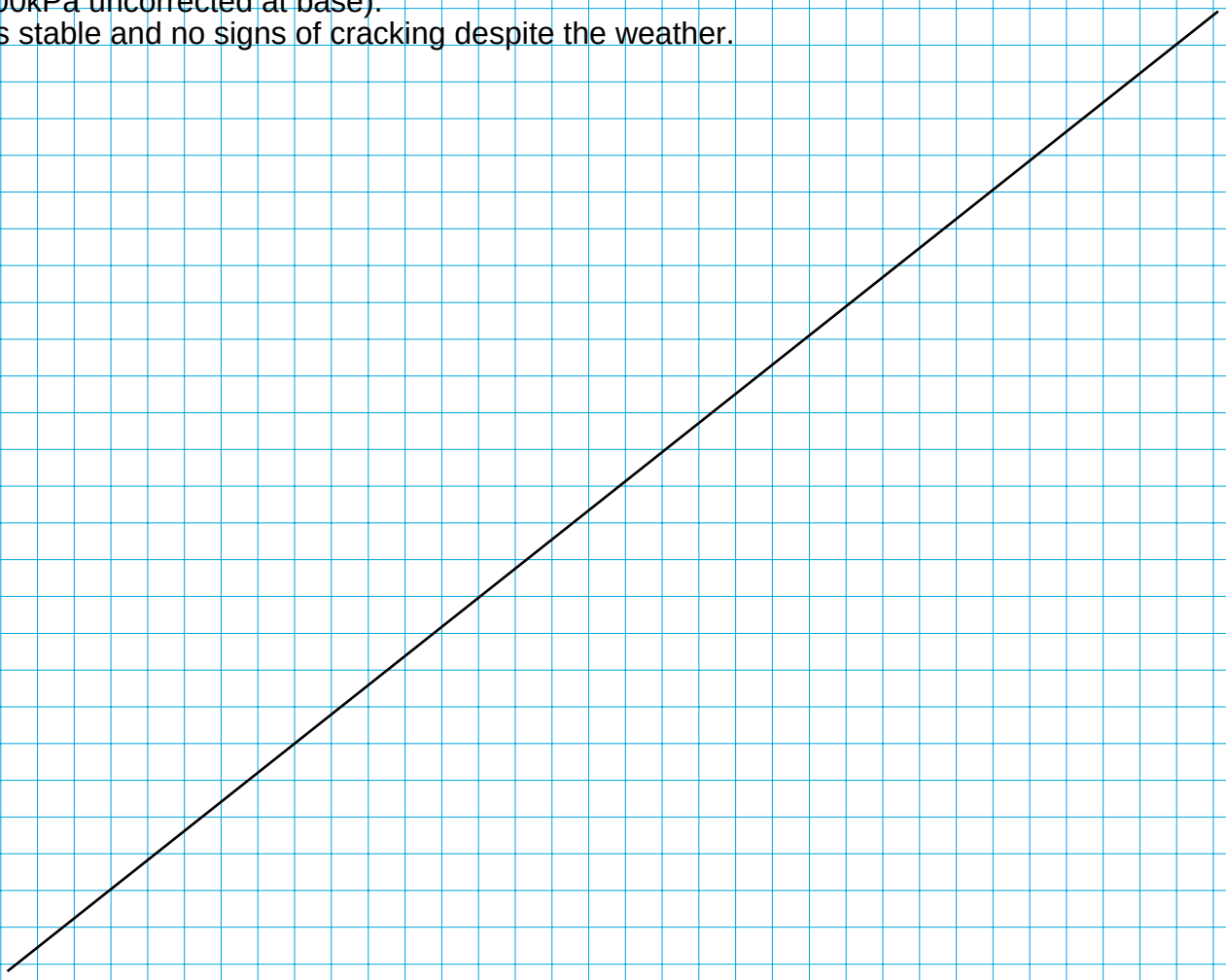
APPENDIX 8 – INSPECTION RECORDS

SITE INSPECTION RECORD

ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	**INSPECTION No.**	RET-001
ADDRESS	51 Te Maika Road, Ngunguru		
INSPECTOR	Stuart Gemmell		
TYPE OF INSPECTION	Retaining Walls		
	CIVIL ◉ **GEOTECHNICAL** ◉ **STRUCTURAL** ◉		
CONSENT No.	TBC	**DATE AND TIME**	
H & S ISSUES ON SITE	Heavy Machinery	**H & S 'TAKE 5'**	◉

Inspected Retaining Wall Cuts
Contractors planning to undertake retaining in sequence, with bottom walls to be completed first
Cuts show completely weathered to highly weathered material present. Good shear values returned (>100kPa uncorrected at base).
Cuts stable and no signs of cracking despite the weather.



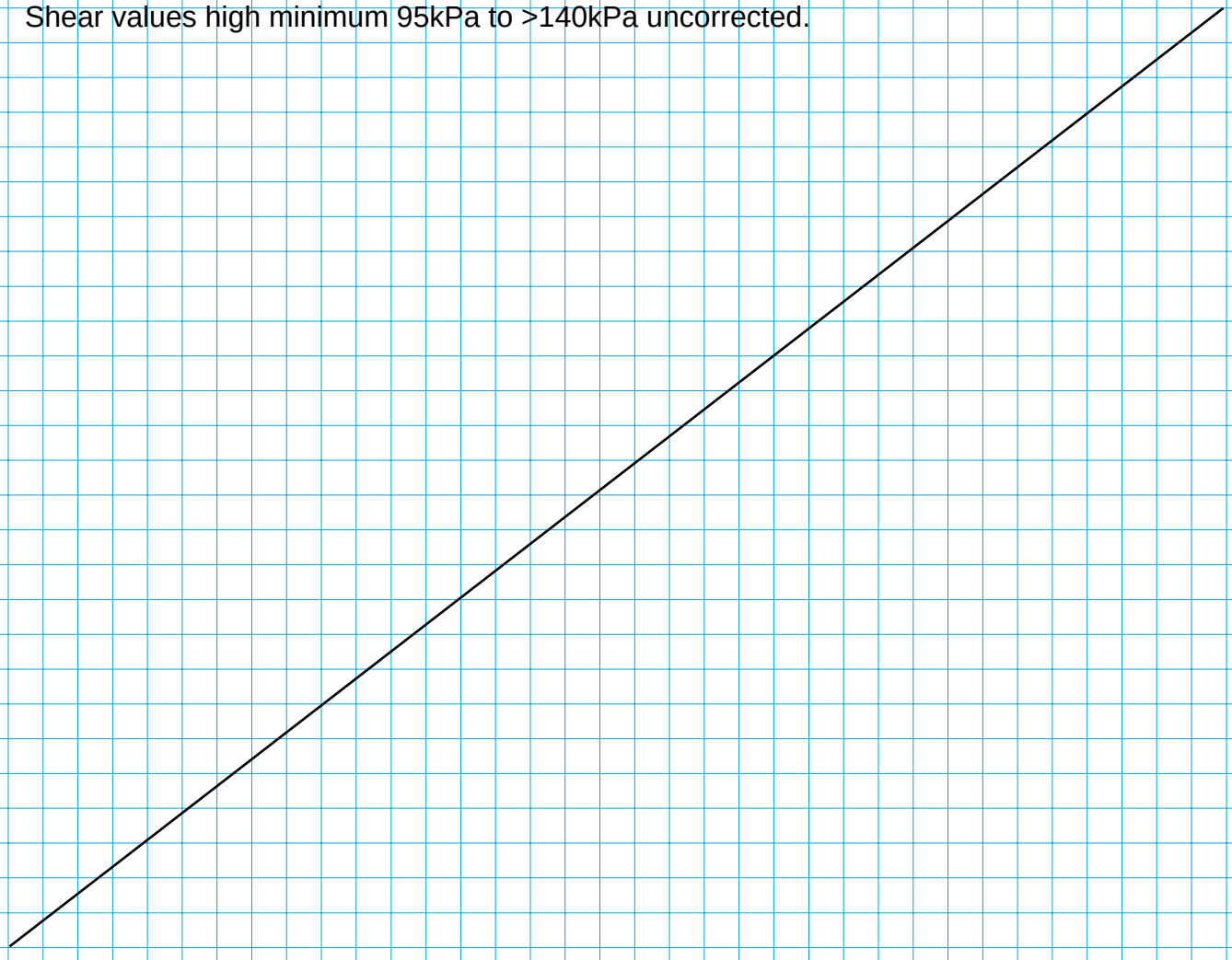
SITE CONTACT		**COUNCIL INSPECTOR**	
PASS ◉	**SIGNED**		
PENDING ○			
FAIL ○	**SIGNED**		

SITE INSPECTION RECORD

ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	**INSPECTION No.**	RET 002
ADDRESS	51 Te Maika Road, Ngunguru		
INSPECTOR	Stuart Gemmell		
TYPE OF INSPECTION	Retaining Walls		
	CIVIL ◉ **GEOTECHNICAL** ◉ **STRUCTURAL** ◉		
CONSENT No.	TBC	**DATE AND TIME**	16 Nov 21 10.00am
H & S ISSUES ON SITE	Heavy Machinery	**H & S 'TAKE 5'**	◉

Check of progress on site for retaining walls. Site filling progressing for Lot 1, contactors planning to undertake Lot 1 retaining later.
All holes checked were to depth as specified.
Shear values high minimum 95kPa to >140kPa uncorrected.



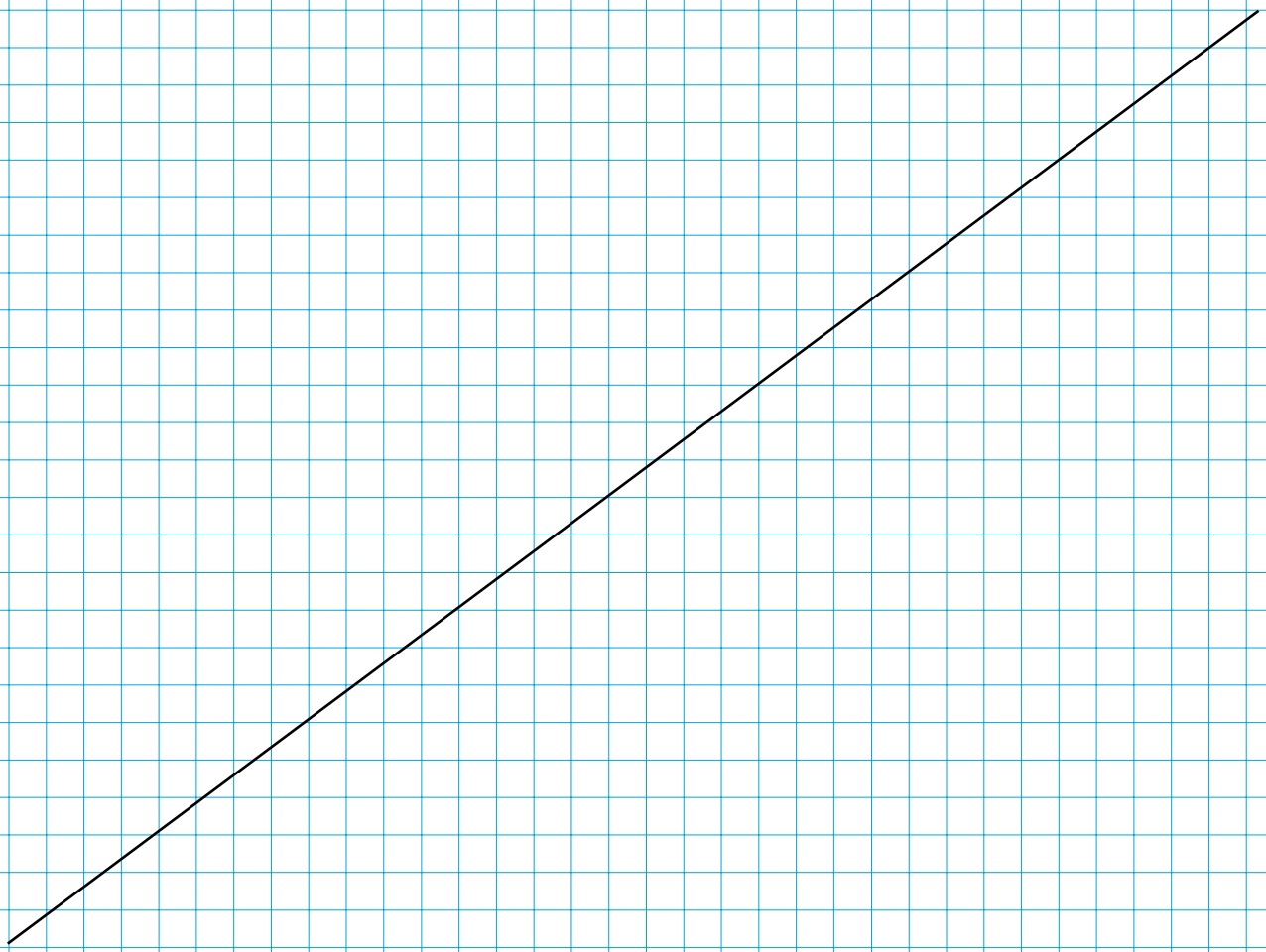
SITE CONTACT		**COUNCIL INSPECTOR**	
PASS ◉	**SIGNED**		
PENDING ○			
FAIL ○	**SIGNED**		

SITE INSPECTION RECORD

ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	**INSPECTION No.**	RET-003
ADDRESS	51 Te Maika Road, Ngunguru		
INSPECTOR	Stuart Gemmell		
TYPE OF INSPECTION	Retaining Walls		
	CIVIL ◉ **GEOTECHNICAL** ◉ **STRUCTURAL** ◉		
CONSENT No.	TBC	**DATE AND TIME**	25 Nov 21 2.30pm
H & S ISSUES ON SITE	Heavy Machinery	**H & S 'TAKE 5'**	◉

Site continues to dry out - some cracking now obvious in soil that has been exposed for a length of time, although even vertical slopes remain stable.
Walls are progressing faster with additional people on site.
Material remains highly consistent and shear vanes were generally in excess of 95kPa uncorrected.



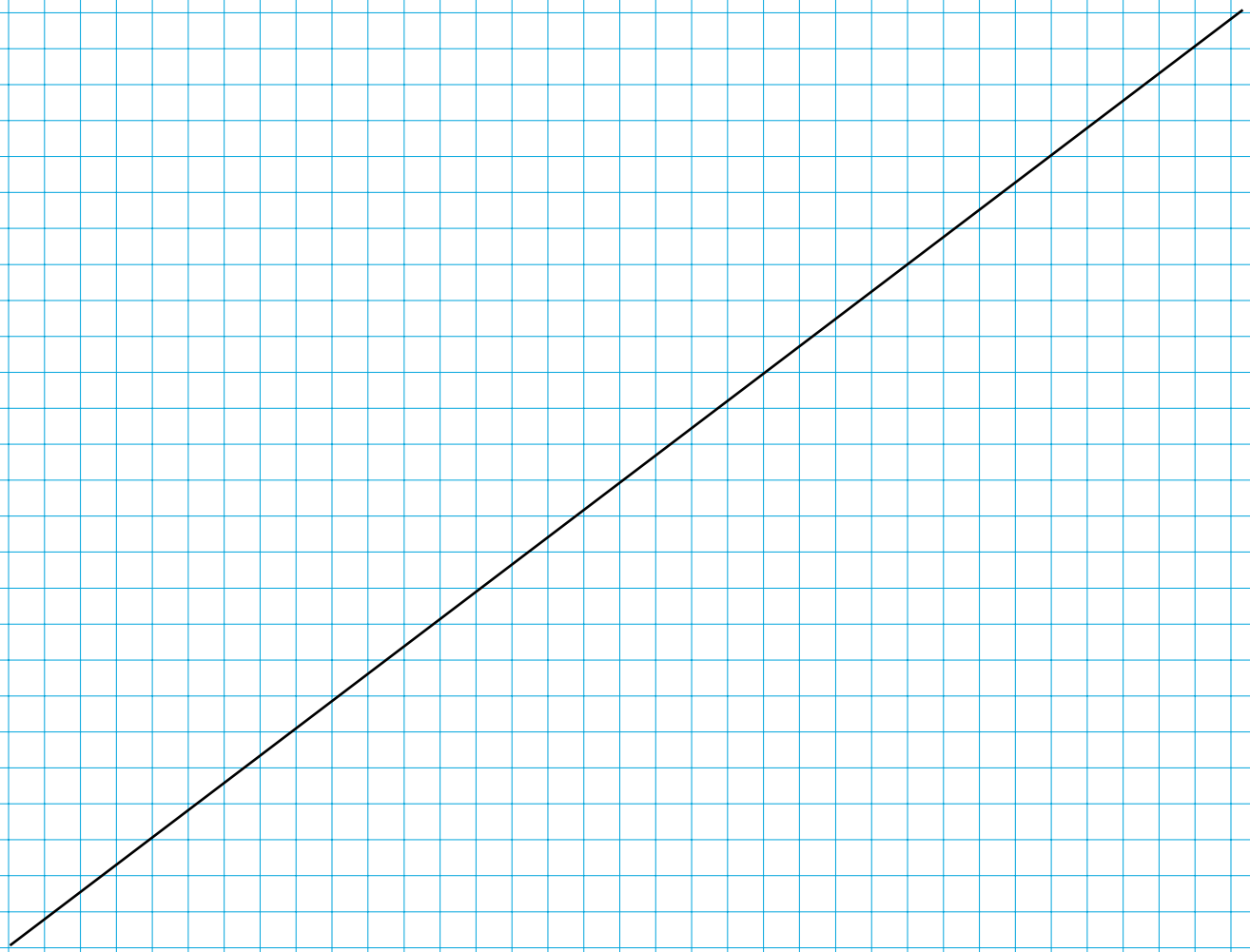
SITE CONTACT		**COUNCIL INSPECTOR**	
PASS ◉	**SIGNED**		
PENDING ○			
FAIL ○	**SIGNED**		

SITE INSPECTION RECORD

ENGINEERING SOLUTIONS
Consulting Engineers

CES JOB No. & REV.	20-0078	**INSPECTION No.**	RET-004
ADDRESS	51 Te Maika Road, Ngunguru		
INSPECTOR	Stuart Gemmell		
TYPE OF INSPECTION	Retaining Walls		
	CIVIL ◉ **GEOTECHNICAL** ◉ **STRUCTURAL** ◉		
CONSENT No.	TBC	**DATE AND TIME**	9 Dec 21 11.30am
H & S ISSUES ON SITE	Heavy Machinery	**H & S 'TAKE 5'**	◉

Cut complete for bottom retaining walls.
Good progress made on remaining walls, shear values continue high.
Walls hopefully completed prior to Christmas.
Bottom walls being built after top walls.



SITE CONTACT		**COUNCIL INSPECTOR**	
PASS ◉	**SIGNED**		
PENDING ○			
FAIL ○	**SIGNED**		

APPENDIX 9 – PRODUCER STATEMENTS FOR CONSTRUCTION FROM CONTRACTOR

Schedule 6 – Form of Producer Statement – Construction

ISSUED BY	**Clements Contractors Ltd**	*(Contractor)*
TO	**Traverse Ltd**	*(Principal)*
IN RESPECT OF	**Traverse Ltd - Te Maika Road Development**	*(Description of Contract Works)*
AT	**51 Te Maika Rd, Ngunguru, Whangarei**	*(Address)*

Clements Contractors Ltd *(Contractor)* has contracted to **Traverse Ltd** *(Principal)* to carry out and complete certain building works in accordance with a Contract titled **Traverse Ltd – Te Maika Road Development** ('the Contract')

I **Ryan Hayward** *(Duly Authorised Agent)* a duly authorised representative of **Clements Contractors Ltd** *(Contractor)* believe on reasonable grounds that **Clements Contractors Ltd** *(Contractor)* has carried out and completed:

☐ All

☒ Part only as specified in the attached particulars of the contract works in accordance with the Contract

Earthworks

Date **3 August 2022**

(Signature of Authorised Agent on behalf of)

Clements Contractors Ltd

(Contractor)

32 Westwood Lane, Maunu

(Address)

Schedule 6 – Form of Producer Statement – Construction

ISSUED BY	**Clements Contractors Ltd**	*(Contractor)*
TO	**Traverse Ltd**	*(Principal)*
IN RESPECT OF	**Traverse Ltd - Te Maika Road Development**	*(Description of Contract Works)*
AT	**51 Te Maika Rd, Ngunguru, Whangarei**	*(Address)*

Clements Contractors Ltd *(Contractor)* has contracted to **Traverse Ltd** *(Principal)* to carry out and complete certain building works in accordance with a Contract titled **Traverse Ltd – Te Maika Road Development** ('the Contract')

I **Ryan Hayward** *(Duly Authorised Agent)* a duly authorised representative of **Clements Contractors Ltd** *(Contractor)* believe on reasonable grounds that **Clements Contractors Ltd** *(Contractor)* has carried out and completed:

☐ All

☒ Part only as specified in the attached particulars of the contract works in accordance with the Contract

Placement and overlapping of Geo Composite material, and reinstatement to manufacturers specification where material has been cut to install services

Date **3 August 2022**

(Signature of Authorised Agent on behalf of)

Clements Contractors Ltd

(Contractor)

32 Westwood Lane, Maunu

(Address)

Schedule 6 – Form of Producer Statement – Construction

ISSUED BY	**Clements Contractors Ltd**	*(Contractor)*
TO	**Traverse Ltd**	*(Principal)*
IN RESPECT OF	**Traverse Ltd - Te Maika Road Development**	*(Description of Contract Works)*
AT	**51 Te Maika Rd, Ngunguru, Whangarei**	*(Address)*

Clements Contractors Ltd *(Contractor)* has contracted to **Traverse Ltd** *(Principal)* to carry out and complete certain building works in accordance with a Contract titled **Traverse Ltd – Te Maika Road Development** ('the Contract')

I **Ryan Hayward** *(Duly Authorised Agent)* a duly authorised representative of **Clements Contractors Ltd** *(Contractor)* believe on reasonable grounds that **Clements Contractors Ltd** *(Contractor)* has carried out and completed:

☐ All

☒ Part only as specified in the attached particulars of the contract works in accordance with the Contract

Retaining Walls

Date **3 August 2022**

(Signature of Authorised Agent on behalf of)

Clements Contractors Ltd

(Contractor)

32 Westwood Lane, Maunu

(Address)

SIXTH SCHEDULE

FORM OF PRODUCER STATEMENT – CONSTRUCTION

ISSUED BY: **Webb Contracting Ltd**
(Contractor)

TO: **Traverse LTD - Clements Contractors**
(Principal)

TO BE SUPPLIED TO: **Whangarei District Council**
(Territorial authority)

IN RESPECT OF: **51 Te Maika Road DP374000**
(Description of Contract Works)

AT: **51 Te Maika Road, Ngunguru, Whangarei.**
(Address)

Webb Contracting Ltd *(Contractor)* has contracted to **Traverse Limited** *(Principal)* to carry out and complete certain building works in accordance with a contract, titled **Traverse - Lot 51 Te Maika Road** ("the contract")

I **Jake Pattison** *(Duly Authorized Agent)* a duly authorized representative of **Webb Contracting Ltd** *(Contractor)* believe on reasonable grounds that **Webb Contracting Ltd** *(Contractor)* has carried out and completed

☐ All

■ Part only as specified in the attached particulars of the building works in accordance with the contract.
Laying of Ø1350mm Stormwater line
Lance Smith - Certifying Drainlayer #20798

……..... Date 2nd August 2022
(Signature of Authorized Agent on behalf of)

Webb Contracting Ltd
(Contractor)

247 Three Mile Bush Road, Kamo, Whangarei 0145
(Address)