Clevedon Quarry Extension

Geotechnical Feasibility Assessment Report

Proposed Quarry Extension







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1 Introduction

Stevenson Aggregates Limited (SAL) is proposing a quarry expansion at their existing Clevedon Quarry site at 546 McNicol Road, Clevedon (herein referred to as 'the site').

Baseline Geotechnical Limited (BGL) has been engaged to undertake a geotechnical assessment to support consenting for this quarry expansion, which is expected to proceed under the Fast-track Approvals Act 2024 (FFTA).

We understand that SAL is proposing a 50-year plan to extend the existing quarry site south and east, into the 'Special-Purpose- Quarry Zone' and partly into the adjoining Rural Production Zone. A separate geotechnical assessment report for the proposed overburden disposal area (OBDA) has been prepared to support the early stages of overburden stripping for the proposed Quarry expansion[1].

The scope of work was set out in our offer of service dated 05 November 2026, included:

1. Project preparation (Briefings & H&S documentation).
2. Desktop study of available data and background information.
3. Field mapping.
4. Logging of recovered borehole core.
5. Data processing- borehole logs.
6. Kinematic assessments.
7. Development of a ground model.
8. Slope stability analyses.
9. Preparation of a feasibility geotechnical assessment report.
10. Project management.

2 Proposed quarry design

We have completed our geotechnical assessment based on the "Clevedon LoQ Design Stages" (dated 06 October 2026) which are attached in Appendix A. The design package incorporated the proposed quarry design to support excavation over the next 50-years. The proposed design extends the existing Clevedon Quarry to the south and east, covering a total area of approximately 72.8 Ha.

The proposed quarry extension will remove the ridge that the current quarry is being excavated into. It will also result in the removal of the south gully (Stream 2), resulting in a large area of the proposed quarry floor elevation of approximately RL 31 m with a smaller quarry floor at approximately RL 20 m, as outlined in Figure 2-1. Based on the provided quarry design, the proposed batter slopes are approximately 15 m in height, separated by approximately 10 m wide benches. A summary of the proposed design wall height and angles are outlined in Table 2-1.

[1] Baseline Geotechnical Limited (2026) – Clevedon Quarry Extension – OBDA Geotechnical Assessment Report.

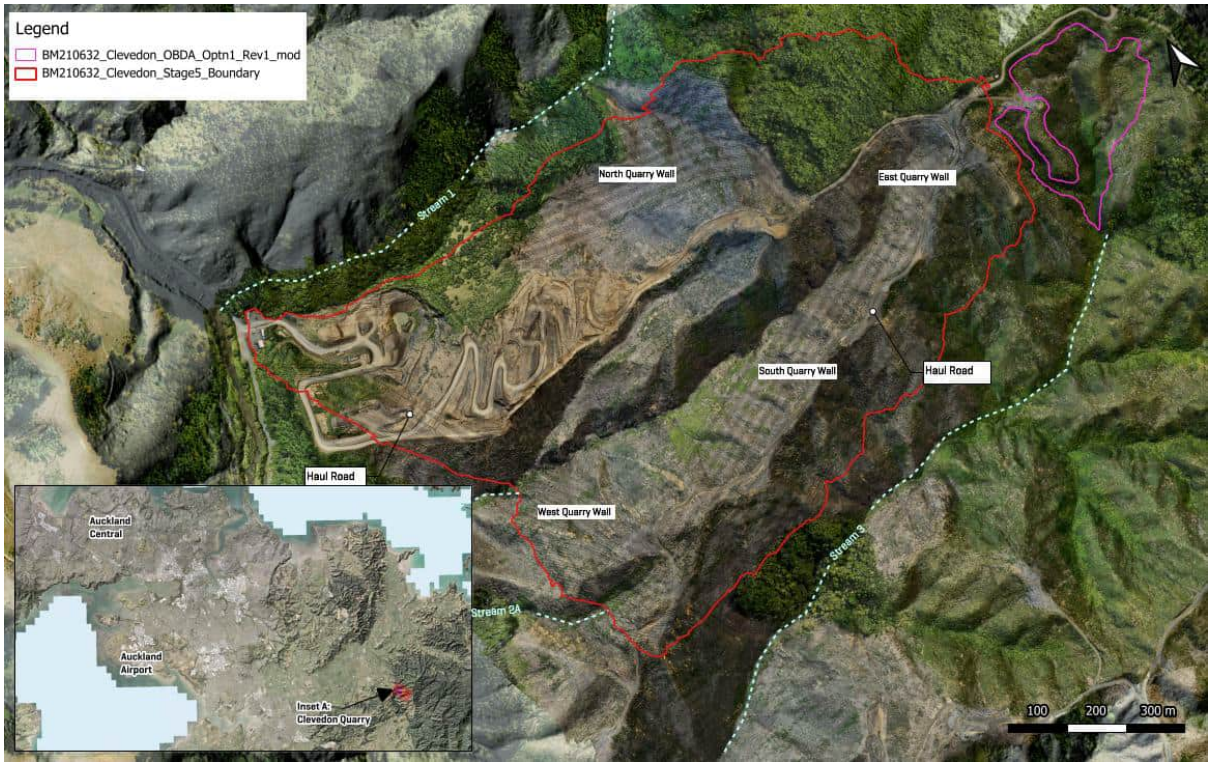


Figure 2-1 Proposed Clevedon Quarry extension and latest OBDA design (sourced from SAL Propeller portal).

Table 2-1 Summary of proposed approx. wall height and angles.

Wall	Crest (m RL)	Overall approx. wall height (m)	Overall approx. slope angle (°)
North	226	195	41
East	315	284	37
South	256	225	38
West	156	125	38

3 Background information

3.1 Site description

Clevedon Quarry is orientated east-west along the lower slopes of the north to south trending Hunua Ranges and the Wairoa River (Figure 3-1). The extraction area is accessed from McNicol Road via the front of house and site office area.

The current Clevedon Quarry does not extend below McNicol Road as it has been developed by pushing back into the flanks of the hillside to the east. Presently, extraction is concentrated on upper benches and is removing weathered rock to expose unweathered greywacke resource. This excavation is broadly following topography eastwards with a series of staggered benches and batters that provide a final approximate slope height of 175 m.

The site office area is at an approximate elevation of RL 21 m, with the current extraction areas at RL 140 m, RL 160 m (Shot Floor), and RL 200 m (Overburden Stripping).

Land to the south and east of the quarry, within which the wider quarry expansion is proposed, is also within the wider SAL land holding. This area was formerly in forestry, which has been progressively harvested since 2020. The area was devoid of vegetation cover with areas of forestry slash apparent. We understand that replanting has occurred again in these areas.

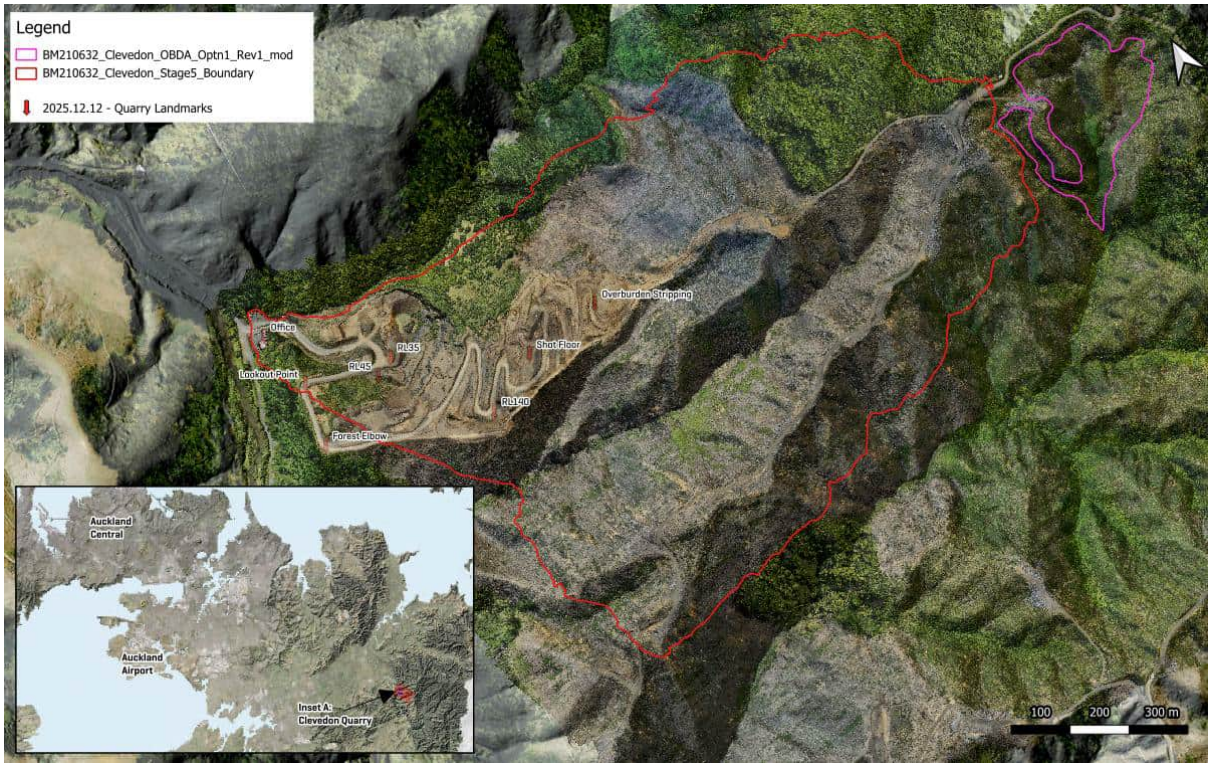


Figure 3-1: Annotated aerial site overview (Sourced from SAL Propeller Portal, surveyed: 28 January 2026).

3.2 Historical aerial photographs

Historical aerial imagery sourced from Auckland Council GeoMaps dated between the 1940s and 2024, were reviewed to understand the site history and previous land-use. An overview of the historical images reviewed are presented in Appendix B. Our observations are set out in Table 3-1 below.

Table 3-1: Summary of historical aerial imagery of the site

Date	Observation
1966-1972 & 1972-1973	Prior to the development and operation of the quarry, the property and surrounding hill sides were undeveloped rural land, populated with dense vegetation. A single small structure was located at the base of the ridge spur. The ridge spur is characterized with several gullies draining into streams situated to the north and south.
1980-1981	Majority of the vegetation was removed, and earthworks have begun at the foot of the ridge spur (i.e. inferred beginning of quarry operations in the late 1970's).
2006-2009	The spur outside of the quarry operation is repopulated with early growth pine plantation. Quarry operations are limited to within 400m of McNicol Road with several benches formed within the quarry.

4 Published geology

Published geological maps (Figure 4-1) indicate that the site is underlain by Waipapa Group. The Waipapa Group is described as a massive to thinly bedded volcaniclastic sandstone and siltstone of Late Triassic to Jurassic age. There are localised deposits of Tauranga Group river and hill slope deposits, East Coast Bays Formation (ECBF) sandstone and siltstone, and Holocene river deposits to the north and west of the site.

The Wairoa North Fault is inferred to be positioned within the western portion of the site and is considered active (downthrown to the southwest). An unnamed secondary fault extends to the west of the Wairoa North Fault, with inferred downthrow to the southeast.

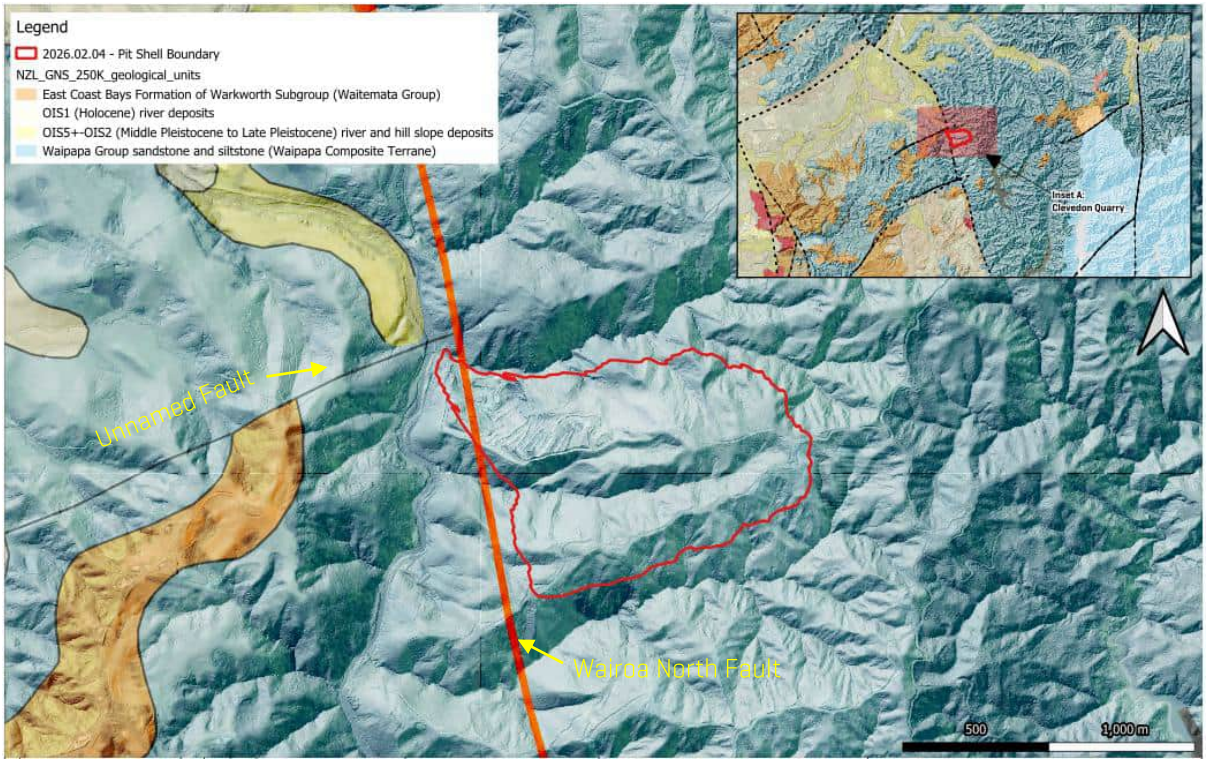


Figure 4-1: Published geological map illustrating the site (red, dashed) and the surrounding geological units. (retrieved from GNS[2])

4.1 Summary of previous reporting

As part of our background review, we have reviewed our previous documentation as well as an earlier annual slope stability review completed by Riley Consultants Limited in 2023.

4.1.1 Riley Consultants – Slope Stability Annual Review (2023)

This geotechnical slope stability review was completed in accordance with the Slope Stability Management Plan (SSMP) for the site. Riley Consultants completed site work comprising mapping

[2] Retrieved from https://data.gns.cri.nz/geology/ on 16/01/2026.

and identification of structural defects and addressed signs of recent instability along the exposed bench facings in August 2023.

As part of their findings, Riley Consultants have identified a strong concentration of defects that dip at 40-60° towards the North, with a minor set of defects dipping 30-50° towards the Northwest. Wedge, and planar failure mechanism within the NW-facing wall were identified as key geotechnical risks at a batter scale.

4.1.2 BGL – Crusher stockyard extension review (2024)

BGL prepared a geotechnical review letter for a recently completed extension of their crusher area and stockyard located at RL 85 m. The objective of the geotechnical review was to understand the expected performance of the fill material, identification of geotechnical risks, and whether any remedial modifications were required.

- The constructed fill has performed acceptably since the completion of the stockyard area. Minor tension cracking observed in the fill platform was believed to be attributed to differential settlement at the contact between the old cut slope and the new embankment fill.
- Slope stability modelling indicated an acceptable level of stability for the embankment fill, subject to assumptions made around groundwater.

5 Field work

BGL personnel visited the site on four occasions in December 2025 (09th, 11th, and 15th-16th) to undertake field works. This included logging the recently completed rotary cored machine borehole, as well as field mapping within the quarry and adjacent gullies to observe exposures of greywacke rock. The following sections provide a summary of our site observations.

5.1 Resource borehole (MW01)

5.1.1 General

A single borehole (labelled MW-01) was drilled by Brown Bros Drilling (NZ) Limited from 25 November 2025 to 05 December 2025. The completed borehole was positioned on the adjacent ridgeline to south of the existing quarry and intercepts the position of the east wall of the proposed final quarry design (as illustrated in Appendix B, Figure 006).

Downhole geophysics (acoustic televiewer and optical televiewer) were undertaken by RDCL within MW01 prior to installation of piezometers in this borehole. BGL was not present during drilling but provided guidance on piezometer construction details for MW01 and recommended the installation of a shallow piezometer positioned in a non-cored borehole offset from MW01 by approximately 9 metres. A summary of the borehole findings is provided in Table 5-1 and Table 5-2.

Output of the borehole including geotechnical logs and accompanied downhole acoustic and optical televiewer data are presented in Appendix C and Appendix D.

Table 5-1 MW01 location summary.

Investigation ID	Location (NZTM)		Elevation RL (m)	Borehole depth (m)	Installation
	Easting (m)	Northing (m)			
MW01 (cored)	428412.87	782896.54	264.56	100.0	91-100m (Screen). 40mm PVC
MW02 (non-cored)	428411.16	782896.04	264.46	13.0	10-13m (Screen), 40mm PVC

Table 5-2 Borehole summary of materials encountered.

From (m bgl)	To (m bgl)	Material (Unit)	Unit thickness (m)
0	0.6	Fill	0.6
0.6	14.5	Residual Soil	13.9
14.5	25.8	Completely weathered greywacke	11.3
25.8	39.0	Highly weathered greywacke	13.2
39.0	46.8	Moderately weathered greywacke	7.8
46.8	92.4	Slightly to unweathered greywacke	45.4
92.4	100.0	Unweathered greywacke	7.6

5.1.2 Summary of lithology

5.1.2.1 Fill

Fill encountered in the upper 0.6 m of MW01 is described as loosely packed coarse angular to subangular greywacke gravels.

5.1.2.2 Residual soil

Residual soil was encountered in MW01, between 0.6 and 14.5 m bgl. This material has undergone weathering and has lost its original rock characteristics and demonstrates soil behaviour. The material encountered within the borehole was described as an orange-grey, mottled brown stiff, silty clay of low plasticity.

5.1.2.3 Completely weathered Greywacke

Completely weathered greywacke is weathered rock that has undergone chemical and physical weathering processes. It is typically grey with orange mottling, with black staining along relict defect surfaces. It is extremely weak, predominantly sandstone.

An outcrop of completely weathered greywacke sandstone with steeply-inclined relict defects was also encountered as part of the site visit undertaken for the proposed OBDA design.

5.1.2.4 Highly weathered Greywacke

Highly weathered material was encountered along the upper bench facing at RL 170 m and RL 180 m. These materials have been described as weak, orange-brown to greyish brown greywacke sandstone.

Highly weathered greywacke samples can be broken by hand along closely spaced insipient defects that are discoloured or stained black or dark brown-orange.

5.1.2.5 Moderately weathered Greywacke

These materials have been described as weak to moderately strong, orange-brown to brownish grey with very closely spaced joints. Defect surfaces are typically planar and rough with discolouration along the surface.

Moderately weathered greywacke sandstone is also observed along a southwest-facing bench face at RL 140 m.

5.1.2.6 Slightly weathered and unweathered Greywacke

Slightly weathered Greywacke included an orange-brown discolouration along defect surfaces. The defect surfaces are typically clean and but may include a weathering rind of limonite. Unweathered Greywacke is a very strong, grey, fine to medium sandstone. Defects are typically clean and rough.

Slightly weathered and unweathered sandstone was also encountered along lower benches, including RL35m and RL45m.

5.1.3 Results of downhole geophysics

BGL have received the results from the acoustic and optical televiewer survey, completed by RDCL at MW01. Based on the results issued by RDCL, a total of 441 defects were recorded. We have plotted the data on a stereonet in dip/dip direction format in Figure 5-1.

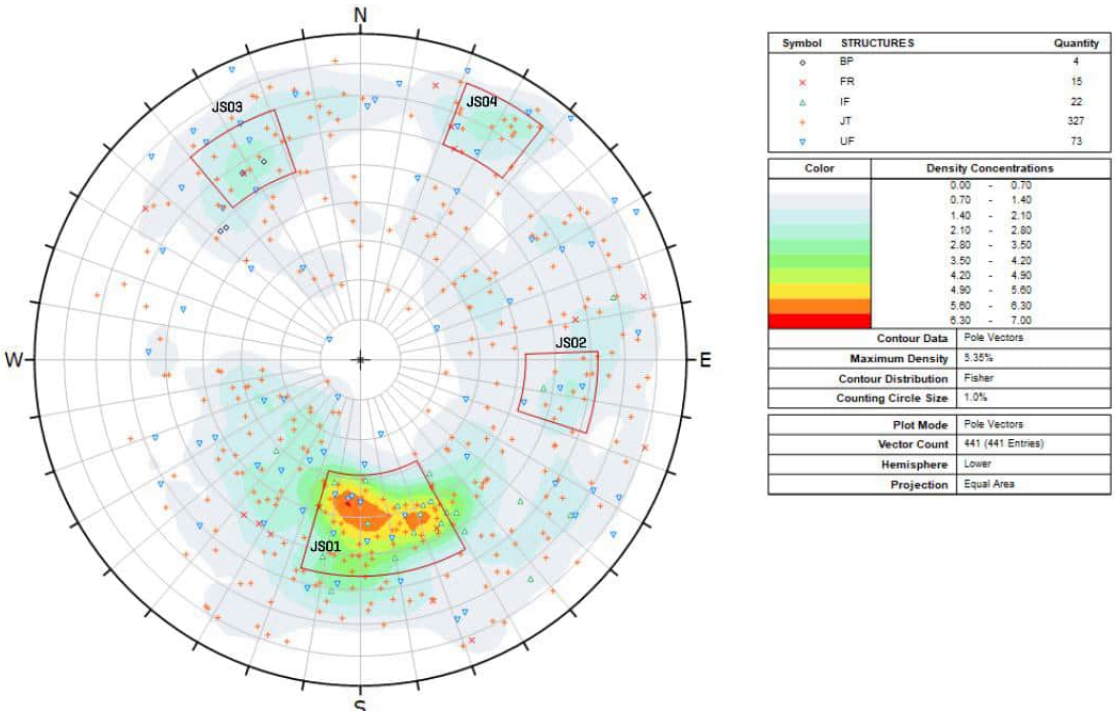


Figure 5-1 Stereonet plot of defects observed at MW01 (Data sourced from RDCL downhole geophysics survey).

Based on the downhole defect data provided, there are strong concentrations of defects observed dipping approximately 30 – 55° to the north. Other less densely packed clusters of poles were also observed, grouped dipping to the west, southwest, and northwest (denoted as JS02 to JS04).

5.2 Geological mapping

5.2.1 General

BGL completed geological field mapping in the existing Clevedon Quarry and in the gully floors of Stream 1 and Stream 2. The focus of the mapping was to identify major structures within the rock mass and where possible, record defect properties such as orientation (dip/dip direction), persistence, surface roughness/waviness, and presence or absence of defect infill.

BGL personnel mapped 134 defects along bench facings and exposed outcrops in Stream 1 and 2. The location of mapped defects is set out in Appendix B (Figures 007 & 008) and Figure 5-2 below presents all mapped structural defects on a stereonet plot in dip/dip direction format.

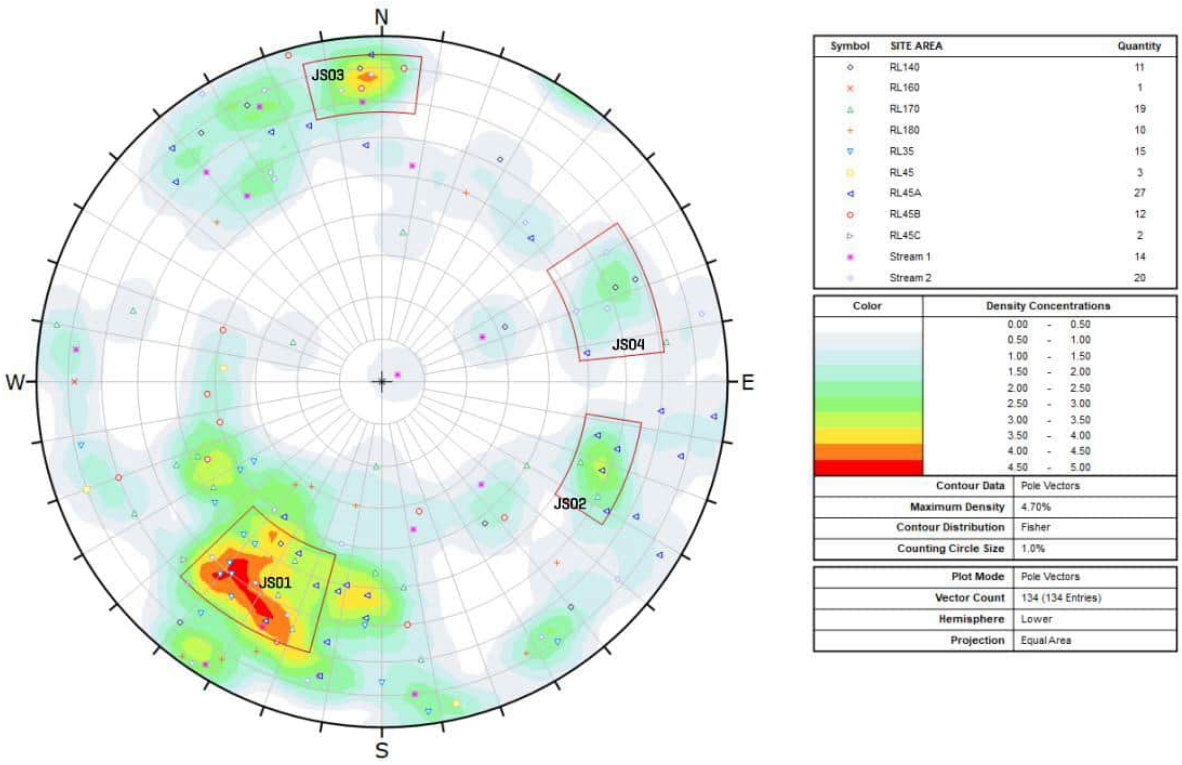


Figure 5-2 Stereonet plot of all measured structural defects.

5.2.2 Faults

Large scale faulting is only evident in the current shot floor at RL 170 m where a prominent fault is observed orientated 85/100 (Dip/Dip Dir) (Appendix B, Figure 007). The fault trace is planar, smooth with a 1 m wide zone of crushed rock, and 5mm of clay gouge. (Figure 5-3 and Figure 5-4). This fault strikes broadly sub-parallel to the inferred orientation of the Wairoa North Fault and is projected to extend into the Stream 2 gully (Appendix B, Figure 009, Section A-A').

Three notable sub-parallel defects with displacements within the rock mass were observed across the height of the batter above at RL 170 m (Figure 5-5). These defects are observed oriented dipping very steeply to sub-vertically to the north with up to 10 mm of clay infill. These defects strike broadly sub-parallel to the Stream 1 and 2 gully axes.

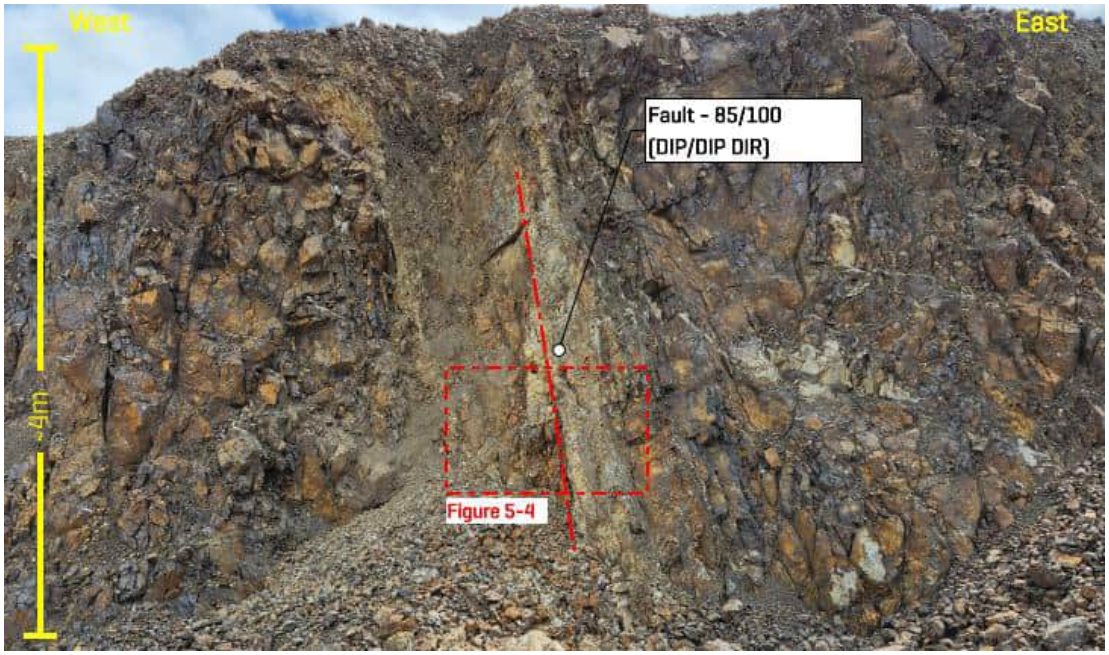


Figure 5-3 Rock outcrop with a sub-vertical fault (85/100˚, Dip/Dip Dir). Outcrop observed at the existing shot floor (RL 170 m).

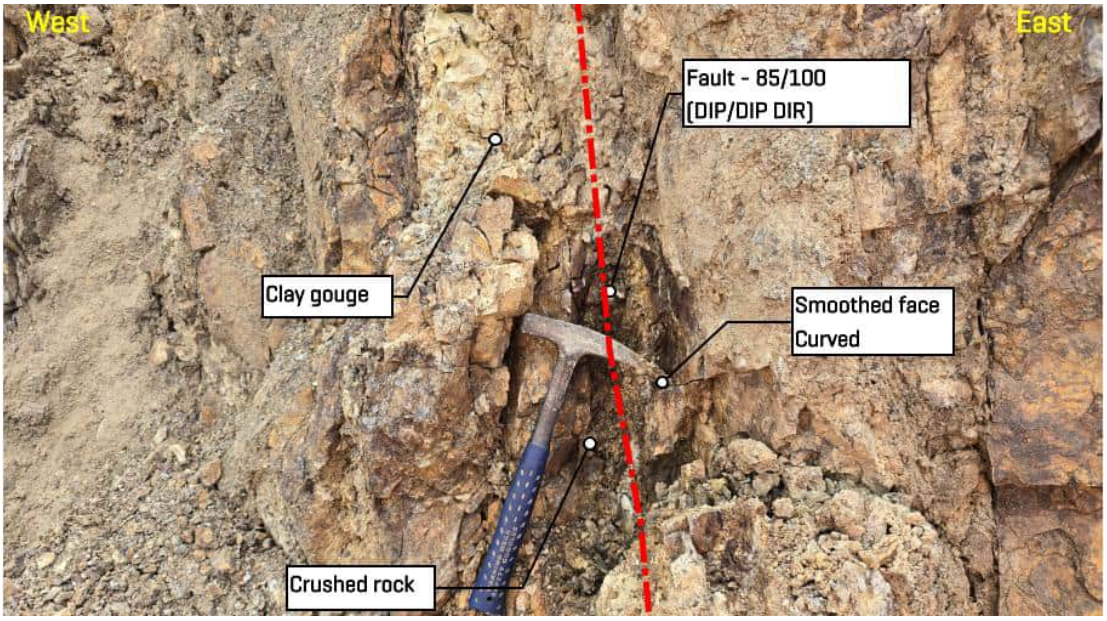


Figure 5-4 Close up of the fault outlined in Figure 5-3.

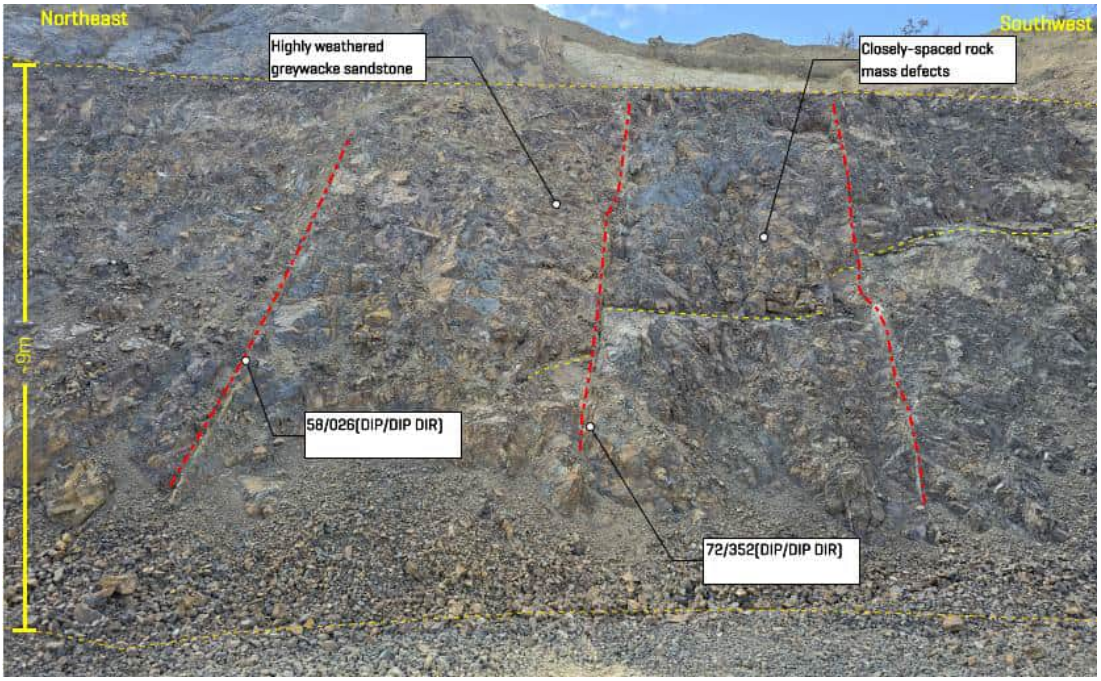


Figure 5-5 Three very steeply inclined, sub-parallel defects along bench facing at RL 170 m.

5.2.3 Joints

Joints were manually grouped into four joint sets (denoted JS01 to JS04) based on pole density concentrations from site observations. Joint surfaces observed within the quarry are typically undulating-rough, undulating smooth, and clean. Table 5-3 presents a summary of the joint sets observed.

Table 5-3 Summary of structural defects observed (15-16th December 2025).

Joint Set	Dip (°)	Dip Direction (°)	Roughness	Comments
JS01	45-70	015-045	Undulating, Smooth/Rough	Defect set 1 primarily observed in RL35 and RL45 benches. Joints identified as JS01 are typically the dominant defects along the bench faces with the greatest persistence (>15m).
JS02	50-65	280-305	Planar, Smooth	Defect set 2 were observed along RL45 and RL170 bench facings. Defect set 2 includes a planar defect daylighting along RL170, with 5 mm of clay infill.
JS03	65-85	165-190	Planar/Stepped, Smooth	Defect set 3 were observed along both stream 1, 2, and RL45. The orientation of defect set 3 run sub-parallel to the orientation of both streams and controls the geometry of the streams.
JS04	45-70	235-265	Undulating Rough	Defect set 4 were observed along RL140 and stream 2.

5.2.4 Current slope and bench performance

As part of the mapping, we assessed the performance of current quarry batters. The batters observed in the field included those above the RL35m, RL45m, RL140m benches, as well as the current shot floor and overburden stripping area (RL170-180m). Appendix B, Figure 007 presents an overview of the observed batter slopes and relevant field observations.

There are no significant multi-bench scale failures observed at the time of our site visit. A number of bench-scale planar failures, wedge failures, and rock topples were observed. Current slope performance is variable across the quarry. In general, it is due to a combination of the existing batter orientations, the weathering grade of the materials exposed and the orientation of defects. A summary of the bench faces observed are set out in Table 5-4.

Table 5-4 Observed bench-scale failures.

Bench Face I.D.	Slope Orientation	Weathering Grade	Structural Controls	Comments
RL35m	SE-NW	UW	56/041°(JS01)	The bench face's rock fabric is massive, dominated by JS01. Planar failure in Unweathered to slightly weathered greywacke sandstone, measuring approximately 3.5 m wide. Releasing plane dip direction is subparallel to the bench facing.
RL45A (Figure 5-6)	SW-NE	UW-SW	55/014° (JS01)	Planar failure within Unweathered to slightly weathered greywacke sandstone. Failure occurs within JS01 which has a dip direction sub-parallel to the bench facing.
RL45B (Figure 5-7)	S-N	UW-SW	70/030°(JS01) 40/320°(JS02)	Wedge failure within slightly weathered greywacke sandstone between JS01 and JS02. The extent of failure is controlled by JS01 due to its persistence.
RL140m	NE-SW	MW-HW	65/248° (JS04) 78/149°	Wedge failure within moderately to highly weathered greywacke sandstone in the upper 5m of the bench face. The wedge failure is estimated to be >10m wide with debris comprising sand to cobble-sized HW greywacke sandstone at the base of the bench.



Figure 5-6: Western batter at RL45m (A) with highlighted defect set JS01(orange), viewed looking west.

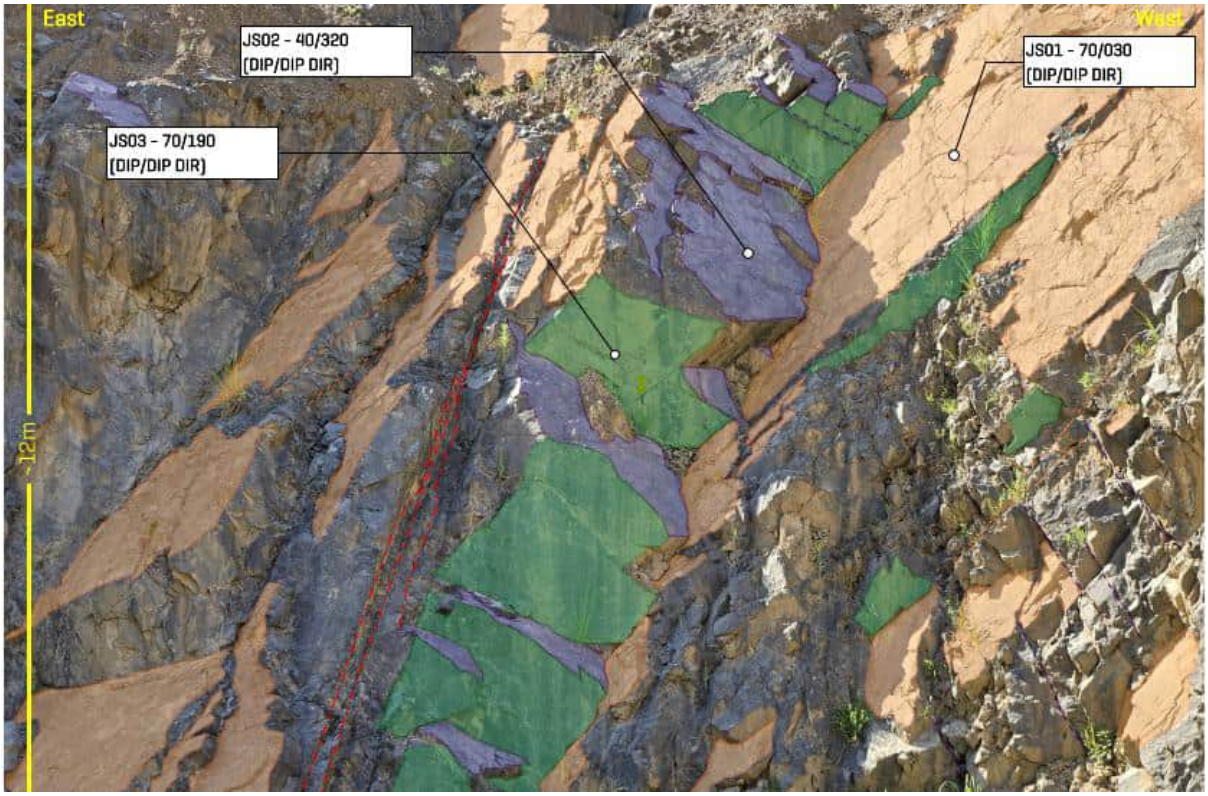


Figure 5-7 Annotated structural defects of three major defect sets: JS01 (orange), JS02 (purple), and JS03 (green) along the south wall of RL45(B) (viewed looking south)

5.3 Groundwater

No evidence of seepage was observed in the quarry at the time of our site visit. Shallow (MW02) and deep piezometers (MW01) have been installed but no groundwater monitoring data was available at the time of this report.

Wallbridge Gilbert Aztec (WGA) have been engaged to undertake groundwater drawdown assessment. We have generally adopted the WGA groundwater model results[3] for the purpose of our preliminary quarry wall stability modelling.

6 Conceptual geological model

Based on the field observations and the existing sub-surface information, the broad geology across the site includes a typical weathering profile of greywacke ranging from residual soil through to unweathered rock, locally overlain by alluvial deposits and colluvial deposits in parts of the gully floors.

Since deposition of the Waipapa Group greywacke, these materials have undergone regional scale tectonic faulting and uplift.

While the published geological maps show that the Wairoa North Fault passes through the quarry, a structure of this size is not apparent in quarry batters, and we infer that the Wairoa River is likely to be defined by the northwest-southeast strike of this major regional scale fault.

Both second order northeast to southwest striking fault structures illustrated in the geological maps, as well as smaller scale northeast to southwest striking faults observed in the existing quarry slopes suggest that the major northeast to southwest trending gully systems within the extension land are likely to be controlled by these bounding faults.

Based on observed weathering depths in the quarry walls and borehole MW01 we anticipate a depth of 40-45 m to slightly weathered greywacke beneath ridge crests. Gully inverts are incised down into moderately to slightly weathered greywacke.

We interpret greywacke rock to be present within a few metres of ground surface in the Stream 2 gully based on mapping of observed exposures of moderately weathered to slightly weathered greywacke rock.

We have produced conceptual geological models in two cross sections through the proposed long term quarry design (presented in Appendix B, Figures 009 & 010). The topographic profile is based on 28 January 2026 survey-derived Digital Surface Model (DSM) sourced from the Stevenson propeller portal.

In areas with a lack of geological exposure, such as inaccessible gullies or beneath ridges, we have made assumptions based on our understanding in the weathering profile within greywacke and our interpretation of local faulting. It must be appreciated that the weathering boundaries and rock

[3] WGA (September 2026). Clevedon Quarry Proposed Expansion – Groundwater assessment. Rev B. Reference ID WGA251647.

structure positions become more uncertain with distance behind the existing quarry faces and actual conditions could vary from the assumed models.

7 Assessment of Natural Hazards – Geotechnical

7.1 Liquefaction

Liquefaction vulnerability is defined in Auckland Council technical report TR2021/19. It identifies the site at Clevedon Quarry as having a categorisation of "very low liquefaction vulnerability" (Appendix B, Figure 013).

Liquefaction requires a large magnitude earthquake and saturated silts and sands. These are not present within the quarry extension footprint. The proposed quarry design will be excavated into greywacke rock, which are non-liquefiable. Liquefaction is therefore not a natural hazard that will affect the proposed extension.

7.2 Landslide hazard assessment (PC120)

BGL have reviewed publicly available Auckland Council natural hazard maps at the site. Shallow and large-scale landslide susceptibility are identified in Auckland Council Technical Report TR2025/7, and this information is available in Auckland Council's public Geomaps portal. These susceptibility assessments were completed at a regional scale which provides guidance around the need for site-specific assessment.

For the proposed OBDA site, shallow & large scale landslide susceptibility is identified by Auckland Council as 'high', and 'very high. Therefore amendments in Proposed Plan Change 120 (PC120) to Chapter 36 of the Auckland Unitary Plan – Operative in Part (AUP) apply.

The purpose of this project is to extend the existing quarry, which will largely excavate out (remove) the existing areas of landslide susceptibility, with the final quarry walls being designed to achieve commonly accepted slope stability criteria.

This report provides a site-specific assessment based on our site observations, and a series of construction recommendations to so that acceptable slope stability risk can be achieved. It supersedes the regional scale assessment outlined in Auckland Council Technical Report TR2025/7. A separate addendum report included in Appendix E assesses the risk classification in accordance with Chapter M, Appendix 24 of the AUP. Based on our assessment, we consider there is a Low (acceptable) landslide hazard risk for the proposed extension at Clevedon Quarry.

8 Kinematic analysis

A kinematic analysis was undertaken to identify structural defect orientations that may present an elevated instability risk for the proposed design. The output of the kinematic assessment graphically compares the orientation of the structural defects with the orientation of the proposed cut slopes and is used as a screening tool to understand the defect orientations that could be problematic. It should be noted that this form of assessment is statistical and does not consider the actual position of individual defects.

The data collected has been analysed using RocScience Dips, v.8.029. Based on the provided CAD file for the proposed design, the overall wall has a slope angle of 40° and a batter angle of 63°. For the majority of the assessment, we have applied a defect friction angle of 45° based on the largely clean, rough defect surfaces. Field observation identified defects with clay infill typically dip towards the south and east. On this basis, we have applied a lower bound friction angle of 30° where relevant for these analyses.

Given our interpretation that the site is predominantly controlled by a series of bounding faults, which may result in changes in defect orientation across the bounding faults, we have used the mapped structural defects for our kinematic assessment for north, east, and west walls. We have used the defects measured from downhole geophysics for the kinematic assessment completed along the southern wall.

Analysis outputs are presented in Appendix F for both wedge and planar failure mechanisms. Although toppling failures may occur within the rock mass they are not considered to be relevant at a global slope scale. Bench-scale kinematic assessment was completed to reflect the small-scale failures we have observed on site. Table 8-1 presents the proposed wall orientations used to complete the assessment.

Table 8-1 Proposed 50-year pit wall orientations.

Quarry Wall	Wall Orientation (°)
North	170°
East	257°
South	331°
West	55°

Based on the in-field data and proposed quarry wall geometry and bench angle, the kinematic analysis broadly indicated the following:

- A whole slope scale planar and wedge failure does not appear to be kinematically feasible. This is attributable to the defects being steeply dipping and the high friction angle adopted for the clean, rough defects. We note that this may change for the south wall if friction angles are lower than those modelled (i.e. more clay filled defects).
- Potential wedge & planar instability can be anticipated at a bench scale along all the quarry walls. However, this behaviour is already observed in existing batters and is not at a scale that is expected to result in off-site environmental effects. This level of instability is an operational and health and safety issue and options exist to manage these risks, such as flattening batters, or reorientating quarry walls (within the proposed consent footprint).

Overall, the kinematic analysis suggests that a structurally controlled failure mechanism is unlikely for the final overall wall geometry.

9 Slope stability assessment

9.1 Methodology

Our stability assessment has been undertaken using RS2 software version 11.026, a finite element software package that analyses stress, deformation, and stability in both soil and rock. Two wall orientations were assessed as part of our geotechnical assessment report (South and East quarry Wall) based on the available geological information.

9.2 Slope geometry

The existing slope geometry, presented in Section 2, has been retrieved from the Propeller online portal[4]. Stability sections (denoted as Sections C-C' and D-D') were cut perpendicular to the proposed quarry wall. Locations of the sections are outlined in Figure 9-1.

We have considered the following slope geometry for the purposes of design.

- 15 m high batters.
- Batter angle 2V:1H (63°).
- 10.0 m wide benches.

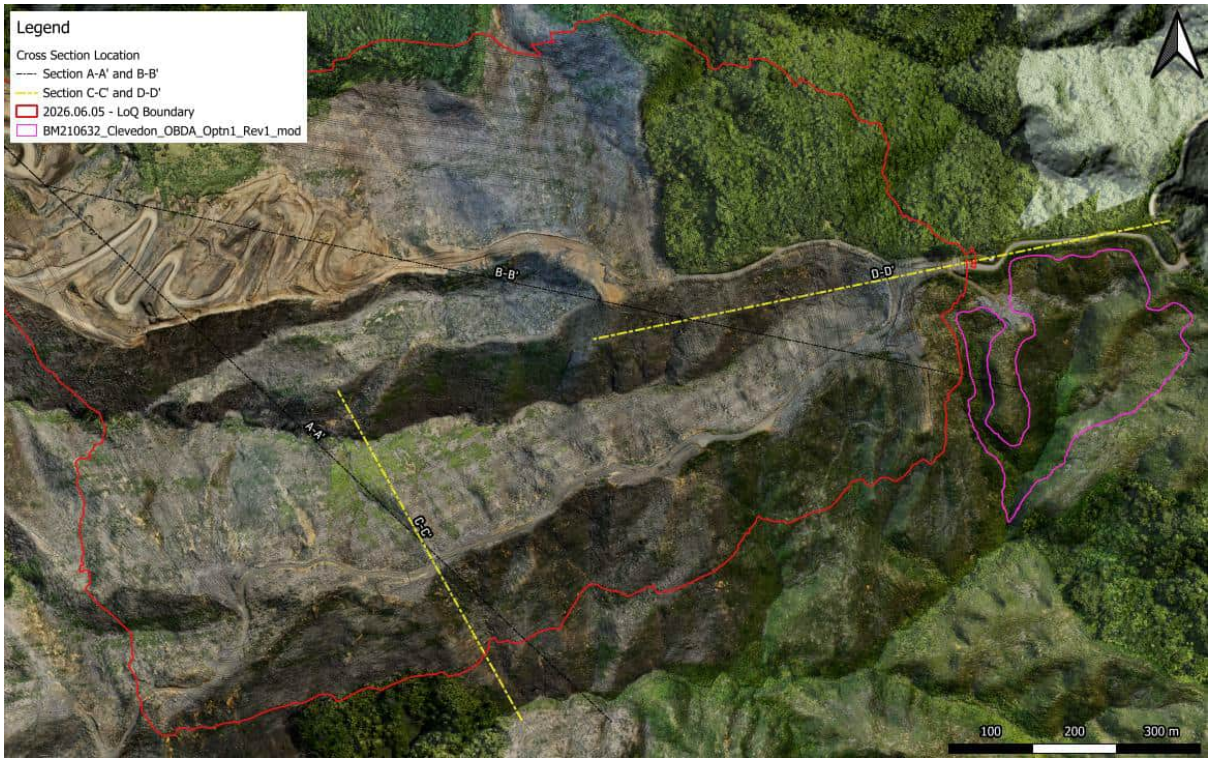


Figure 9-1 RS2 slope stability cross section locations.

[4] 28th January 2026 SAL survey.

9.3 Seismicity

A key consideration for developing seismic loadings is the selection of importance level (IL) in accordance with NZS1170:0. While it is difficult to foresee the future use of the quarry on completion, we understand that once the quarry is completed there will be no buildings placed within the final quarry floor at RL 31 m, with only the site offices positioned well away from the quarry walls, near McNicol Road. On this basis, we have not adopted the recently published technical standard (SNZ TS 1170.5:2025) when considering seismic loading. Rather we have adopted a combination of NZS1170:0, MBIE Module 1[5], and the NZTA Bridge Manual[6] when developing seismic loadings as set out in Table 9-1 below. However, we note that the resulting horizontal seismic loads are consistent with, or slightly below, those generated from SNZ TS1170:5:2025.

Table 9-1 Derivation of seismic loads

Parameter	Value Adopted	Comment
Importance Level	IL1	NZS 1170:0 2002 Table 3.2
Design Life	>100 years	NZS 1170:0 2002 Table 3.3
Recurrence interval	1:250	NZS 1170:0 2002 Table 3.3
ULS Seismic Load (PGA)	0.14g	MBIE Module 1 Table A1
Earthquake Magnitude	5.9	MBIE Module 1 Table A1
Maximum Considered Earthquake (MCE = 1.5 x ULS PGA)	0.21g	NZTA Bridge Manual

9.4 Material parameters and groundwater for design

Material parameter selection has been undertaken based on our observations of materials in the field, in-situ strength testing available from previous assessments, publications[7] and our experience with similar materials. Material parameters estimated for the weathered Greywacke rock mass are outlined in Table 9-2 and Appendix G.

We have modelled a zone of blast-induced damage of 5-7.5 m thick and applied this immediately below and behind the bench facing to mimic a degradation in rock mass strength following blasting[8].

Defects that strike subparallel to the southern and eastern walls have been accounted for in the design by adopting a parallel deterministic joint network in RS2. Defect strengths have been conservatively estimated using the Barton-Bandis failure criterion based on a reduced rock mass strength, field-derived joint roughness coefficient (JRC), and residual friction angle. The normal and

[5] MBIE and NZGS (November 2021) Earthquake Geotechnical Engineering Practice: Module 1 Overview of the guidelines, Appendix A.
[6] NZTA (May 2013). Bridge manual (SP/M/022), version 3.
[7] Stewart, S (2007). Rock Mass Strength and deformability of unweathered closely jointed New Zealand Greywacke, PhD thesis issued by University of Canterbury December 2007.
[8] https://www.rocscience.com/help/slide2/tutorials/tutorials-overview/damage-regions-generalized-hoek-brown

shear joint stiffness parameters were estimated from the rock mass properties, joint spacing, and joint infill properties[9].

The adopted effective stress material and defect parameters are outlined in Table 9-2 and Table 9-3 below.

Table 9-2: Material parameters for RS2 slope stability analyses.

Material	Strength Function	Bulk Density (kN/m³)	Poisson's Ratio	Intact Youngs Modulus (GPa)	Rock Deformation Modulus (GPa)	Cohesion (kPa)	Friction Angle (°)	UCS (MPa)	GSI	mi	D
Residual Soil	Mohr-Coulomb	18	0.26	20	n/a	3	34	n/a			
CW Greywacke	Generalised Hoek-Brown	22	0.26	15	1.7	n/a		1	35	11	0
HW Greywacke		24	0.26	30	4.8	n/a		20	40	11	0
MW Greywacke		26	0.26	50	15.4	n/a		60	50	11	0
SW/UW Sandstone Greywacke		26	0.26	70	44.2	n/a		100	65	11	0
SW/UW Sandstone (Blasted)		26	0.26	70	18.6						0.7

Table 9-3 Joints and defects parameters for RS2 slope stability analyses.

Joint ID	Slip Criterion	JCS (kPa)	JRC	Residual Friction Angle (°)	Normal Stiffness (GPa/m)	Shear Stiffness (GPa/m)
Joint 1 (Joint Set 1)	Barton-Bandis	60,000	5	25	18	7.4
Joint 2 (Joint Set 3)	Barton-Bandis	60,000	7	25	18	7.4

Joint ID	Slip Criterion	Peak cohesion (kPa)	Peak Friction Angle (°)	Normal Stiffness (GPa/m)	Shear Stiffness (GPa/m)
Joint 3 (assumed clay infill)	Mohr-Coulomb	3	24	1.2	0.476

[9] https://static.rocscience.cloud/assets/verification-and-theory/RS2/RS2-Estimating-Joint-Stiffness.pdf

Groundwater within the greywacke rock mass is expected to be drawn down by the ongoing excavation within the pit. On this basis, a regional groundwater surface profile produced by WGA has been adopted in the analyses, based on drawdown effects on an existing regional groundwater profile.

9.5 Stability analysis results

We have carried out stability analyses for the cross sections (C-C' and D-D') illustrated in Appendix H, and have applied the material parameters outlined in Table 9-2.

RS2 analyses results included computed deformation/displacement assessment and a strength reduction factor (SRF), which considers incremental reduction in shear strength in the model to induce a "failure" scenario. SRF values broadly correlate to Factor of Safety typically derived from limit equilibrium analysis, such as RocScience Slide2 slope stability assessment.

Key analysis outputs considering the existing topography and proposed final design level cases are presented in Appendix H and a summary of analysis outcomes are presented in Table 9-4.

Table 9-4: Summary of analysis results for design options.

Section	Scenario	Calculated max Displacement (m)	Threshold Strength Reduction Factor (SRF)	Displacement at SRF threshold (m)
East Wall (Section D-D')	Static	0.018	>1.5	0.018
	Seismic (0.21g)	0.019	1.0	n/a
South Wall (Section C-C')	Static	0.014	>1.5	0.014
	Seismic (0.21g)	0.015	1.0	n/a

9.6 Discussion

Overall, the analyses indicate acceptable levels of stability for static and seismic scenarios along the South and East walls at a whole slope scale (multi-bench).

Based on the stability analyses, the calculated maximum displacement post-excavation for the East Wall analysis is approximately 18 mm for the base case and SRF=1.5 case.

For the South Wall, a critical SRF of 1.21 is calculated. This SRF is associated with a distinct joint interaction with the crest of a batter slope and is to be expected when considered in the context of existing performance of joint set 1 in the south walls of the current Clevedon quarry where occasional failures are observed. Failures of this scale are not expected to generate an environmental effect, are locally dependent on the exact positioning of individual defects and can be managed by normal quarry management practices.

At a larger, whole slope scale, displacements of approximately 14 mm are calculated for the base case, and the SRF=1.7 case.

We note that displacements modelled in these scenarios do not indicate a state of "failure" of the rock mass, but rather a reaction to unloading.

In the seismic case, displacements of 15 mm and 19 mm are calculated for the base case (by definition an SRF =1 case). Higher displacements are concentrated at batter crests and do not reflect expected whole wall performance.

10 Recommendations

10.1 Bench/batter geometry

Our preliminary stage analyses indicated a risk of failure in the upper, residual soil and completely weathered batters, which could push effects back beyond the boundary of the quarry.

We therefore recommended that the draft design be modified to follow the general quarry slope geometry set out in Table 10-1.

Table 10-1: Proposed bench batter geometry revision.

Material Type	Batter Angle	Batter Height	Bench Width
Residual Soil	1V:1.5H (~34°)	10 m	5 m
Completely weathered greywacke	1V:1H (~45°)	10 m	5 m
Highly weathered greywacke	1V:0.75H (~53°)	15 m	10 m
Moderately weathered to unweathered greywacke	1V:0.5H (~63°)	15 m	10 m

The latest design (Appendix A) adopts our proposed batter geometry and demonstrates an acceptable level in batter performance within the weathered greywacke profile. The exception to the revised batter geometry is the north quarry wall, where batter slopes appear to remain at the original batter angle of 63° from horizontal.

On further review, the survey basis for the design is drone orthophotography and the upper batters of the wall are partially in dense vegetation. The intent is to cut this upper batter in accordance with the recommended bench batter configuration, and this can be easily implemented given the conservative bench widths (10 m) that currently exist within the design.

10.2 Managing geological uncertainty

A key risk in quarry extension design is always uncertainty in the rock structure in final walls. While the mapping undertaken and the borehole data provides a guide to expected quarry slope performance rock structure orientations can change with distance and the local unfavourable intersection of specific, large scale, persistent faults with final walls can be difficult to predict with a high degree of certainty.

We consider that this geological uncertainty can be managed by:

- Undertaking intermittent geotechnical design review (indicatively on a 5-year basis). One of these reviews should be completed prior to individual quarry walls being excavation back within 30 m of any final wall position.
- Collation of rock structural data into a geotechnical database. Slope analyses and the associated design should be revised as required if ground conditions change significantly from those defined in this reporting.

From a consenting perspective, we consider that these recommendations could be readily incorporated into a quarry management plan where they would sit alongside any operational/health and safety requirements related to pit slope performance.

11 Summary and conclusions

We have completed our geotechnical review of the proposed quarry extension at Clevedon Quarry, which seeks to extend the quarry footprint to an area of 72.8 Ha, over a 50-year quarry design plan.

Overall, we consider that the proposed quarry extension design is feasible from a geotechnical perspective and acceptable levels of stability exist for whole slope/global stability, subject to the design guidance set out above (Section 10.1) and our recommendations for ongoing review (Section 10.2). It is our opinion that the risk of environmental effects associated with slope performance is negligeable.

Our assessment has included mapping of rock exposure within the quarry and in accessible parts of Stream 1 and Stream 2 and logging of core recovered from a single deep borehole positioned on a ridge crest between Stream 2 and Stream 3.

Mapping within the quarry and adjacent Stream 1 and 2 has identified slightly weathered to unweathered greywacke sandstone underlying steam channels and in bench faces at RL35 and RL45. At higher elevations, the existing quarry batters are excavated in moderately to completely weathered greywacke, overlain by a thin veneer of residual soil.

Four major defect sets were observed within the quarry and adjacent gullies, with joint set 1 (JS01) controlling bench-scale planar and wedge failures observed along the RL35, RL45 and RL140 m benches. Batter scale failures within the current quarry usually occur during blasting (as back break) and the scale of failures observed does not present a risk of an environmental effect, being contained within the quarry.

Kinematic assessment of the proposed quarry wall orientation and geometry indicates that structurally controlled multi-bench failure is unlikely. This is consistent with current quarry batter performance.

Our finite element assessment indicates acceptable levels of displacement for quarry walls when considering a shear strength reduction factor of >1.5 (a proxy for Factor of Safety). The seismic case also achieves acceptable levels of whole slope stability.

Local instability of batters may occur, where intersection with specific defects intersect these batters. This is to be expected based on currently observed performance in the existing quarry. Instability at this scale is an operational and health and safety issue (the remit of Worksafe New Zealand) and is not expected to present a risk of an environmental effect.

We note that there is a significant level of flexibility in the eventual implemented design within the proposed consent footprint due to the conservative bench widths currently adopted.

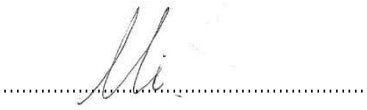
We have reviewed the proposed consent conditions drafted by SAL. We are satisfied that the conditions proposed adequately address the recommendations set out in this report.

12 Applicability

This report has been prepared for the exclusive use our client Stevenson Aggregates Limited, and the Fast Track Expert Panel in their capacity as decision makers for an Application for consent for the Clevedon Quarry Extension project. The recommendations and opinions in this report are limited to the purpose stated within the report. It may not be relied upon in other contexts or for any other purpose, or by any person other than those nominated above, without our prior written agreement.

We trust that this report meets your present requirements. If you have any queries or wish to discuss any aspect, please contact the undersigned.

For and on behalf of Baseline Geotechnical Limited:



Charles Li

Engineering Geologist

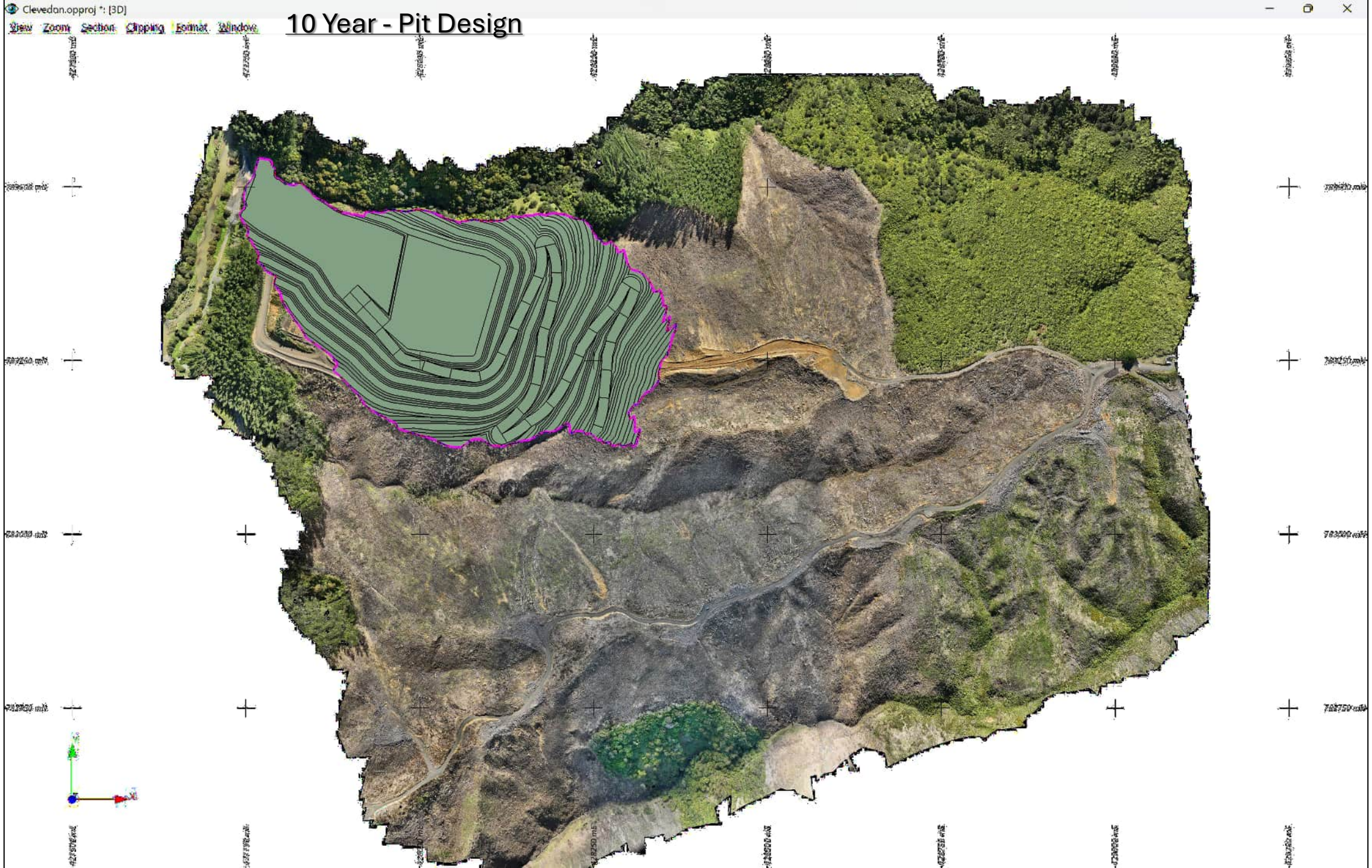


Cameron Lines

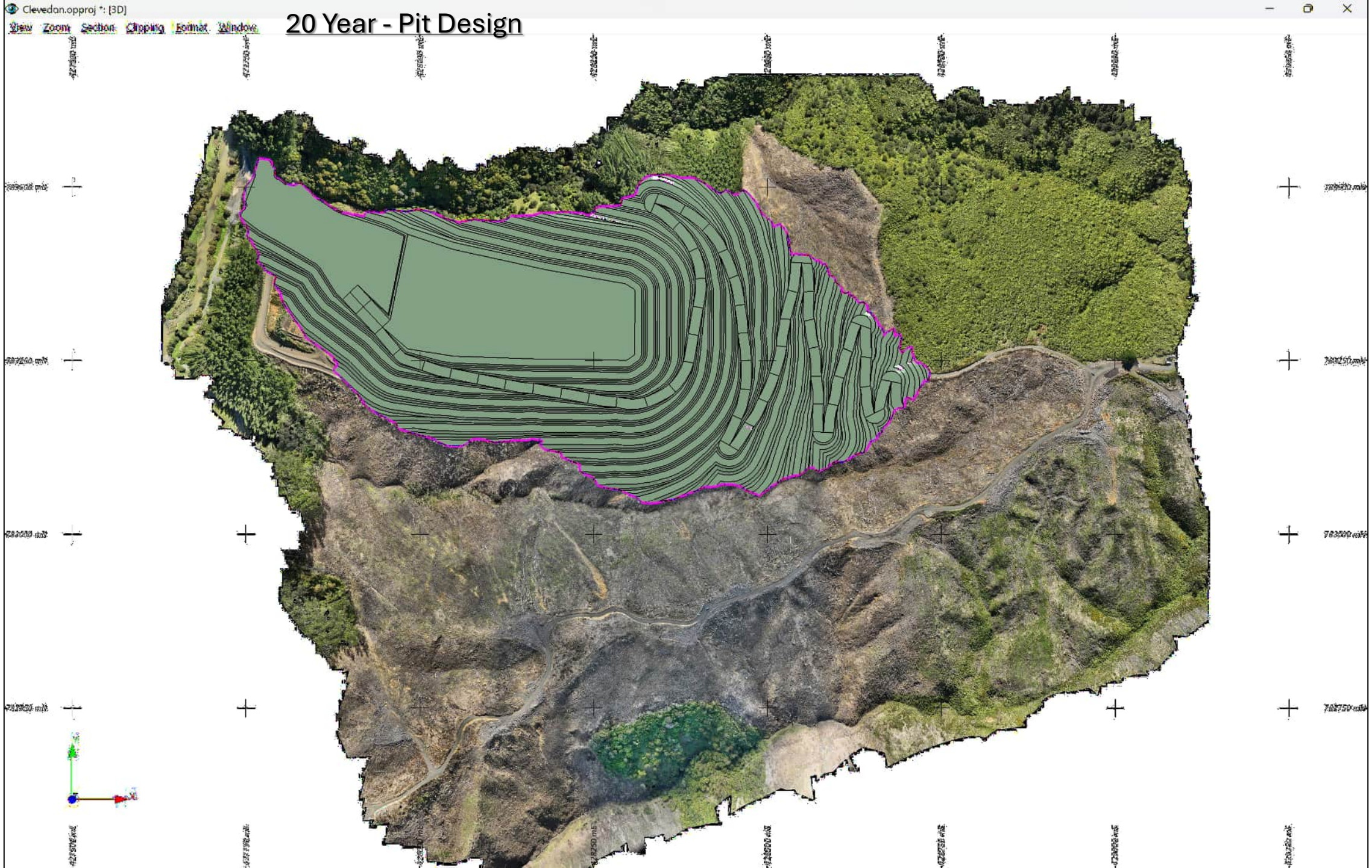
Director

Appendix A – SAL Clevedon 50-year quarry design evaluations

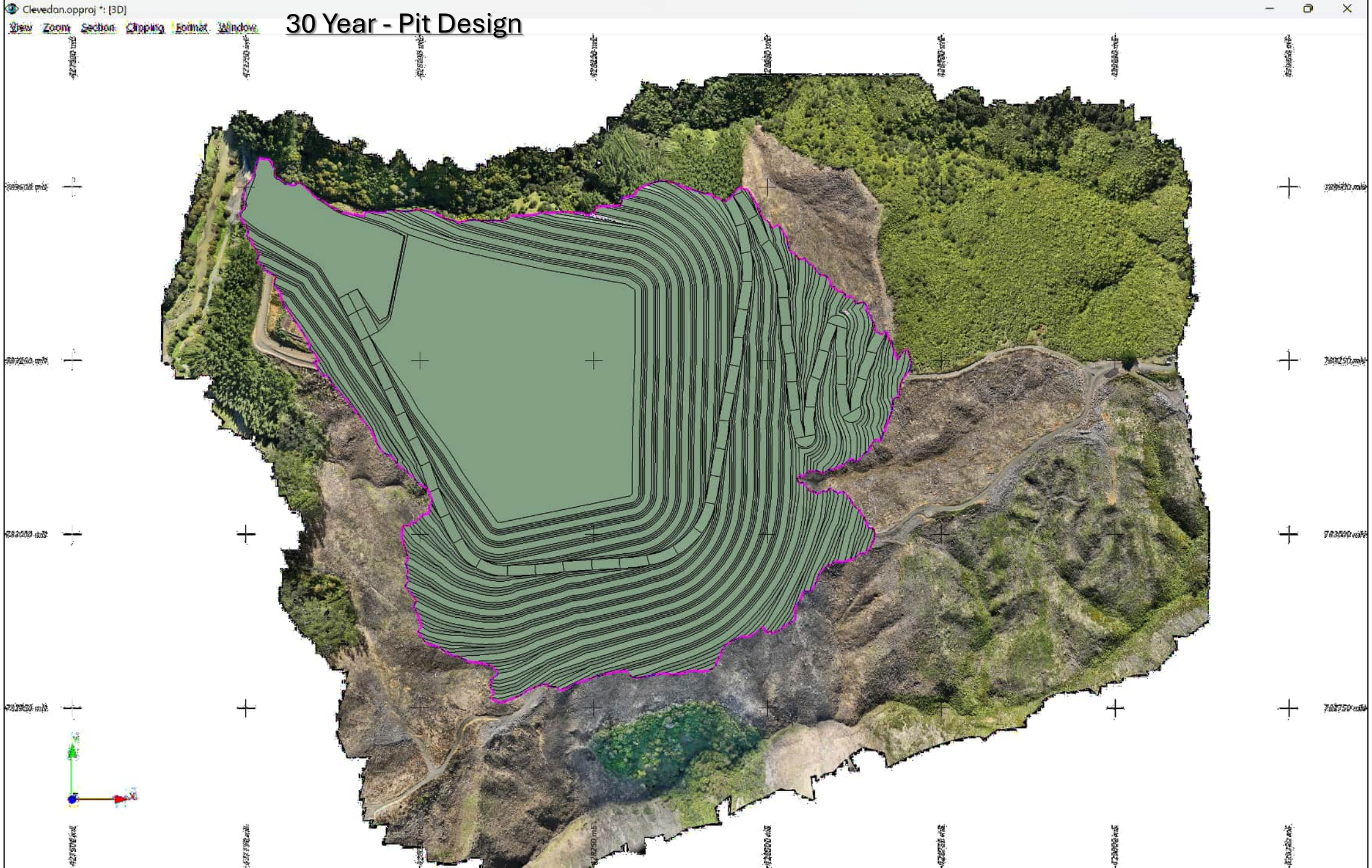
10 Year - Pit Design



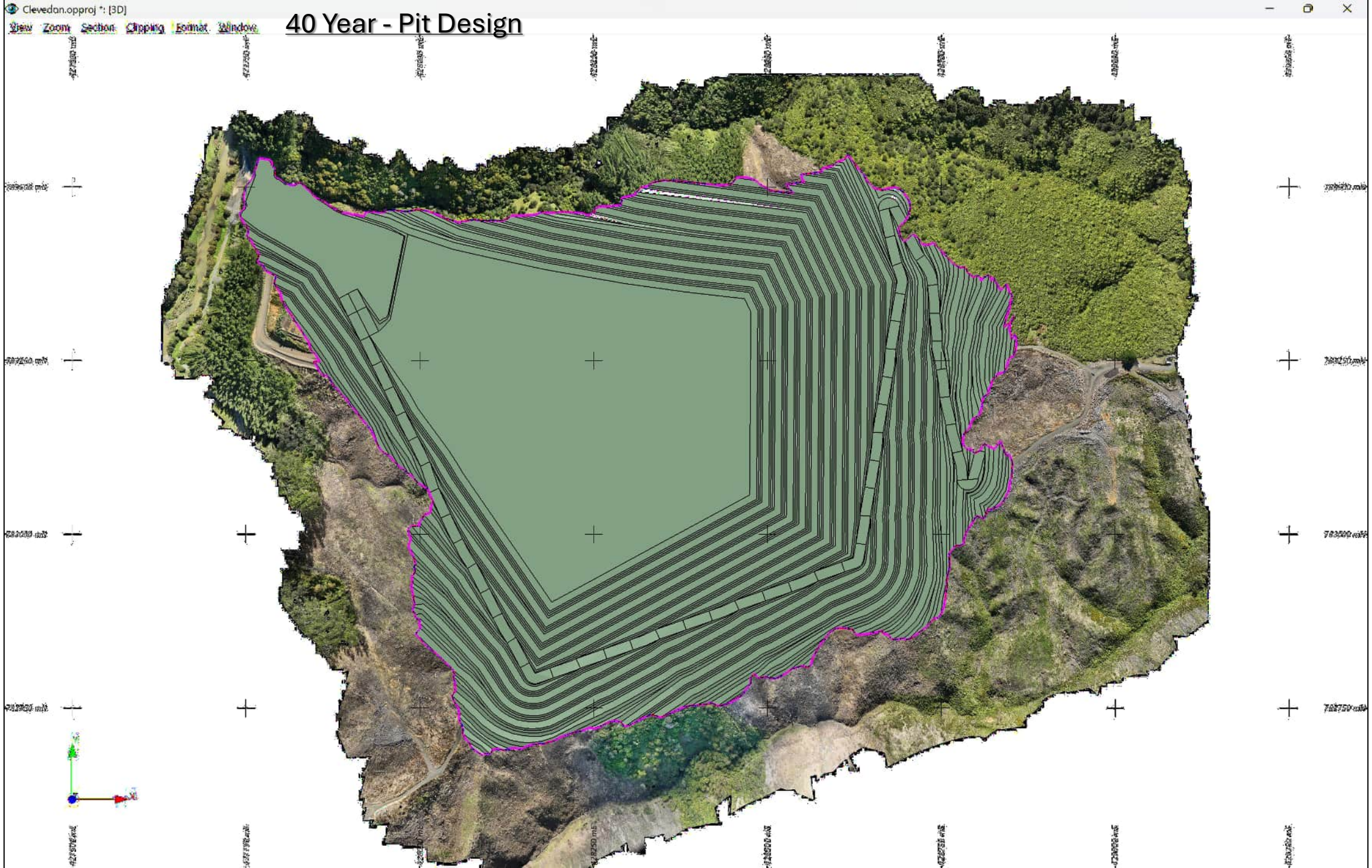
20 Year - Pit Design



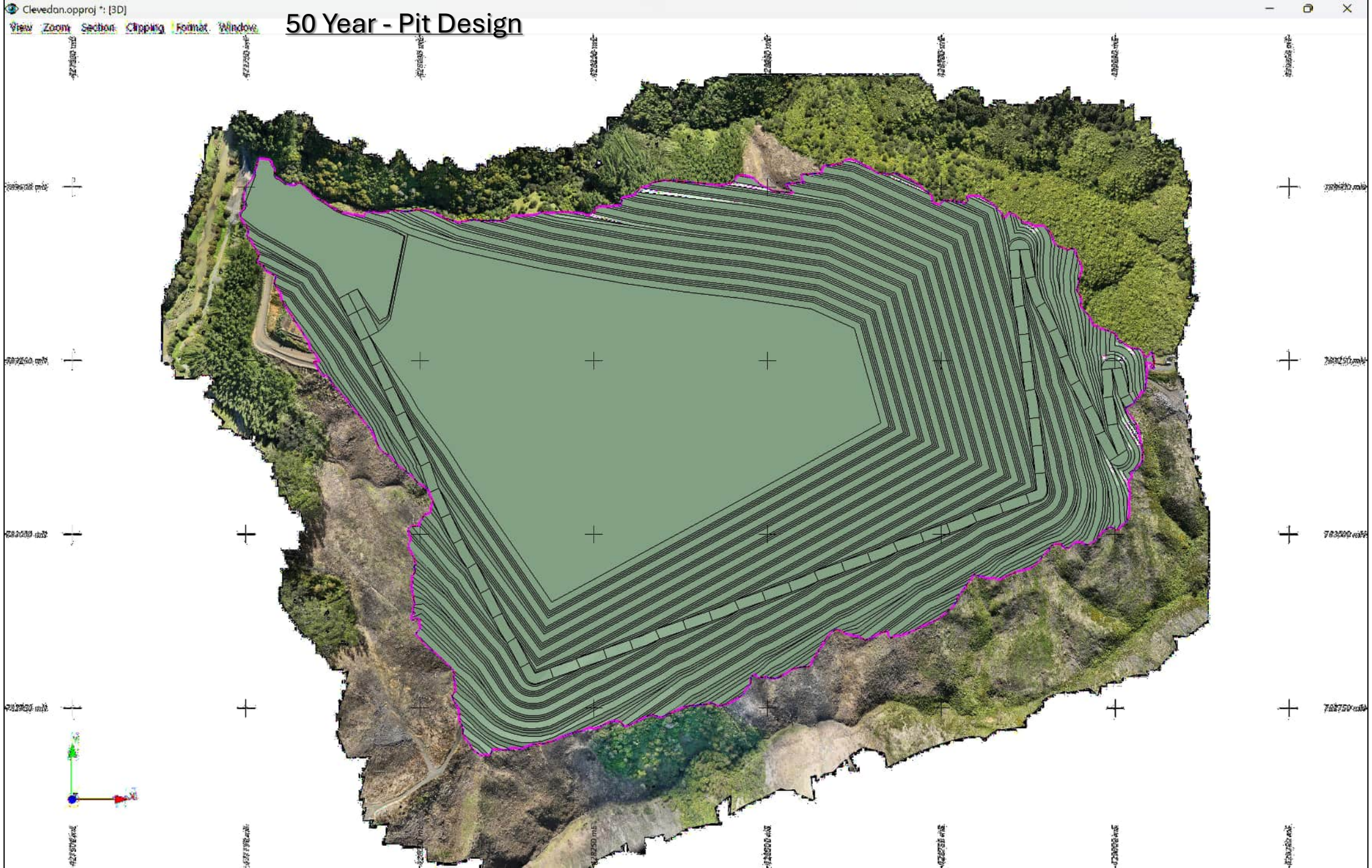
30 Year - Pit Design



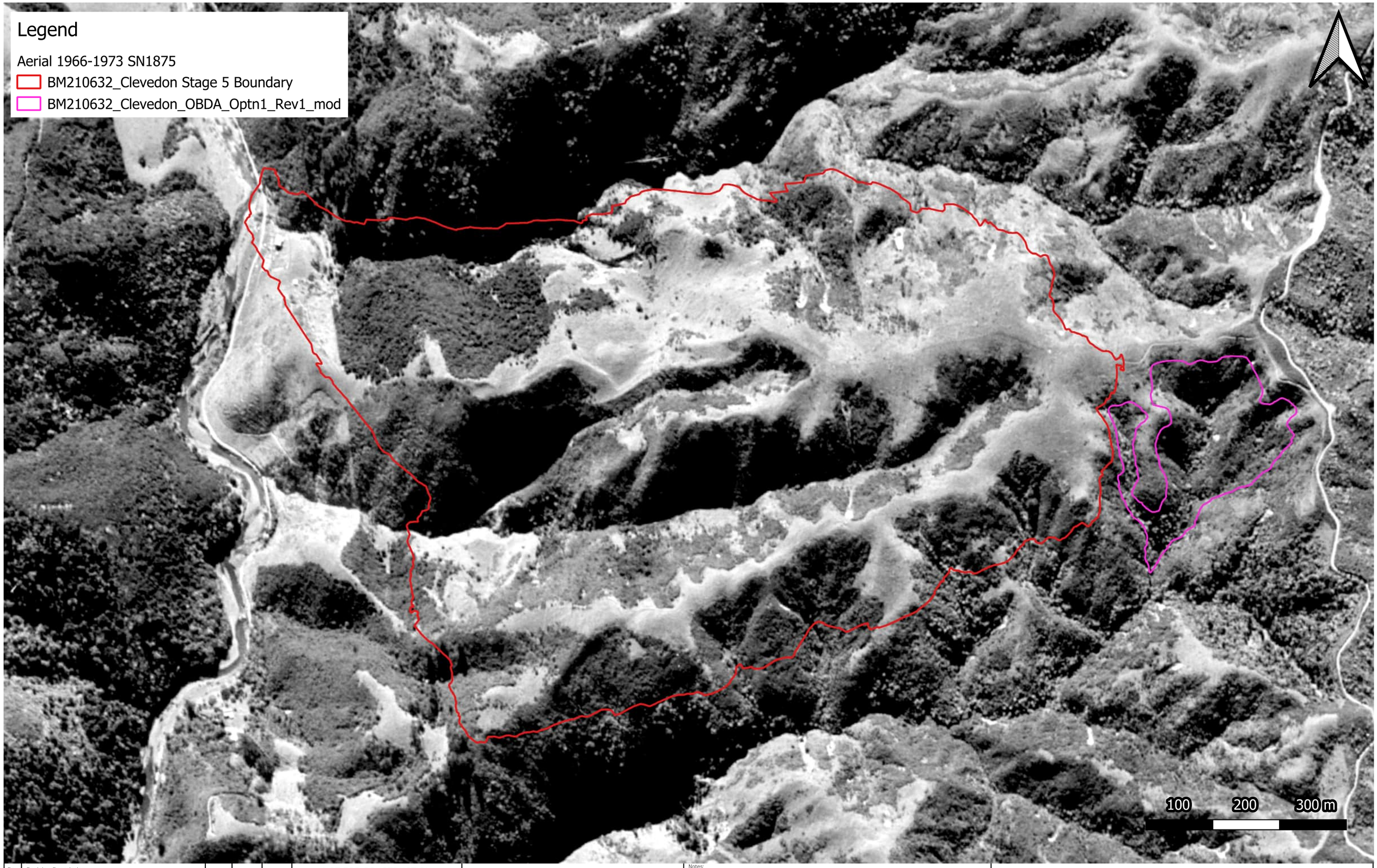
40 Year - Pit Design



50 Year - Pit Design



Appendix B – BGL Figures



Rev	Revision Description	Designed	Drawn	Checked
1.0	Project Desktop Review - Geotechnical Report		CLi	CJL
1.1	Updated quarry and OBDA boundary		CLi	CJL

NOT FOR CONSTRUCTION

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Approved:

Date: 05/06/2026

Scale: 1:5000 Original Size: A3

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www.baselinegeotechnical.co.nz

Notes:
1. Historical aerial of the quarry was sourced and georeferenced from Auckland Council.
2. Proposed quarry extension and OBDA design are updated as of 29 May 2026).

STEVENSON

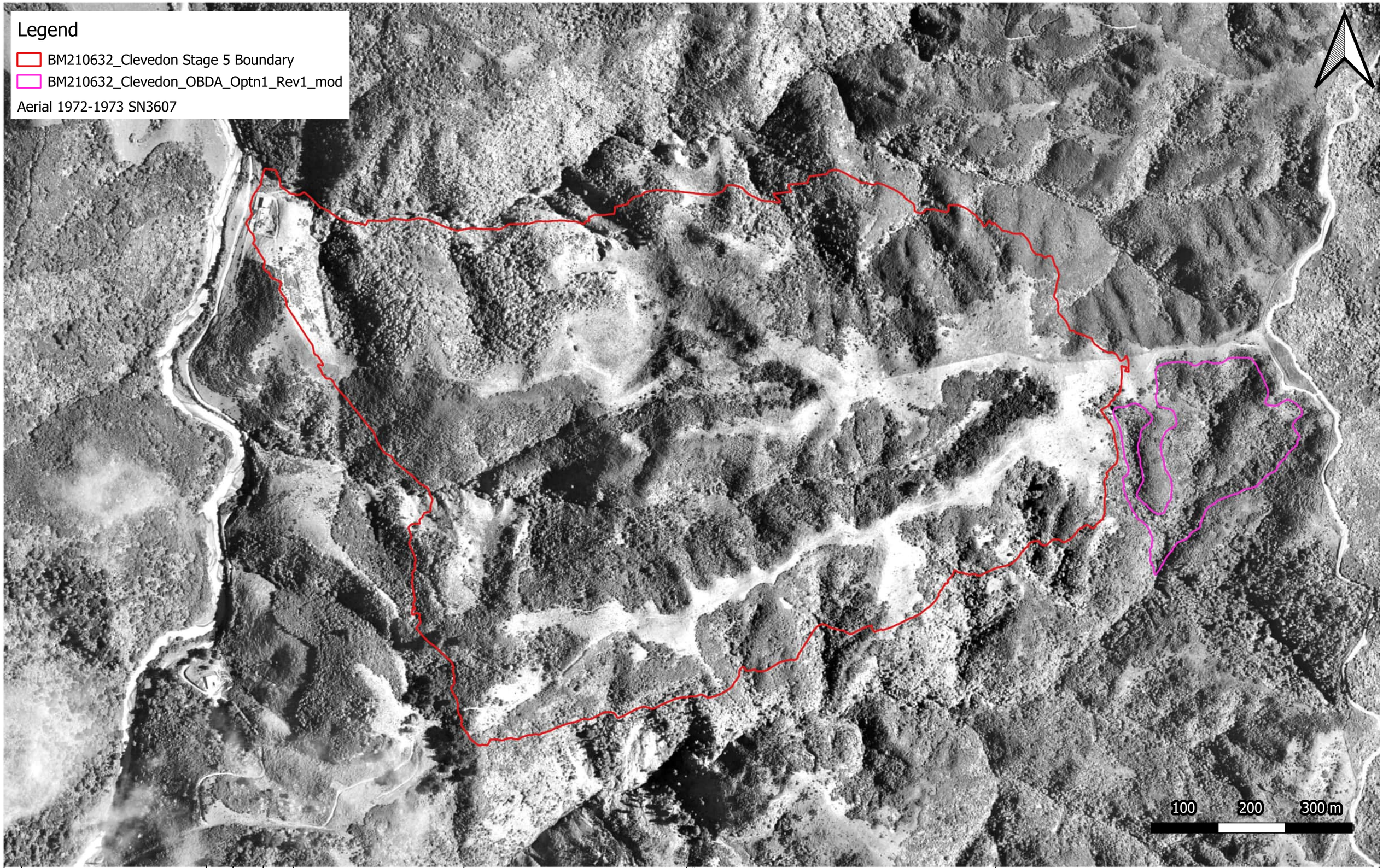
Historical Aerial (1966-1973)

Stevenson Aggregate Limited (SAL)

Project Reference: BGL000206A

Figure Number: BGL000206A-001

Revision: 1.1



Rev	Revision Description	Designed	Drawn	Checked
1.0	Project Desktop Review - Geotechnical Report		CLi	CJL
1.1	Updated quarry and OBDA boundary		CLi	CJL

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Scale: 1:5000 Original Size: A3

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Notes:
1. Historical aerial of the quarry was sourced and georeferenced from Auckland Council.
2. Proposed quarry extension and OBDA design are updated as of 29 May 2026).

STEVENSON

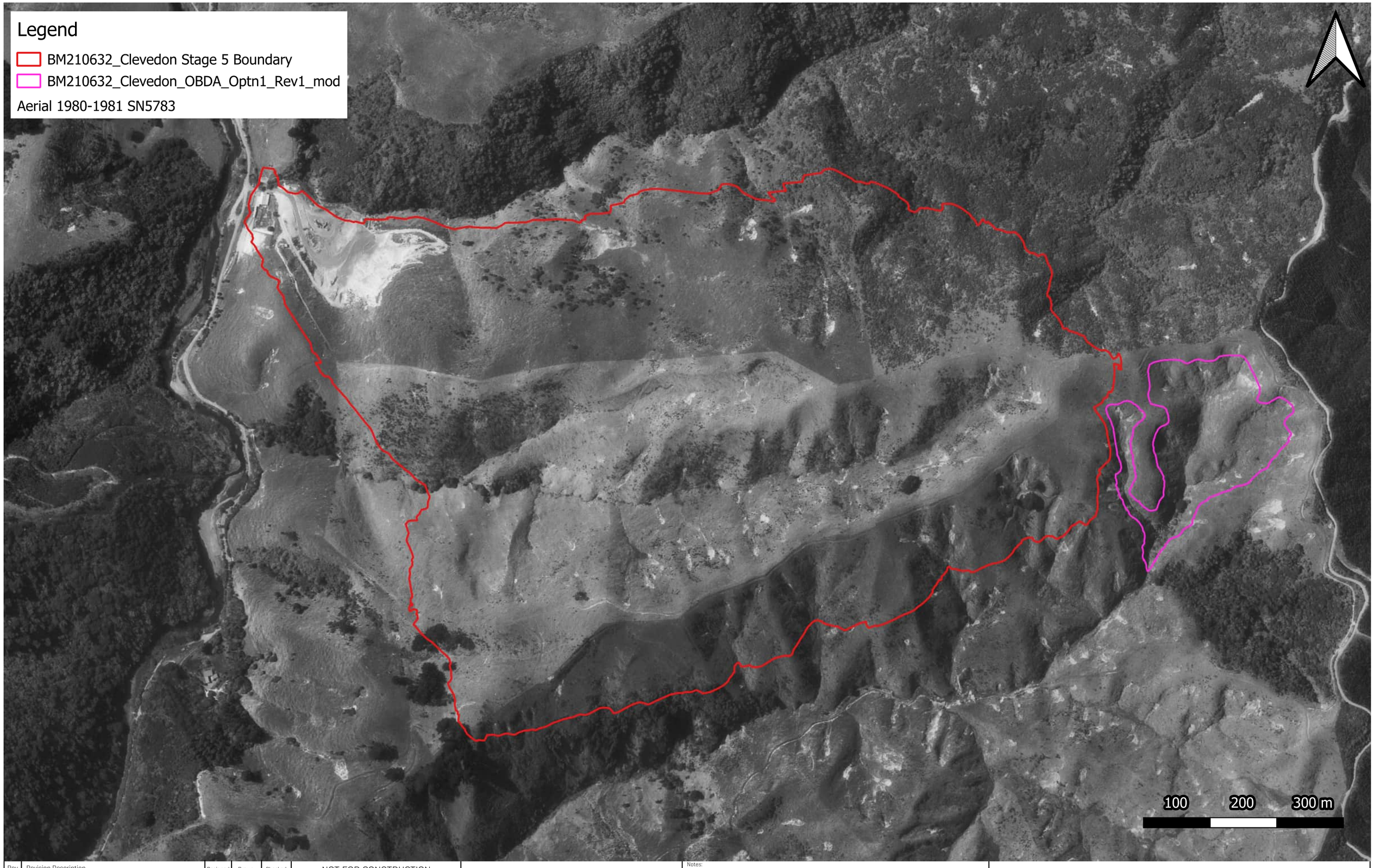
Historical Aerial (1972-1973)

Stevenson Aggregate Limited [SAL]

Project Reference: BGL000206A

Figure Number: BGL000206A-002

Revision: 1.1



Rev	Revision Description	Designed	Drawn	Checked
1.0	Project Desktop Review - Geotechnical Report		CLi	CJL
1.1	Updated quarry and OBDA boundary		CLi	CJL

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Date: 05/06/2026

Scale: 1:5000 Original Size: A3

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Notes:
1. Historical aerial of the quarry was sourced and georeferenced from Auckland Council.
2. Proposed quarry extension and OBDA design are updated as of 29 May 2026).

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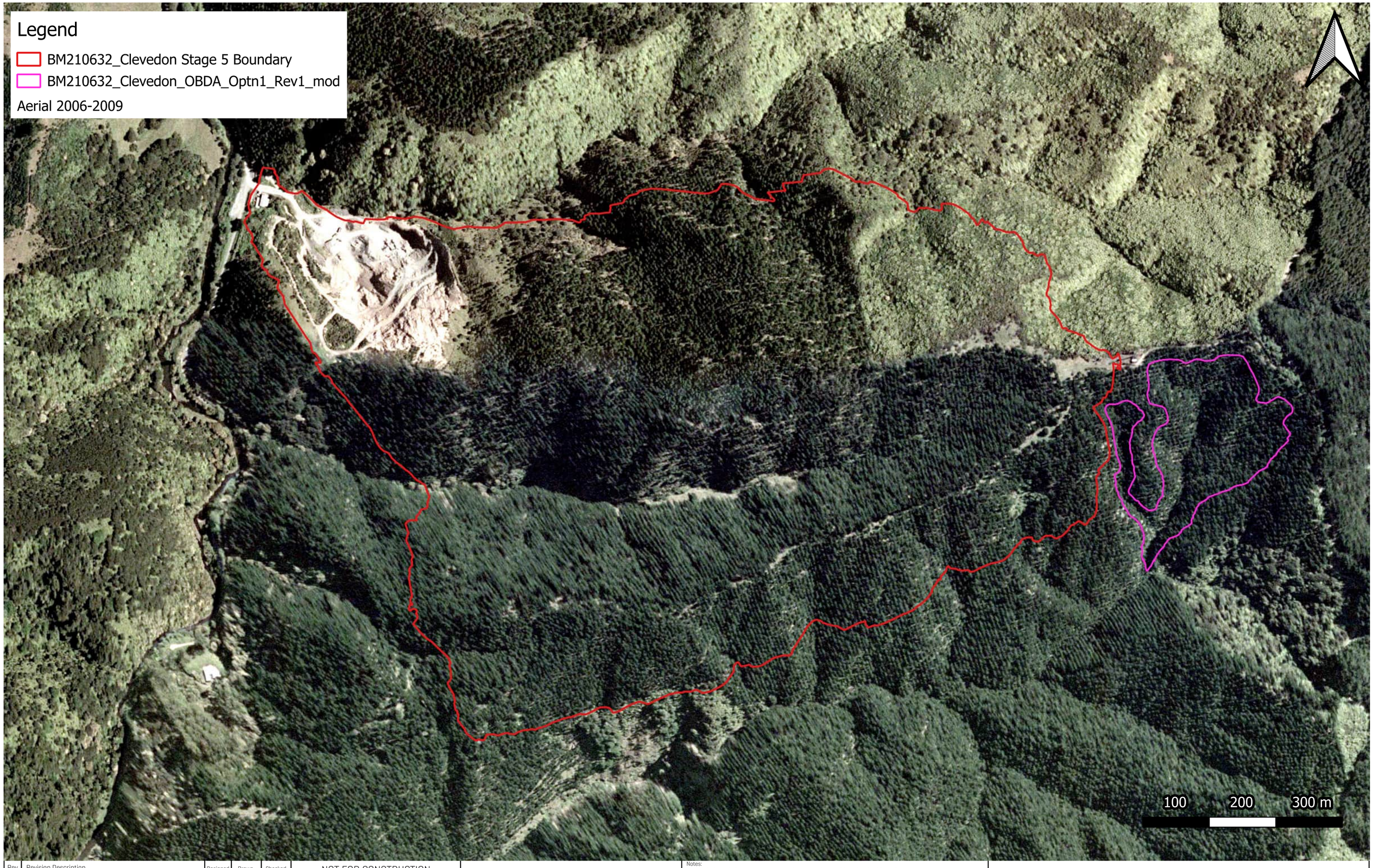
Historical Aerial (1980-81)

Stevenson Aggregate Limited (SAL)

Project Reference: BGL000206A

Figure Number: BGL000206A-003

Revision: 1.1



Rev	Revision Description	Designed	Drawn	Checked
1.0	Project Desktop Review - Geotechnical Report		CLi	CJL
1.1	Updated quarry and OBDA boundary		CLi	CJL

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Notes:
1. Historical aerial of the quarry was sourced and georeferenced from Auckland Council.
2. Proposed quarry extension and OBDA design are updated as of 29 May 2026).

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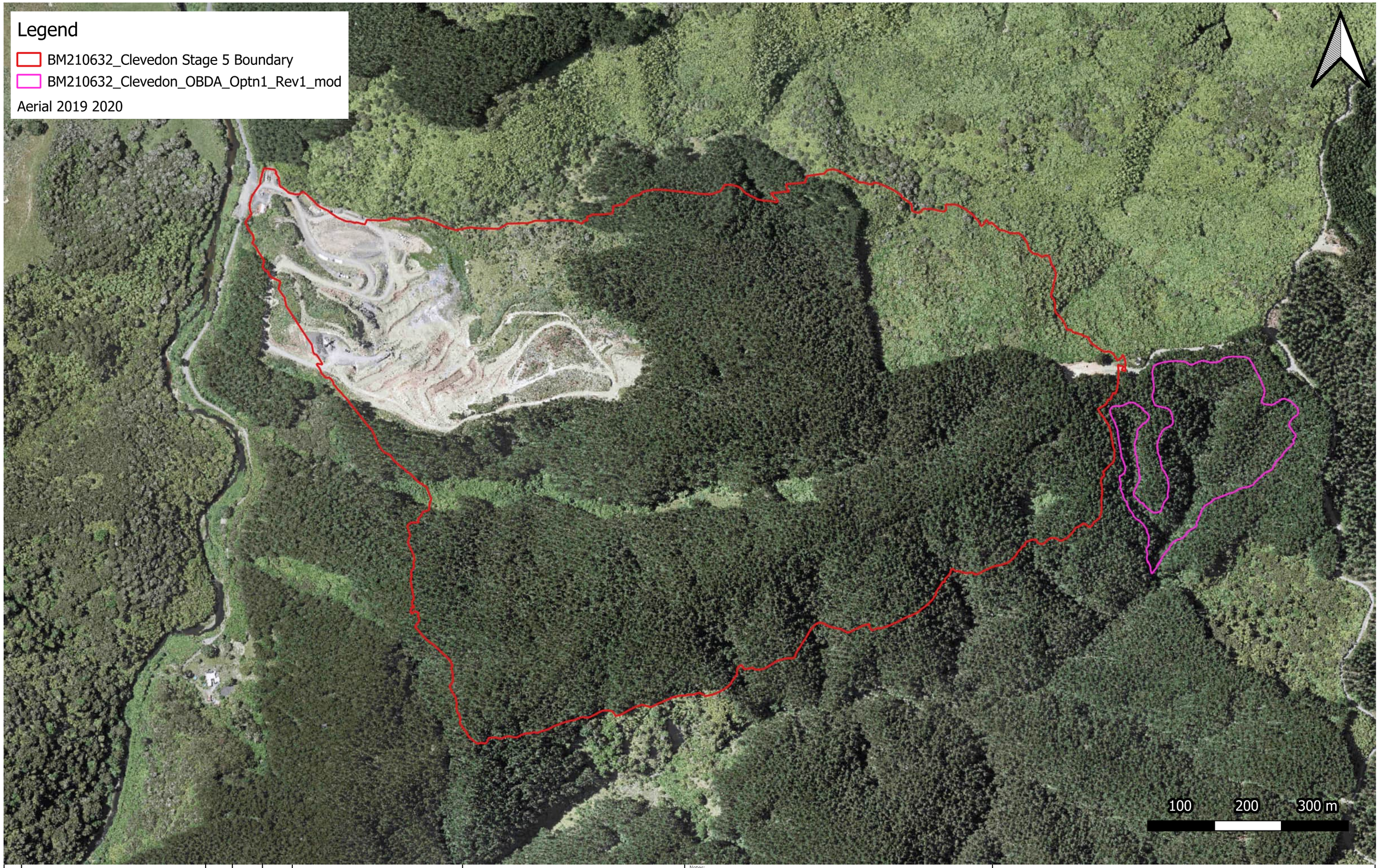
Historical Aerial (2006-09)

Stevenson Aggregate Limited (SAL)

Project Reference: BGL000206A

Figure Number: BGL000206A-004

Revision: 1.1



Rev	Revision Description	Designed	Drawn	Checked
1.0	Project Desktop Review - Geotechnical Report		CLi	CJL
1.1	Updated quarry and OBDA boundary		CLi	CJL

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Notes:
1. Historical aerial of the quarry was sourced and georeferenced from Auckland Council.
2. Proposed quarry extension and OBDA design are updated as of 29 May 2026).

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Historical Aerial (2019-20)

Stevenson Aggregate Limited (SAL)

Project Reference: BGL000206A

Figure Number: BGL000206A-005

Revision: 1.1

Legend

- MW01 (Completed December '25)
- BM210632_Clevedon_Stage 5 - LoQ Boundary
- BM210632_Clevedon_OBDA_Optn1_Rev1_mod

MW01

Auckland Central

Auckland Airport

Inset A: Clevedon Quarry

100 200 300 m

Rev	Revision Description	Designed	Drawn	Checked
1.0	Project Desktop Review - Geotechnical Report		CLi	CJL
1.1	Updated Quarry LoQ and OBDA Boundaries		CLi	CJL

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Date: 05/06/2026

Scale: 1:300000 Original Size: A3

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Notes:
1. Aerial of the quarry was provided by SAL (dated January 2026).
2. Local basemap sourced from Auckland Council Geomaps (dated 2024).
3. Proposed quarry extension and OBDA design are updated as of January 2026).

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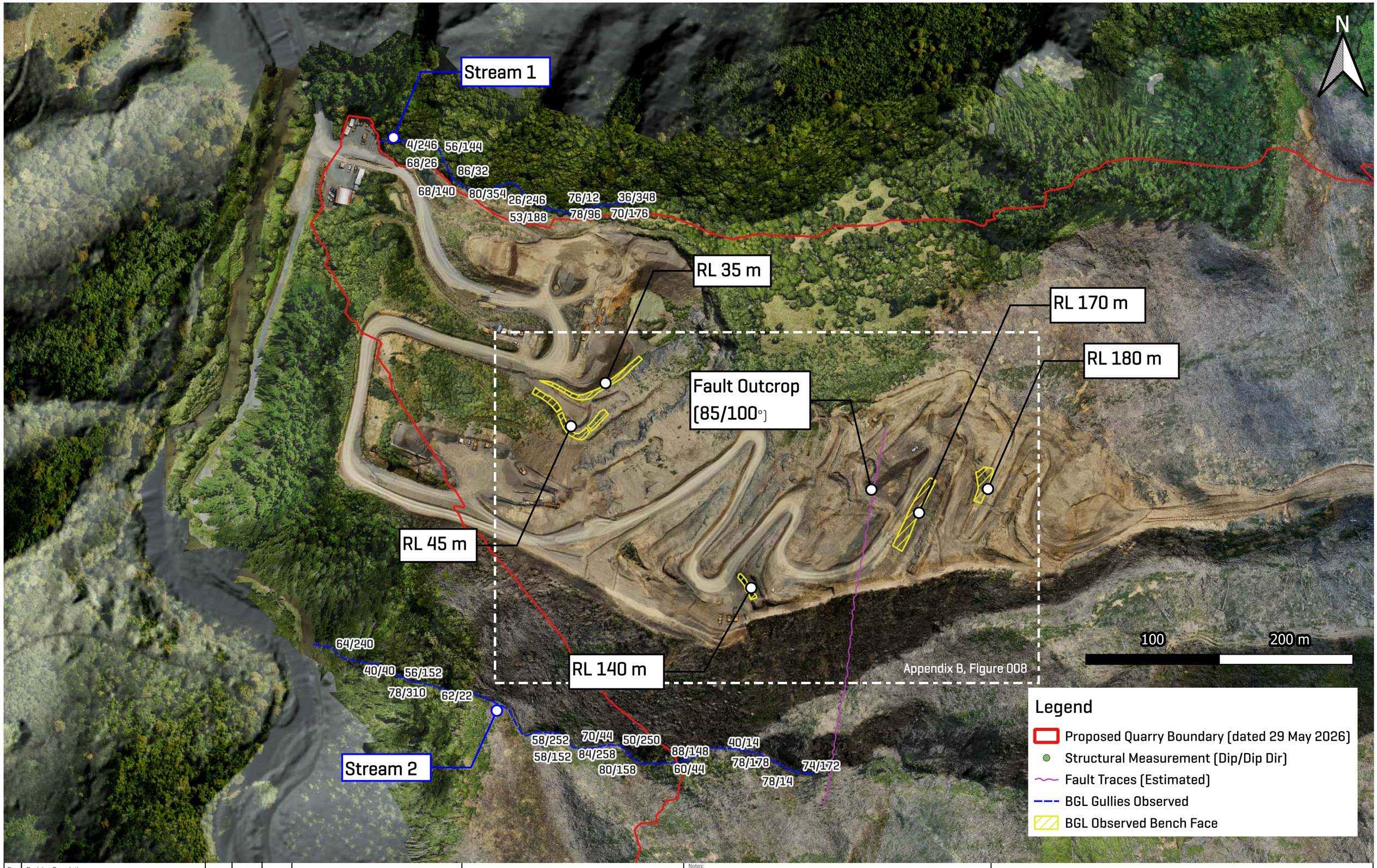
Clevedon Quarry - Borehole Investigation

Stevenson Aggregate Limited (SAL)

Project Reference: BGL000206A

Figure Number: BGL000206A-006

Revision: 1.1



Rev	Revision Description	Designed	Drawn	Checked
1.0	Project Desktop Review - Geotechnical Report		CLi	CJL
1.1	Updated quarry boundary		CLi	CJL

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Approved:

Date:

Scale: 1:2500 Original Size: A3

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Notes:
1. Aerial of the quarry was provided by SAL (dated 28 January 2026).
2. Local basemap sourced from Auckland Council Geomaps (dated 2024).
3. Site observations completed on 16 December 2025.

STEVENSON

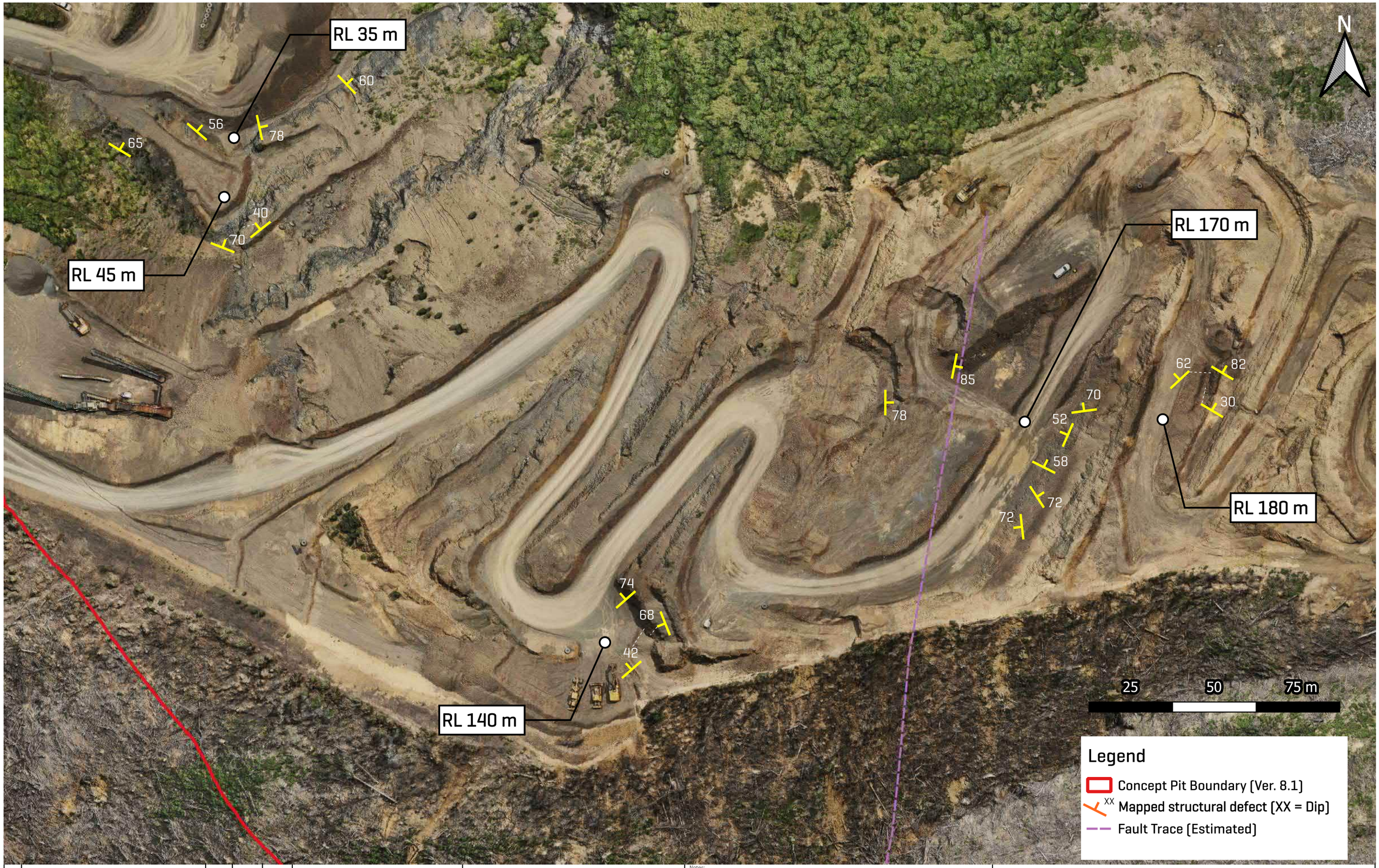
Field Observation (17-18 Dec')

Stevenson Aggregate Limited (SAL)

Project Reference: BGL000206A

Figure Number: BGL000206A-007

Revision: 1.1



Rev	Revision Description	Designed	Drawn	Checked
A	Project Desktop Review - Geotechnical Report	CLi	CLi	

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Approved:

Date:

Scale: 1:1000 Original Size: A3

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Notes:
1. Aerial of the quarry was provided by SAL (captured January 2026).
2. Site observations completed on 16 December 2025.

STEVENSON

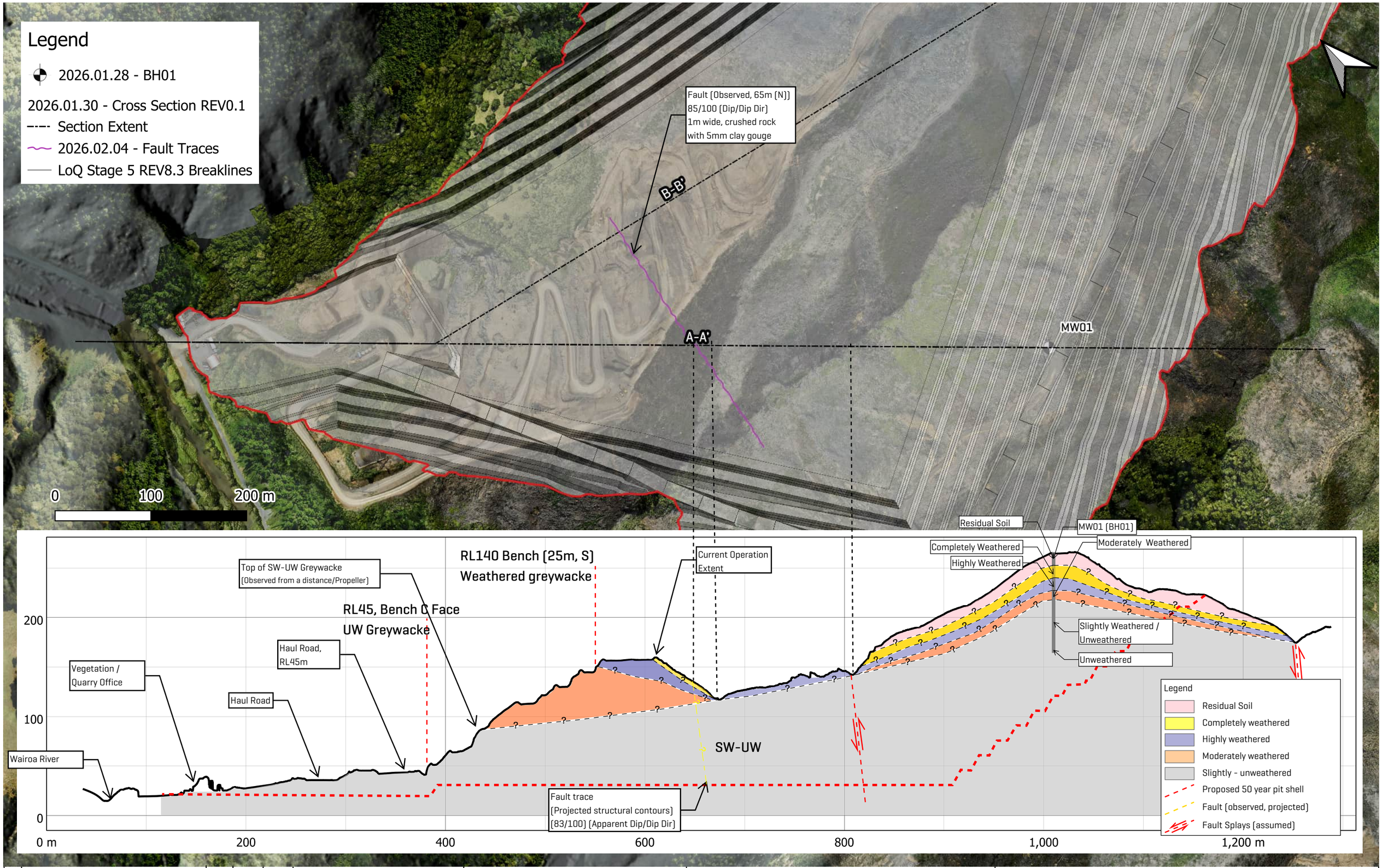
Observed Structural Defects (Quarry)

Stevenson Aggregate Limited (SAL)

Project Reference: BGL000206A

Figure Number: BGL000206A-008

Revision: A



Rev	Revision Description	Designed	Drawn	Checked
0.1	Project Desktop Review - Geotechnical Report	CLi	CLi	CJL
1.0	Revised extension design (ref: version 8.3)	CLi	CLi	CJL
1.1	Revised quarry extension design (ref: BM210632_Stage 5)	CLi	CLi	CJL

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Approved:

Date: 05/06/2026

Scale: 1:3500 Original Size: A3

BASELINE GEOTECHNICAL

www.baselinegeotechnical.co.nz

Notes:
1. Aerial and drone-derived elevation data provided by Stevenson Limited, captured January 2026.
2.Site observations completed on 16-17 December 2025.

STEVENSON

Section A-A' - Conceptual Ground Model

Stevenson Limited

Project Reference: BGL000206A

Figure Number: BGL000206A-009

Revision: 1.1

Legend

- BH01 - BGL (Dec' 2025)

2026.01.30 - Cross Section REV0.1

- Section Extent
- 2026.02.04 - Fault Traces

LoQ Rev 8.3 TIN (Clipped)

- LoQ Stage 5 REV8.3 Breaklines
- BM210632_Clevedon_Quarry_Stage5 Boundary
- BM210632_Clevedon_OBDA_Optn1_Rev1_mod

B-B'

A-A'

Fault (Observed, 25m (S))
85/100 (Dip/Dip Dir)
1m wide, crushed rock
with 5mm clay gouge

0 100 200 m

Undisturbed weathering profile

Fault splay
(inferred based on geometry of the stream orientation)

Current OB stripping area

Fault trace
(Projected structural contours)
85/100 (Dip/Dip Dir)

Haul Road, RL45m

RL45, Bench C Face
UW Greywacke

Vegetation / Quarry Office

Haul Road

Wairoa River

300
200
100
0

0 m 200 400 600 800 1,000 1,200 1,400 m

Legend
- Completely weathered
- Highly weathered
- Moderately weathered
- Slightly - unweathered
- Proposed 50 year pit shell
- Fault (observed, projected)
- Fault Splays (estimated)

Rev	Revision Description	Designed	Drawn	Checked
0.1	Project Desktop Review - Geotechnical Report	CLi	CLi	CJL
1.0	Revised pit extension design (ref: version 8.3)	CLi	CLi	CJL
1.1	Revised quarry extension design (ref: BM210632_Stage5)	CLi	CLi	CJL

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

Approved:

Date: 05/06/2026

Scale: 1:4000 Original Size: A3

BASELINE GEOTECHNICAL

www.baselinegeotechnical.co.nz

Notes:
1. Aerial and drone-derived elevation data provided by Stevenson Limited, captured January 2026.
2.Site observations completed on 16-17 December 2025.

STEVENSON

Section B-B' - Conceptual Ground Model

Stevenson Limited

Project Reference: BGL000206A

Figure Number: BGL000206A-010

Revision: 1.1



Rev	Revision Description	Designed	Drawn	Checked
1.0	Project Desktop Review - Geotechnical Report	CLi	CLi	CJI
1.1	Updated quarry boundary [ref: BM210632_stage5]	CLi	CLi	CJI

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

Approved:

Date: 05/06/2026

Scale: 1:7000 Original Size: A3

BASELINE GEOTECHNICAL®

www.baselinegeotechnical.co.nz

Notes:
1. Aerial of the quarry was provided by SAL (dated 28 January 2026).
2. Local basemap sourced from Auckland Council Geomaps (dated 2024).
3. Proposed quarry extension and OBDA design are updated as of 29 May 2026).

STEVENSON

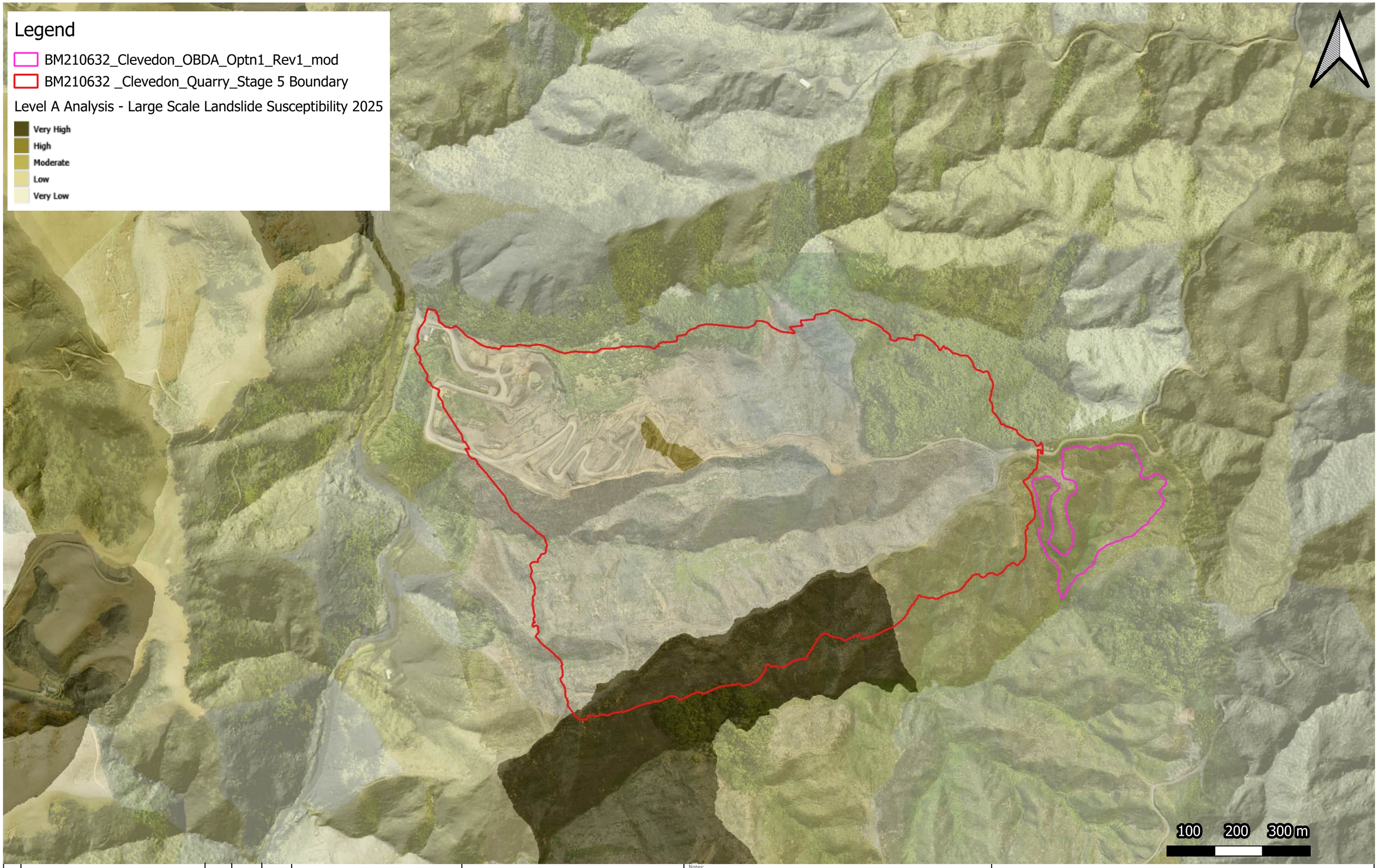
Natural Hazard, Shallow Landslide

Stevenson Aggregate Limited [SAL]

Project Reference: BGL000206A

Figure Number: BGL000206A-011

Revision: 1.1



Rev	Revision Description	Designed	Drawn	Checked
1.0	Project Desktop Review - Geotechnical Report	CLi	CLi	CJI
1.1	Updated quarry boundary (ref: BM210632_stage5)	CLi	CLi	CJI

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

Approved:

Date: 05/06/2026

Scale: 1:7000 Original Size: A3

BASELINE GEOTECHNICAL®

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Notes:
1. Aerial of the quarry was provided by SAL (dated 28 January 2026).
2. Local basemap sourced from Auckland Council Geomaps (dated 2024).
3. Proposed quarry extension and OBDA design are updated as of 29 May 2026).

STEVENSON

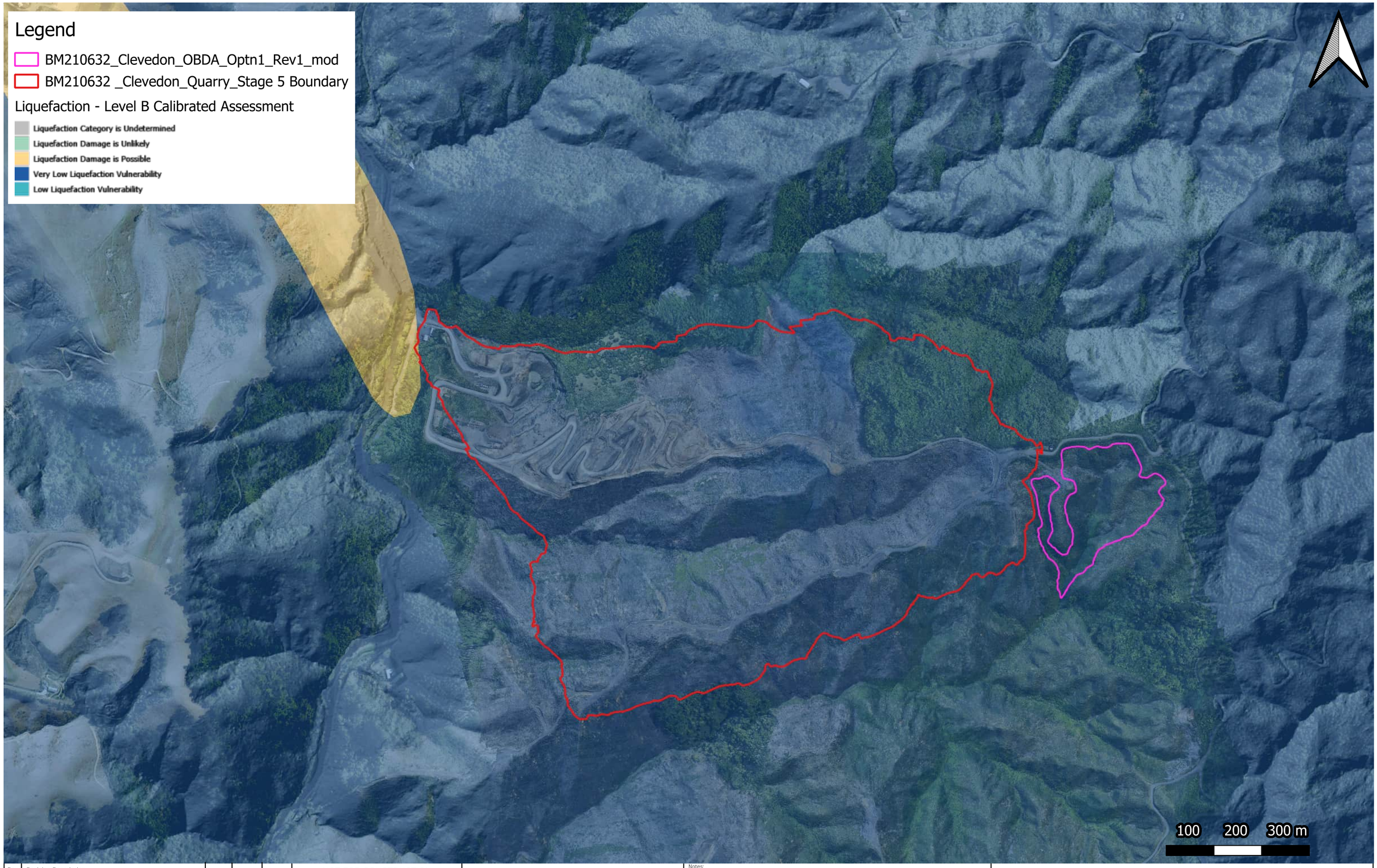
Natural Hazard, Large scale Landslide

Stevenson Aggregate Limited (SAL)

Project Reference: BGL000206A

Figure Number: BGL000206A-012

Revision: 1.1



Rev	Revision Description	Designed	Drawn	Checked
1.0	Project Desktop Review - Geotechnical Report	CLi	CLi	CJI
1.1	Updated quarry boundary (ref: BM210632_stage5)	CLi	CLi	CJI

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

Approved:

Date: 05/06/2026

Scale: 1:7000 Original Size: A3

BASELINE GEOTECHNICAL®

www.baselinegeotechnical.co.nz

Notes:
1. Aerial of the quarry was provided by SAL (dated 28 January 2026).
2. Local basemap sourced from Auckland Council Geomaps (dated 2024).
3. Proposed quarry extension and OBDA design are updated as of 29 May 2026).

STEVENSON

Natural Hazard, Liquefaction

Stevenson Aggregate Limited (SAL)

Project Reference: BGL000206A

Figure Number: BGL000206A-013

Revision: 1.1

Appendix C – BGL borehole log

BASELINE GEOTECHNICAL

BOREHOLE ROCK LOG

DRILLHOLE No.: MW-01

SHEET 1 OF 23

Job No.: BGL000206a

CLIENT: Stevenson Aggregates Ltd
PROJECT NAME: SAL Clevedon Expansion
LOCATION: Clevedon Quarry
DRILLING CONTRACTOR: Brown Brothers

COORDINATES: 428412mE, 782896mN, (Mt Eden 2000)
GRID: Mt Eden 2000
ELEVATION: 264.5m

ORIENTATION: 0
INCLINATION: 90
HOLE DEPTH: 100.00m
DRILL TYPE: HQTT
LOGGED BY: ASW

UNIT	DESCRIPTION	GRAPHIC	WEATHERING (UW SW MW HW)	STRENGTH (ES VS S MS W VW)	DEPTH & ELEVATION	SAMPLES	CORE LENGTH & SIZE	CORE LOSS (%) (25 50 75)	RQD (%) (75 50 25)	DISCONTINUITIES: FRACTURE SPACING (mm) (500 400 300 200 100)	DISCONTINUITIES: DESCRIPTION	WATER	INSTALLATION
Fill	GRAVEL with minor silt; grey. Loose. [FILL]				264								
lTr d	CORE LOSS.				1		1.5m	73	0				
	Clayey SILT with some fine sand; grey with orange mottling. Stiff, moist, low plasticity. [Residual Greywacke soil]				263		0.7m	67	0				
	CORE LOSS.				2								
	As above: clayey SILT. [Residual Greywacke soil]				262		1.4m	27	0				
					3								
					261		1.5m	0	0				
					4								
	5.10m: Changes to; some black amorphous organics.				260								
					5								
					259		1.5m	0	0				
					6								
	CORE LOSS.				258		1.5m	40	0				
	As above: clayey SILT. [Residual Greywacke soil]				7								
					257								
					8								
					256		1.5m	0	0				
					9								
	Fine to medium sandy SILT; grey with orange mottling and black specks. Stiff, moist, low plasticity.				255		1.5m	0	0				Bentonite

Drill Fluid Notes:

Remarks

Hole Depth (m): 100

Cluster:

Start Date: 25/11/2025

End Date: 01/12/2025

Page Depth: 10.00

BASELINE GEOTECHNICAL

BOREHOLE ROCK LOG

DRILLHOLE No.: MW-01

SHEET 2 OF 23

Job No.: BGL000206a

CLIENT: Stevenson Aggregates Ltd
PROJECT NAME: SAL Clevedon Expansion
LOCATION: Clevedon Quarry
DRILLING CONTRACTOR: Brown Brothers

COORDINATES: 428412mE, 782896mN, (Mt Eden 2000)
GRID: Mt Eden 2000
ELEVATION: 264.5m

ORIENTATION: 0
INCLINATION: 90
HOLE DEPTH: 100.00m
DRILL TYPE: HQTT
LOGGED BY: ASW

UNIT	DESCRIPTION	GRAPHIC	WEATHERING (UW SW MW HW)	STRENGTH (ES VS S MS W VW)	DEPTH & ELEVATION	SAMPLES	CORE LENGTH & SIZE	CORE LOSS (%) (25 50 75)	RQD (%) (75 50 25)	DISCONTINUITIES: FRACTURE SPACING (mm) (500 400 300 200 100)	DISCONTINUITIES: DESCRIPTION	WATER	INSTALLATION
ITr d	[CONT] Fine to medium sandy SILT; grey with orange mottling and black specks. Stiff, moist, low plasticity.				254		1.5m	0	0				Bentonite
	Clayey SILT with some fine sand; grey with orange mottling. Stiff, moist, low plasticity. [Residual Greywacke soil]				11								
	CORE LOSS.				253		1.5m	60	0				
	Silty fine GRAVEL with some fine sand, minor clay; grey with orange mottling and black specks. Loosely packed, moist. Gravels are subangular, light grey, extremely weak, siltstone. [Residual Greywacke soil]				12								
	12.90m: Siltstone cobble, extremely weak.				252		1.5m	0	0				
	14.00m: Siltstone cobble, extremely weak.				13								
	CORE LOSS.				251		1.5m	27	0				
	Completely weathered, grey with orange mottling, fine, SANDSTONE, extremely weak, black staining to relict defect surfaces, some 1mm white powdery infill. [Silty fine gravel; grey. Loosely packed, moist. Gravels are angular, extremely weak, siltstone]		CW	EW	14								
	15.00m - 15.60m: Returned as cobbles and gravels.				250								
	CORE LOSS.				15		0.75m	67	0				
	As above: completely weathered SANDSTONE.				249		0.75m	20	0				
	16.10m - 17.10m: Returned as cobbles and gravels.				16								
			CW	EW	248		1.5m	13	0				
					17								
					247		0.75m	33	0				
	CORE LOSS.				18								
	As above: completely weathered SANDSTONE.				246		0.75m	33	0				
	19.55m - 20.10m: Returned as cobbles and gravels.		CW	EW	19								
					245								

Drill Fluid Notes:

Remarks

Hole Depth (m): 100

Cluster:

Start Date: 25/11/2025

End Date: 01/12/2025

Page Depth: 10.00

BOREHOLE ROCK LOG

DRILLHOLE No.: MW-01

SHEET 3 OF 23

Job No.: BGL000206a

CLIENT: Stevenson Aggregates Ltd
PROJECT NAME: SAL Clevedon Expansion
LOCATION: Clevedon Quarry
DRILLING CONTRACTOR: Brown Brothers

COORDINATES: 428412mE, 782896mN, (Mt Eden 2000)
GRID: Mt Eden 2000
ELEVATION: 264.5m

ORIENTATION: 0
INCLINATION: 90
HOLE DEPTH: 100.00m
DRILL TYPE: HQTT
LOGGED BY: ASW

UNIT	DESCRIPTION	GRAPHIC	WEATHERING (UW SW MW HW)	STRENGTH (ES VS S MS W VW)	DEPTH & ELEVATION	SAMPLES	CORE LENGTH & SIZE	CORE LOSS (%)	RQD (%)	DISCONTINUITIES: FRACTURE SPACING (mm)	DISCONTINUITIES: DESCRIPTION	WATER	INSTALLATION
ITr d	Completely weathered, grey with orange mottling, fine, SANDSTONE, extremely weak, black staining to relict defect surfaces, some 1mm white powdery infill. [Silty fine gravel; grey. Loosely packed, moist. Gravels are angular, extremely weak, siltstone]		CW	EW	21 (244)		1.5m	0	0				Bentonite
					22 (243)		1m	20	0				
	CORE LOSS.				23 (242)		0.5m	40	0				
	As above: completely weathered SANDSTONE.		CW	EW									
	CORE LOSS.						0.7m	70	0				
	As above: completely weathered SANDSTONE.		CW	EW	24 (241)		0.8m	25	0				
	CORE LOSS.				25 (240)		1.2m	33	0				
	As above: completely weathered SANDSTONE.		CW	EW									
	25.70m: 5mm weathering rind.				26 (239)		0.3m	100	0				
	Highly weathered, grey with orange mottling, fine, SANDSTONE, very weak, closely spaced, very steeply inclined defect sets stained dark orange.						1m	30	70				
	27.70m - 27.90m: Crush zone.		HW	W	27 (238)		0.7m	0	0		27.30m,83°,JT, PL,RG, 0,Iron staining.		
					28 (237)		1.3m	0	0	100	28.70m,60°,JT, PL,SM, 4,Iron staining with a 4mm weathering rind.		
					29 (236)						29.00m,70°,JT, PL,RG, 10,Iron staining with a 10mm weathering rind.		
					(235)		1.2m	0	0				

Drill Fluid Notes:

Remarks

Hole Depth (m): 100

Cluster:

Start Date: 25/11/2025

End Date: 01/12/2025

Page Depth: 10.00

BOREHOLE ROCK LOG

DRILLHOLE No.: MW-01

SHEET 4 OF 23

Job No.: BGL000206a

CLIENT: Stevenson Aggregates Ltd
PROJECT NAME: SAL Clevedon Expansion
LOCATION: Clevedon Quarry
DRILLING CONTRACTOR: Brown Brothers

COORDINATES: 428412mE, 782896mN, (Mt Eden 2000)
GRID: Mt Eden 2000
ELEVATION: 264.5m

ORIENTATION: 0
INCLINATION: 90
HOLE DEPTH: 100.00m
DRILL TYPE: HQTT
LOGGED BY: ASW

UNIT	DESCRIPTION	GRAPHIC	WEATHERING (UW SW MW HW)	STRENGTH (ES VS S MS W VW)	DEPTH & ELEVATION	SAMPLES	CORE LENGTH & SIZE	CORE LOSS (%)	RQD (%)	FRACTURE SPACING (mm)	DISCONTINUITIES DESCRIPTION	WATER	INSTALLATION
ITr d	[CONT] Highly weathered, grey with orange mottling, fine, SANDSTONE, very weak, closely spaced, very steeply inclined defect sets stained dark orange.				234		1.2m	0	0		30.00m,60°,JT, PL,SM, 0,Iron staining.		
	30.30m: 10mm lens of very soft, white clay infilling joints.				31		1.5m	0	0	75			
					233						31.80m,60°,JT, PL,SM, 0,Iron staining.		
					32		1.4m	0	8	50	32.50m,25°,JT, PL,SM, 0,Iron staining.		
			HW	W	232						32.70m,85°,JT, PL,SM, 0,Iron staining.		
					33								
					231		1.2m	8	23	100	33.55m,60°,JT, ST,RG, 0,Iron staining.		
	34.30m - 34.60m: Crush zone.				34								
					230		0.7m	0	0		34.40m,70°,JT, UN,SM, 0,Iron staining.		
	CORE LOSS.				35					75			
	As above: highly weathered SANDSTONE.				229		1.1m	27	0		35.70m,75°,JT, UN,SM, 0,Iron staining.		
					36								
					228		1.1m	0	16	150			
			HW		37						37.00m,70°,JT, ST,RG, 10,Iron staining with a 10mm weathering rind.		
				W - MS	227		0.8m	0	0	100			
	38.10m: Cobble with 2mm weathering rind.				38						37.80m,76°,JT, PL,SM, 0,Iron staining.		
					226		0.9m	0	0	50			
	38.40m - 39.00m: Crush zone.				39								
	Moderately weathered, dark grey, fine, SANDSTONE (Greywacke), weak to moderately strong, closely spaced, sub-vertical defect sets stained orange.		MW		225		1.2m	0	10	100	39.70m,85°,JT, PL,SM, 0,Iron staining.		Bentonite

Drill Fluid Notes:

Remarks

Hole Depth (m): 100

Cluster:

Start Date: 25/11/2025

End Date: 01/12/2025

Page Depth: 10.00

BOREHOLE ROCK LOG

DRILLHOLE No.: MW-01

SHEET 5 OF 23

Job No.: BGL000206a

CLIENT: Stevenson Aggregates Ltd
PROJECT NAME: SAL Clevedon Expansion
LOCATION: Clevedon Quarry
DRILLING CONTRACTOR: Brown Brothers

COORDINATES: 428412mE, 782896mN, (Mt Eden 2000)
GRID: Mt Eden 2000
ELEVATION: 264.5m

ORIENTATION: 0
INCLINATION: 90
HOLE DEPTH: 100.00m
DRILL TYPE: HQTT
LOGGED BY: ASW

UNIT	DESCRIPTION	GRAPHIC	WEATHERING (UW SW MW HW)	STRENGTH (ES VS S MS W VW)	DEPTH & ELEVATION	SAMPLES	CORE LENGTH & SIZE	CORE LOSS (%)	RQD (%)	FRACTURE SPACING (mm)	DISCONTINUITIES DESCRIPTION	WATER	INSTALLATION
lTr d	[CONT] Moderately weathered, dark grey, fine, SANDSTONE (Greywacke), weak to moderately strong, closely spaced, sub-vertical defect sets stained orange.		MW	W - MS	41		1.2m	0	10				
							0.9m	0	0	100	40.50m,87°,JT, PL,SM, 0,Iron staining. 40.80m,88°,JT, PL,SM, 0,Iron staining.		
					42		1.1m	0	0	75			
	41.80m - 43.20m: Crush zone.						1m	40	0	50	42.70m,75°,JT, PL,SM, 0,Iron staining.		
					43		0.9m	0	23	150			
	44.00m: Changes to; a primary very steeply inclined joint set with a secondary, steeply inclined joint set.				44		0.6m	0	0	100	44.00m,44°,JT, UN,RG, 0,Iron staining. 44.10m,76°,JT, PL,SM, 0,Clean.		
	44.60m: 100mm lens of silty fine sand with some fine gravel, minor clay; greenish grey.				45		1.5m	0	34				
					46		0.9m	0	26	150	45.80m,86°,JT, PL,SM, 0,Iron staining. 46.00m,30°,JT, PL,SM, 0,Iron staining. 46.20m,61°,JT, UN,SM, 0,Iron staining.		
	Slightly weathered, dark grey, fine, SANDSTONE (Greywacke), strong, closely spaced, steeply to very steeply inclined joint sets stained orange.		SW	S	47		1.5m	0	0	200			
					48						48.10m,69°,JT, UN,SM, 0,Iron staining.		
					49		0.3m	0	0	50			
							1.2m	0	48	150	49.30m,81°,JT, UN,SM, 0,Iron staining.		
											49.90m,42°,JT, UN,SM, 0,Iron		

Bentonite

Drill Fluid Notes:

Remarks

Hole Depth (m): 100

Cluster:

Start Date: 25/11/2025

End Date: 01/12/2025

Page Depth: 10.00

BOREHOLE ROCK LOG

DRILLHOLE No.: MW-01

SHEET 6 OF 23

Job No.: BGL000206a

CLIENT: Stevenson Aggregates Ltd
PROJECT NAME: SAL Clevedon Expansion
LOCATION: Clevedon Quarry
DRILLING CONTRACTOR: Brown Brothers

COORDINATES: 428412mE, 782896mN, (Mt Eden 2000)
GRID: Mt Eden 2000
ELEVATION: 264.5m

ORIENTATION: 0
INCLINATION: 90
HOLE DEPTH: 100.00m
DRILL TYPE: HQTT
LOGGED BY: ASW

UNIT	DESCRIPTION	GRAPHIC	WEATHERING (UW SW MW HW)	STRENGTH (ES VS S MS W VW)	DEPTH & ELEVATION	SAMPLES	CORE LENGTH & SIZE	CORE LOSS (%)	RQD (%)	FRACTURE SPACING (mm)	DISCONTINUITIES DESCRIPTION	WATER	INSTALLATION
lTr d	[CONT] Slightly weathered, dark grey, fine, SANDSTONE (Greywacke), strong, closely spaced, steeply to very steeply inclined joint sets stained orange.				214				48		staining.		
							1.5m	0	7		50.20m,65°,JT, PL,RG, 2,Iron staining with a 2mm weathering rind.		
					51						51.00m,77°,JT, PL,SM, 0,Iron staining.		
					213								
											51.80m,38°,JT, PL,SM, 0,Iron staining.		
					52		1.5m	0	36				
			SW	S	212					150			
	52.90m - 53.00m: Crush zone.				53								
					211		0.7m	0	0		53.30m,73°,JT, UN,SM, 0,Iron staining.		
	54.00m: Changes to; some quartz veining.				54						54.00m,30°,JT, PL,SM, 0,Clean.		
							1.3m	0	22		54.20m,50°,JT, PL,RG, 0,Quartz infill.		
					210								
	55.10m - 56.10m: Unweathered, dark grey, fine SANDSTONE (Greywacke), very weak, closely spaced, sub-vertical joint sets.				55						55.30m,84°,JT, PL,SM, 0,Clean.		
			UW	VS	209		1m	0	17				
	56.20m: Changes to; sub-vertical joint sets.				56						56.20m,80°,JT, PL,SM, 0,Iron staining.		
					208		1.2m	0	0	100	56.60m,89°,JT, UN,SM, 0,Clean.		
	57.20m: 100mm zone of highly fractured rock with 10mm quartz veins oriented at 15 degrees.				57								
					207		0.7m	0	0				
											57.80m,86°,JT, UN,SM, 0,Clean.		
			SW	S	58						58.10m,82°,JT, UN,RG, 0,Iron staining.		
					206		1.6m	0	0	50			
											58.70m,80°,JT, PL,SM, 0,Clean.		
					59								
					205		1.5m	0	0	100			

Bentonite

Drill Fluid Notes:

Remarks

Hole Depth (m): 100

Cluster:

Start Date: 25/11/2025

End Date: 01/12/2025

Page Depth: 10.00

BOREHOLE ROCK LOG

DRILLHOLE No.: MW-01

SHEET 7 OF 23

Job No.: BGL000206a

CLIENT: Stevenson Aggregates Ltd
PROJECT NAME: SAL Clevedon Expansion
LOCATION: Clevedon Quarry
DRILLING CONTRACTOR: Brown Brothers

COORDINATES: 428412mE, 782896mN, (Mt Eden 2000)
GRID: Mt Eden 2000
ELEVATION: 264.5m

ORIENTATION: 0
INCLINATION: 90
HOLE DEPTH: 100.00m
DRILL TYPE: HQTT
LOGGED BY: ASW

UNIT	DESCRIPTION	GRAPHIC	WEATHERING (UW SW MW HW)	STRENGTH (ES VS S MS W VW)	DEPTH & ELEVATION	SAMPLES	CORE LENGTH & SIZE	CORE LOSS (%)	RQD (%)	FRACTURE SPACING (mm)	DISCONTINUITIES DESCRIPTION	WATER	INSTALLATION
lTr d	[CONT] Slightly weathered, dark grey, fine, SANDSTONE (Greywacke), strong, closely spaced, steeply to very steeply inclined joint sets stained orange.		SW	S	61		1.5m	0	0	100	60.10m,87°,JT, PL,SM, 0,Clean.		
											60.80m,49°,JT, PL,SM, 0,Clean.		
					62		0.8m	0	0	50			
							0.5m	67	0		61.90m,73°,JT, PL,RG, 0,Iron staining.		
					63		1.5m	100	0				
	63.90m - 65.20m: Unweathered, dark grey, fine SANDSTONE (Greywacke), very weak, closely spaced, sub-vertical joint sets.		UW	VS	64		1.2m	50	25	300			
					65						65.60m,50°,JT, UN,SM, 0,Clean.		
			SW	S	66		1.5m	0	26				
										250	66.60m,87°,JT, UN,SM, 0,Clean.		
					67						67.00m,89°,JT, PL,SM, 0,Clean.		
							1.5m	0	48				
	66.60m - 70.00m: Unweathered, dark grey, fine SANDSTONE (Greywacke), very weak, closely spaced, very steeply to sub-vertical joint sets.		UW	VS	68						68.30m,82°,JT, PL,SM, 0,Clean.		
							1.1m	0	12	100			
					69						68.90m,61°,JT, UN,RG, 0,Clean.		
							1.1m	0	21	150	69.70m,70°,JT, UN,RG, 0,Clean.		
					70								

INSTALLATION: Bentonite

Drill Fluid Notes:

Remarks

Hole Depth (m): 100

Cluster:

Start Date: 25/11/2025

End Date: 01/12/2025

Page Depth: 10.00

BOREHOLE ROCK LOG

DRILLHOLE No.: MW-01

SHEET 8 OF 23

Job No.: BGL000206a

CLIENT: Stevenson Aggregates Ltd
PROJECT NAME: SAL Clevedon Expansion
LOCATION: Clevedon Quarry
DRILLING CONTRACTOR: Brown Brothers

COORDINATES: 428412mE, 782896mN, (Mt Eden 2000)
GRID: Mt Eden 2000
ELEVATION: 264.5m

ORIENTATION: 0
INCLINATION: 90
HOLE DEPTH: 100.00m
DRILL TYPE: HQTT
LOGGED BY: ASW

UNIT	DESCRIPTION	GRAPHIC	WEATHERING (UW SW MW HW)	STRENGTH (ES VS S MS W VW)	DEPTH & ELEVATION	SAMPLES	CORE LENGTH & SIZE	CORE LOSS (%)	RQD (%)	DISCONTINUITIES: FRACTURE SPACING (mm)	DISCONTINUITIES: DESCRIPTION	WATER	INSTALLATION
lTr d	[CONT] Slightly weathered, dark grey, fine, SANDSTONE (Greywacke), strong, closely spaced, steeply to very steeply inclined joint sets stained orange. 70.30m - 71.10m: Returned as cobbles and gravels. 70.60m: 200mm lens of quartz veining with some pyrite. 71.70m - 72.70m: Unweathered, dark grey, fine SANDSTONE (Greywacke), very weak, closely spaced, sub-vertical joint sets. 77.20m - 78.50m: Unweathered, dark grey, fine SANDSTONE (Greywacke), very weak, closely spaced, sub-vertical joint sets. 77.80m: 5mm quartz veins.		SW / UW / SW / UW / SW	S / VS / S / VS / S	194 193 192 191 190 189 188 187 186 185		1.1m 0.8m 1.5m 0.7m 0.8m 0.8m 0.7m 1.5m 1.5m 1.5m	0 0 0 0 0 0 0 0 0 0	21 0 87 33 0 48 0 55 87 83	150 100 250 200 100 200 300	71.00m,84°,JT, PL,SM, 0,Clean. 72.00m,41°,JT, PL,SM, 0,Clean. 73.00m,80°,JT, PL,RG, 3,Iron staining with a 3mm weathering rind. 73.60m,85°,JT, UN,SM, 0,Iron staining. 74.10m,70°,JT, UN,RG, 0,Iron staining. 76.40m,73°,JT, UN,SM, 0,Clean. 78.10m,62°,JT, PL,SM, 0,Clean. 79.10m,68°,JT, PL,RG, 0,Clean.		Bentonite

Drill Fluid Notes:

Remarks

Hole Depth (m): 100

Cluster:

Start Date: 25/11/2025

End Date: 01/12/2025

Page Depth: 10.00

BOREHOLE ROCK LOG

DRILLHOLE No.: MW-01

SHEET 9 OF 23

Job No.: BGL000206a

CLIENT: Stevenson Aggregates Ltd
PROJECT NAME: SAL Clevedon Expansion
LOCATION: Clevedon Quarry
DRILLING CONTRACTOR: Brown Brothers

COORDINATES: 428412mE, 782896mN, (Mt Eden 2000)
GRID: Mt Eden 2000
ELEVATION: 264.5m

ORIENTATION: 0
INCLINATION: 90
HOLE DEPTH: 100.00m
DRILL TYPE: HQTT
LOGGED BY: ASW

UNIT	DESCRIPTION	GRAPHIC	WEATHERING (UW SW MW HW)	STRENGTH (ES VS S MS W VW)	DEPTH & ELEVATION	SAMPLES	CORE LENGTH & SIZE	CORE LOSS (%)	RQD (%)	FRACTURE SPACING (mm)	DISCONTINUITIES DESCRIPTION	WATER	INSTALLATION
lTr d	[CONT] Slightly weathered, dark grey, fine, SANDSTONE (Greywacke), strong, closely spaced, steeply to very steeply inclined joint sets stained orange.				184								
					81		1.5m	0	13		80.80m,60°,JT, PL,RG, 2,2mm silt infil.		
					183						81.20m,86°,JT, UN,SM, 2,2mm grey clay infil.		
					82		1.4m	0	19	200	81.80m,75°,JT, UN,RG, 2,Iron staining with a 2mm weathering rind.		
			SW	S	182								
					83		1.5m	0	10	150	83.20m,85°,JT, UN,RG, 0,Clean.		
					181								
					84						84.10m,81°,JT, PL,RG, 1,Iron staining with a 1mm weathering rind.		
	84.50m - 86.90m: Unweathered, dark grey, fine SANDSTONE (Greywacke), very weak, closely spaced, sub-vertical joint sets.				180								
					85		1.5m	0	87		85.50m,76°,JT, UN,SM, 0,Clean.		
			UW	VS	179								
					86		1.5m	0	67	300	86.00m,50°,JT, PL,RG, 0,Iron staining.		
					178								
					87						86.90m,64°,JT, UN,SM, 0,Quartz infil.		
			SW	S	177								87.00 Bentonite
					88		1.3m	0	0	200	88.00m,86°,JT, UN,RG, 0,Iron staining.		
					176								
			UW	VS	89		0.9m	0	0	150	89.40m,69°,JT, PL,RG, 0,Iron staining.		
	88.20m - 89.60m: Unweathered, dark grey, fine SANDSTONE (Greywacke), very weak, closely spaced, sub-vertical joint sets.				175								Sand
			SW	S			1.5m	0	37		89.70m,80°,JT, UN,RG, 0,Iron		89.55 K2 Sand

Drill Fluid Notes:

Remarks

Hole Depth (m): 100

Cluster:

Start Date: 25/11/2025

End Date: 01/12/2025

Page Depth: 10.00

BOREHOLE ROCK LOG

DRILLHOLE No.: MW-01

SHEET 10 OF 23

Job No.: BGL000206a

CLIENT: Stevenson Aggregates Ltd
PROJECT NAME: SAL Clevedon Expansion
LOCATION: Clevedon Quarry
DRILLING CONTRACTOR: Brown Brothers

COORDINATES: 428412mE, 782896mN, (Mt Eden 2000)
GRID: Mt Eden 2000
ELEVATION: 264.5m

ORIENTATION: 0
INCLINATION: 90
HOLE DEPTH: 100.00m
DRILL TYPE: HQTT
LOGGED BY: ASW

UNIT	DESCRIPTION	GRAPHIC	WEATHERING (UW SW MW HW)	STRENGTH (ES VS S MS W VW)	DEPTH & ELEVATION	SAMPLES	CORE LENGTH & SIZE	CORE LOSS (%) (25 50 75)	RQD (%) (75 50 25)	FRACTURE SPACING (mm) (500 400 300 200 100)	DISCONTINUITIES DESCRIPTION	WATER	INSTALLATION
lTr d	[CONT] Slightly weathered, dark grey, fine, SANDSTONE (Greywacke), strong, closely spaced, steeply to very steeply inclined joint sets stained orange. 91.30m: Quartz veins oriented at 50 degrees. Unweathered, dark grey, fine SANDSTONE (Greywacke), very strong, moderately widely spaced, steeply inclined joint sets. EOH: 100.00m		SW UW	S VS	174 173 172 171 170 169 168 167 166 165 91 92 93 94 95 96 97 98 99		1.5m 1m 1m 1.5m 1.5m 1.2m 0.8m 0.8m 1m	0 0 0 0 0 0 0 0 0	37 0 28 80 0 0 0 88 0	150 250 300 150 100 400 300	staining. 90.70m,86°,JT, UN,RG, 0,Iron staining. 91.50m,47°,JT, UN,SM, 0,Clean. 92.50m,65°,JT, UN,SM, 0,Clean. 93.10m,63°,JT, UN,RG, 0,Quartz infill. 93.60m,74°,JT, UN,RG, 0,Clean. 95.60m,85°,JT, UN,RG, 0,Clean. 96.90m,71°,JT, UN,RG, 0,Clean. 97.50m,41°,JT, PL,SM, 0,Quartz infill. 98.30m,65°,JT, UN,SM, 0,Clean. 99.50m,55°,JT, PL,SM, 0,2mm silt infill. 99.70m,52°,JT, UN,RG, 0,Clean.		89.55 K2 Sand

Drill Fluid Notes:

Remarks

Hole Depth (m): 100

Cluster:

Start Date: 25/11/2025

End Date: 01/12/2025

Page Depth: 10.00

BASELINE GEOTECHNICAL

CORE PHOTOS

HOLE No.: **MW-01**

JOB No.: BGL000206a

Box 1, 0.0-5.1m



Box 2, 5.1-8.7m



Box 3, 8.7-11.6m



BASELINE GEOTECHNICAL

CORE PHOTOS

HOLE No.: MW-01

JOB No.: BGL000206a

Box 4, 11.6-15.6m



Box 5, 15.6-19.5m



Box 6, 19.5-22.6m



BASELINE GEOTECHNICAL

CORE PHOTOS

HOLE No.: **MW-01**

JOB No.: BGL000206a

Box 7, 22.6-26.6m



Box 8, 26.6-29.4m



Box 9, 29.4-32.0m



BASELINE GEOTECHNICAL

CORE PHOTOS

HOLE No.: **MW-01**

JOB No.: BGL000206a

Box 10, 32.0-34.4m



Box 11, 34.4-37.2m



Box 12, 37.2-39.7m



BASELINE GEOTECHNICAL

CORE PHOTOS

HOLE No.: **MW-01**

JOB No.: BGL000206a

Box 13, 39.7-42.4m



Box 14, 42.4-45.8m



Box 15, 45.8-47.9m



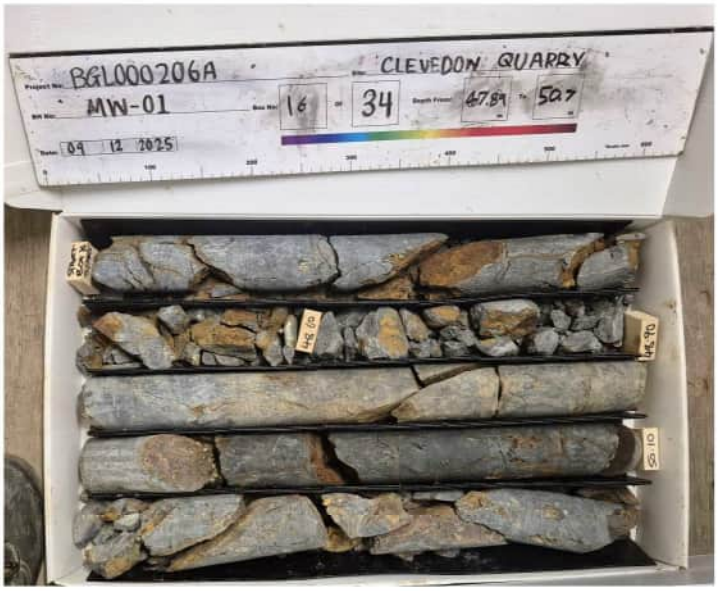
BASELINE GEOTECHNICAL

CORE PHOTOS

HOLE No.: **MW-01**

JOB No.: BGL000206a

Box 16, 47.9-50.7m



Box 17, 50.7-53.3m



Box 18, 53.3-55.9m



BASELINE GEOTECHNICAL

CORE PHOTOS

HOLE No.: **MW-01**

JOB No.: BGL000206a

Box 19, 55.9-58.4m



Box 20, 58.4-61.1m



Box 21, 61.1-65.9m



BASELINE GEOTECHNICAL

CORE PHOTOS

HOLE No.: **MW-01**

JOB No.: BGL000206a

Box 22, 65.9-68.7m



Box 23, 68.7-71.1m



Box 24, 71.1-73.8m



BASELINE GEOTECHNICAL

CORE PHOTOS

HOLE No.: **MW-01**

JOB No.: BGL000206a

Box 25, 73.8-76.4m



Box 26, 76.4-79.0m



Box 27, 79.0-81.8m



BASELINE GEOTECHNICAL

CORE PHOTOS

HOLE No.: **MW-01**

JOB No.: BGL000206a

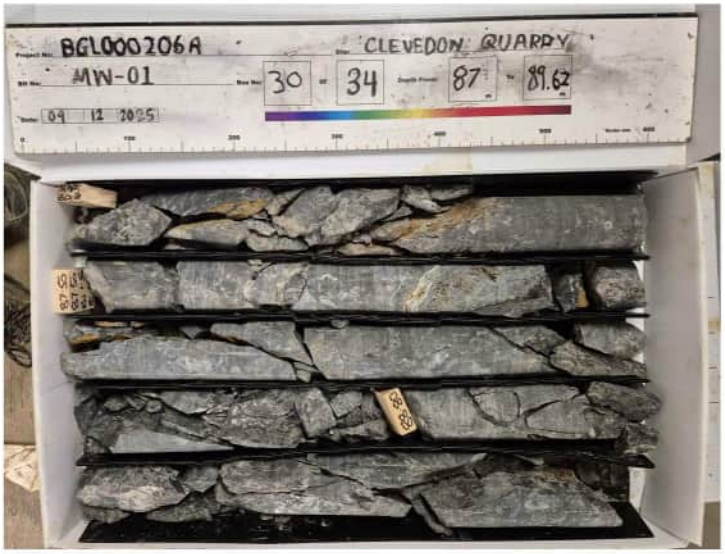
Box 28, 81.8-84.3m



Box 29, 84.3-87.0m



Box 30, 87.0-89.6m



BASELINE GEOTECHNICAL

CORE PHOTOS

HOLE No.: **MW-01**

JOB No.: BGL000206a

Box 31, 89.6-92.2m



Box 32, 92.2-94.9m



Box 33, 94.9-97.5m



BASELINE GEOTECHNICAL

CORE PHOTOS

HOLE No.: **MW-01**

JOB No.: BGL000206a

Box 34, 97.5-100.0m



Appendix D – RDCL downhole geophysics defect log

RDCL®

Unit A3, 269a Mt Smart Road
Onehunga
Auckland, 1061
New Zealand

Ph: +64 6 8771652
Fax: +64 6 8775015
Email: info@rdcl.co.nz
www.rdcl.co.nz

Basic Information:

Drill hole ID:	MW-01
Client:	Stevenson Aggregates Ltd
Run Number(s):	01, 02, 04
Tool Type(s):	ABI40-2G-VLB Acoustic Televiewer OBI40-2G Optical Televiewer QL40-CAL Mechanical Calliper
Service Company:	RDCL
Operator:	L Peters
Date Logged:	04/12/2025
Field:	Clevedon Quarry
State / Province:	Auckland
Country:	New Zealand

Location Description:

At the top of a ridge, approximately 840 m southeast of the Clevedon Quarry office.

Drillhole Information:

Log interval from (m):	20.50	Log interval to (m):	100.27
Depth Driller (m):	100.00	Depth Logger (m):	100.19
Fluid Type:	Water	Fluid Level (m):	42.75 (ATV)
Easting:	1785334.85	Northing:	5899589.69
Elevation:	N/A	Coord Ref System:	NZTM
Hole Azimuth:	Vertical	Hole Inclination:	<-88.2°
Magnetic Declination:	+20° 26' East	Magnetic Inclination:	62° 53'
Drill Company:	Brown Bros Drilling		

Printing Information:

Depth Unit:	Metres	Log Scale:	1:10	Log Version:	Final
Processed:	K Seth			Log Reviewer:	E Brim

Bit Size Record:

Size (mm):	From (m):	To (m):
HQ (96.0)	0.00	100.00
##.#	##.#	##.#
##.#	##.#	##.#
##.#	##.#	##.#

Casing Record:

Type:	Size:	From (m):	To (m):
HWT	101.6	-0.32	20.83
XX	##.#	##.#	##.#
XX	##.#	##.#	##.#
XX	##.#	##.#	##.#

Structural Legend:

- BP - Bedding Plane
- BF - Bedding Fracture
- JT - Joint
- FR - Fracture
- FZ - Fractured Zone
- SH - Shear
- CZ - Crushed Zone
- IF - Infilled Zone
- DZ - Decomposed Zone
- UF - Unidentified Feature

Log Nomenclature:

Azimuth = Tool azimuth from magnetic north

Tilt = Inclination from vertical

Acoustic Calliper = 360° average from travel time

Calliper from Cent = Calliper derived from travel time

Image-NM = Optical image oriented to magnetic north

Amplitude-NM = Acoustic amplitude (magnetic north)

Structures = Apparent Structures oriented to hole

Structures - True =Structures Oriented to true north

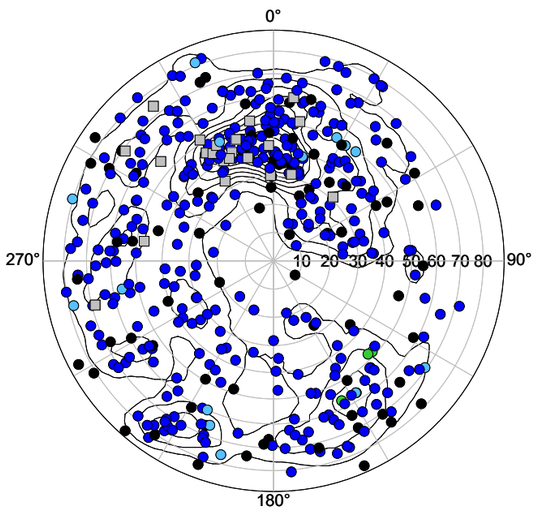
3D Optical = 3D representation of optical log

3D Acoustic = 3D representation of acoustic log

Comments:

1. Structures - True are reported in dip direction and dip relative to grid north.
2. Coordinates were obtained via Google Earth and are approximate.
3. No geotech logs or core logs were made available to RDCL during processing. As such, classification of defects should be checked by user.

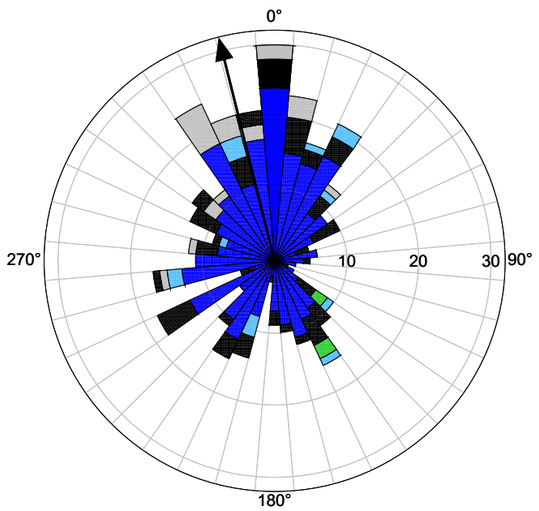
Stereoplot - Polar Projection Dip



Schmidt Plot - Upper (Northern) Hemisphere - Structures - True

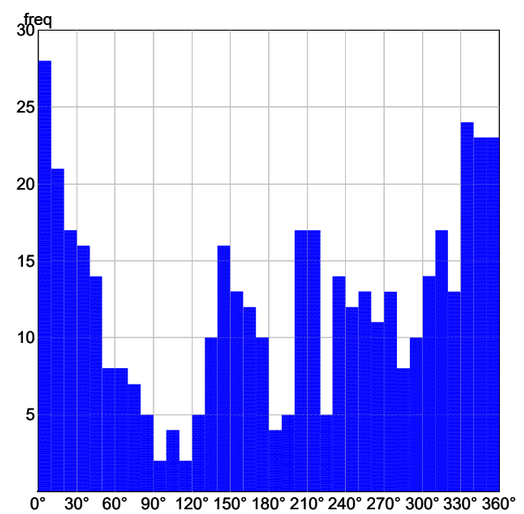
Depth: 20.83 m to 100.27 m

Rose Diagram - Azimuth



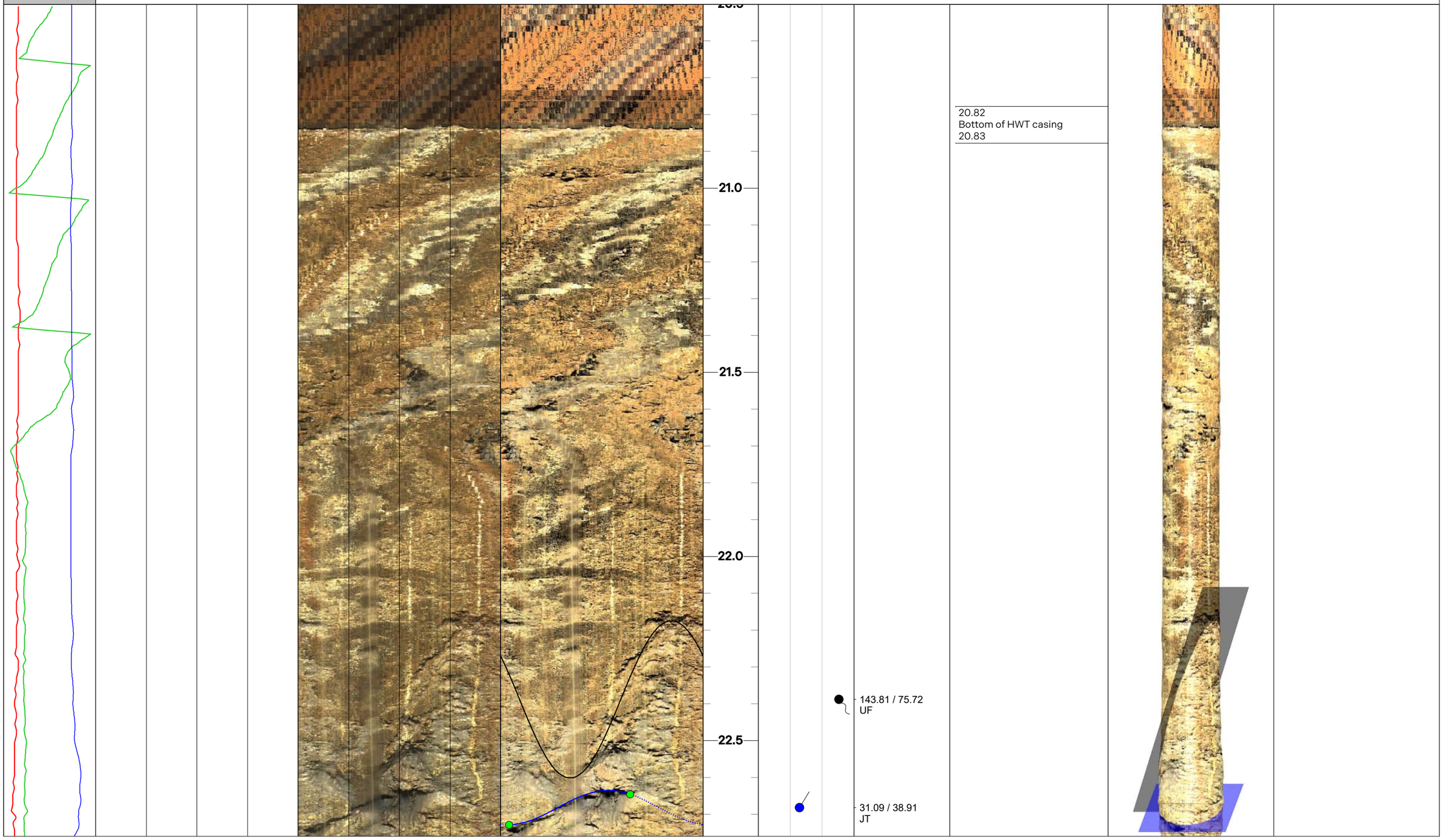
Depth: 20.83 m to 100.27 m

Histogram - Azimuth

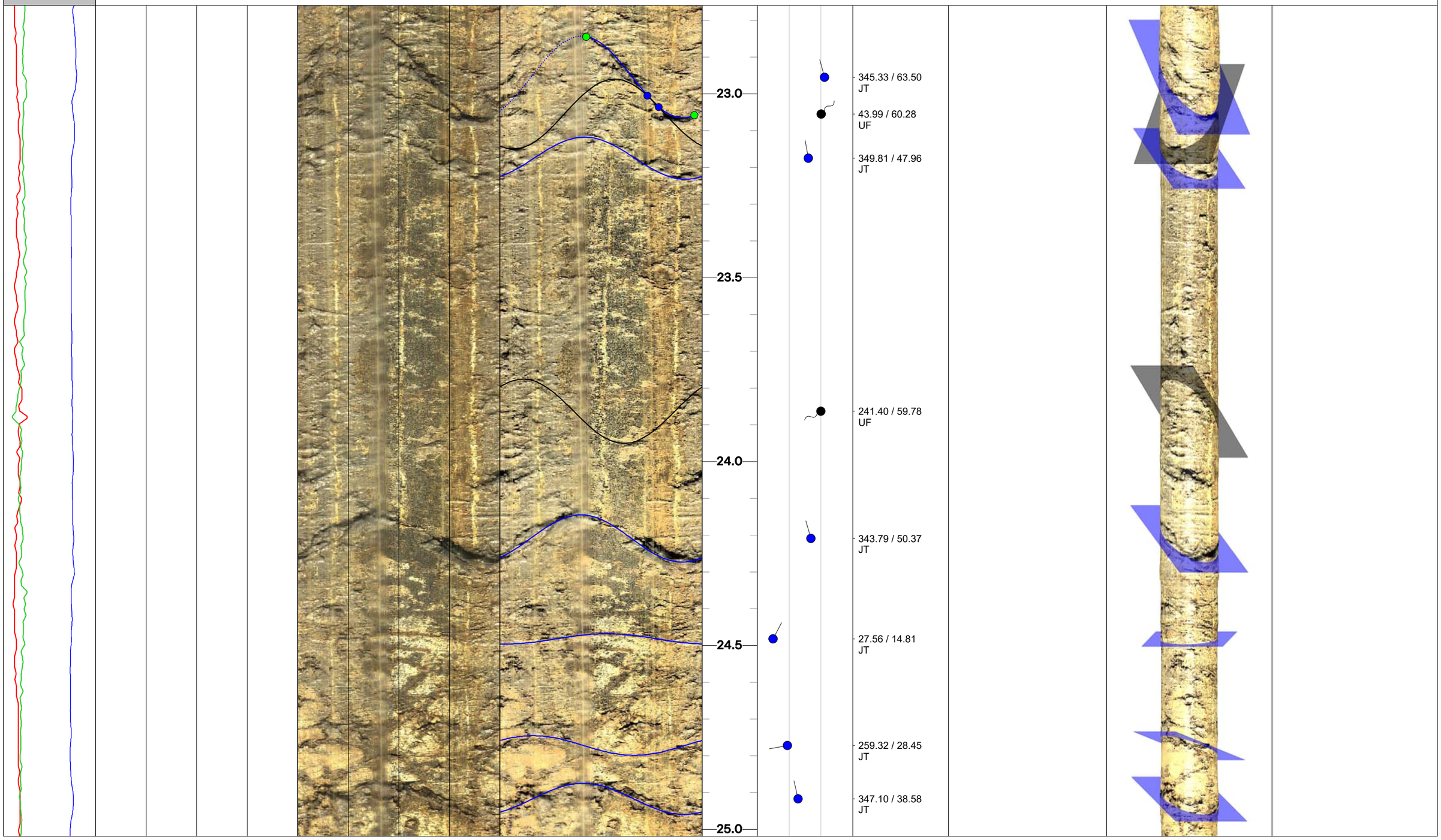


Depth: 20.83 m to 100.27 m

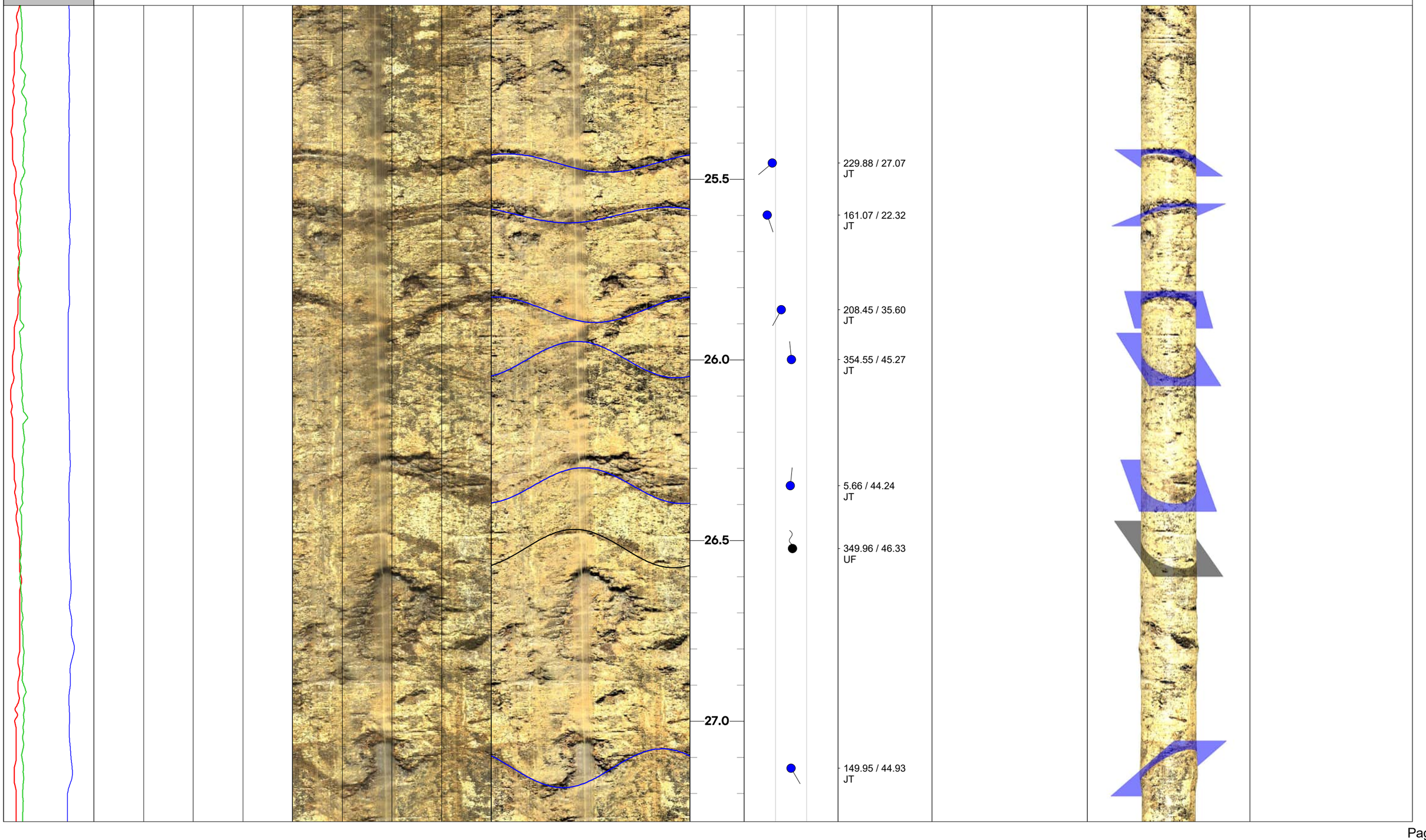
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth	0° 90° 180° 270° 0°	**Amplitude-NM**	**Structures**						
0 deg 360		0 10000	0° 90° 180° 270° 0°						
Calliper-Merged		0° 90° 180° 270° 0°							
0 mm 140									



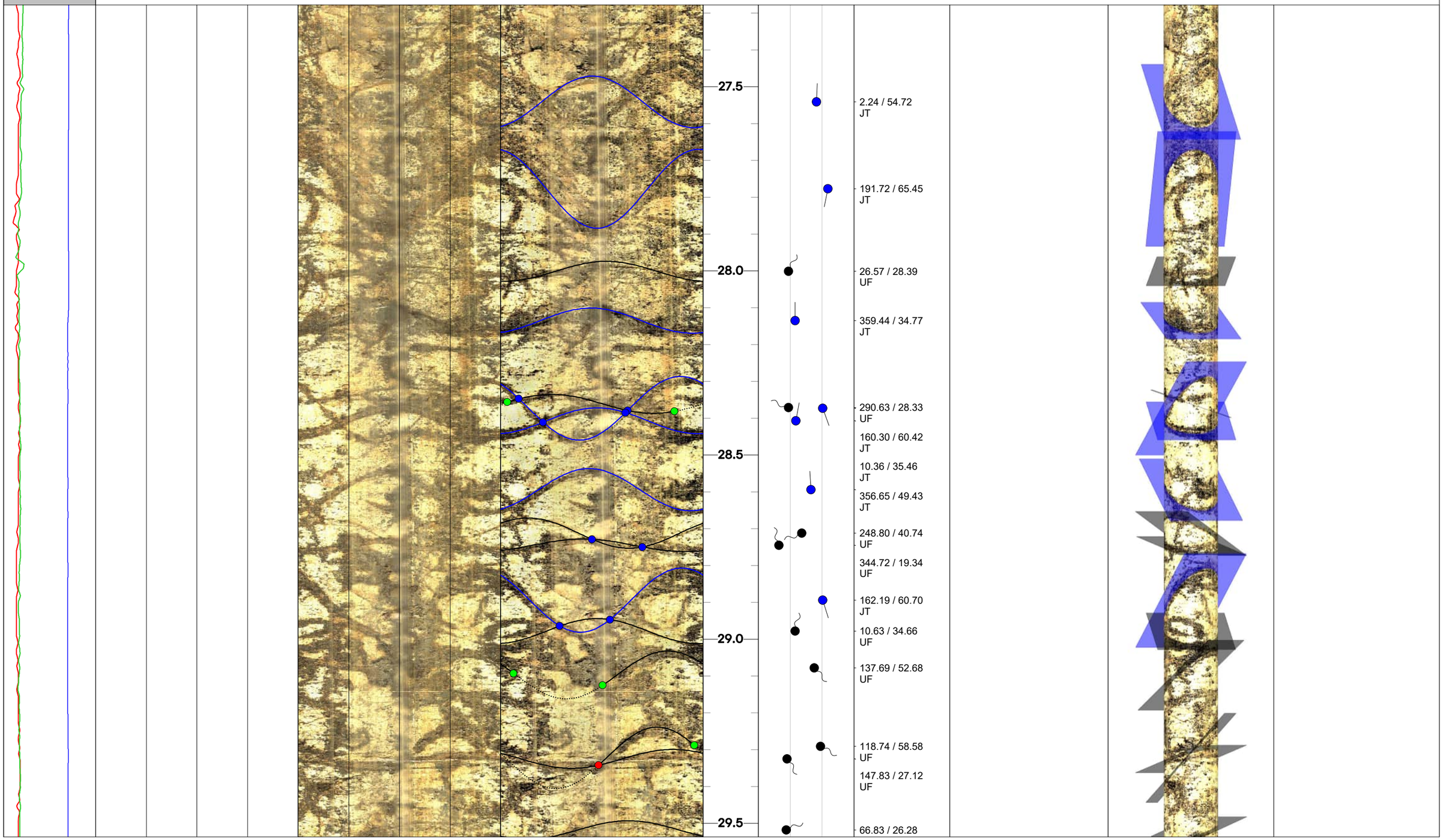
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0 deg 5	46 mm 54	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



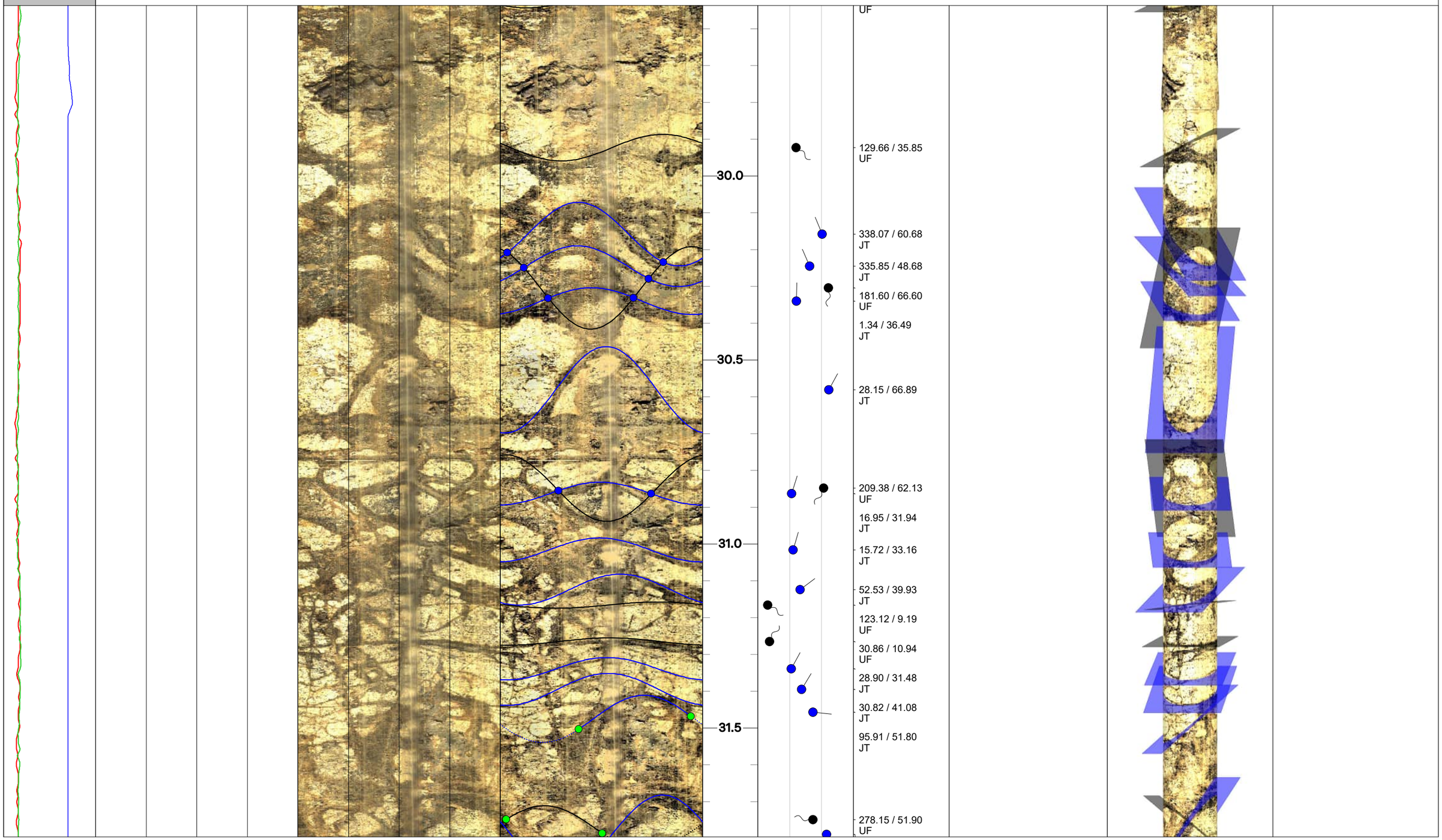
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0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



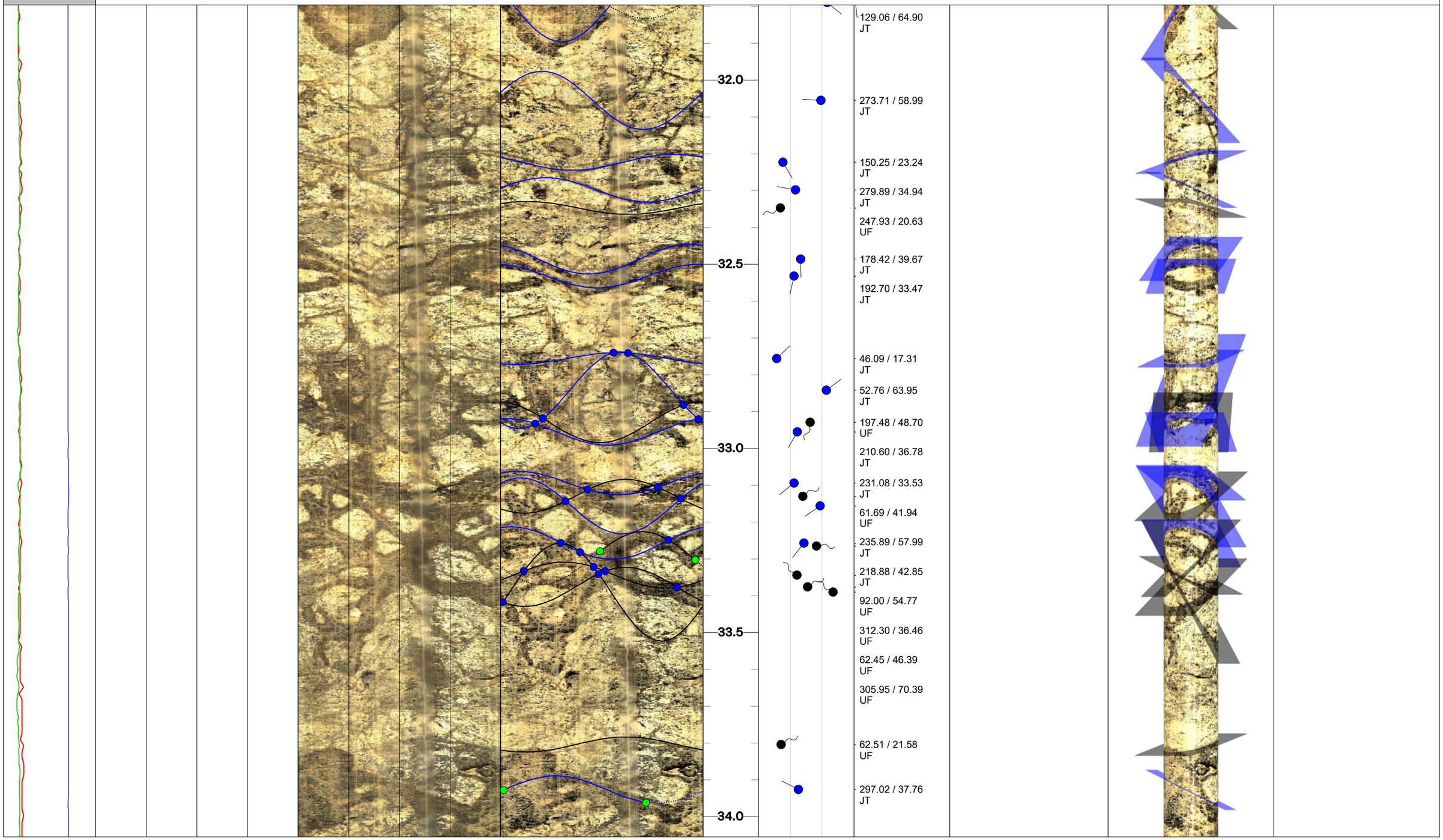
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Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



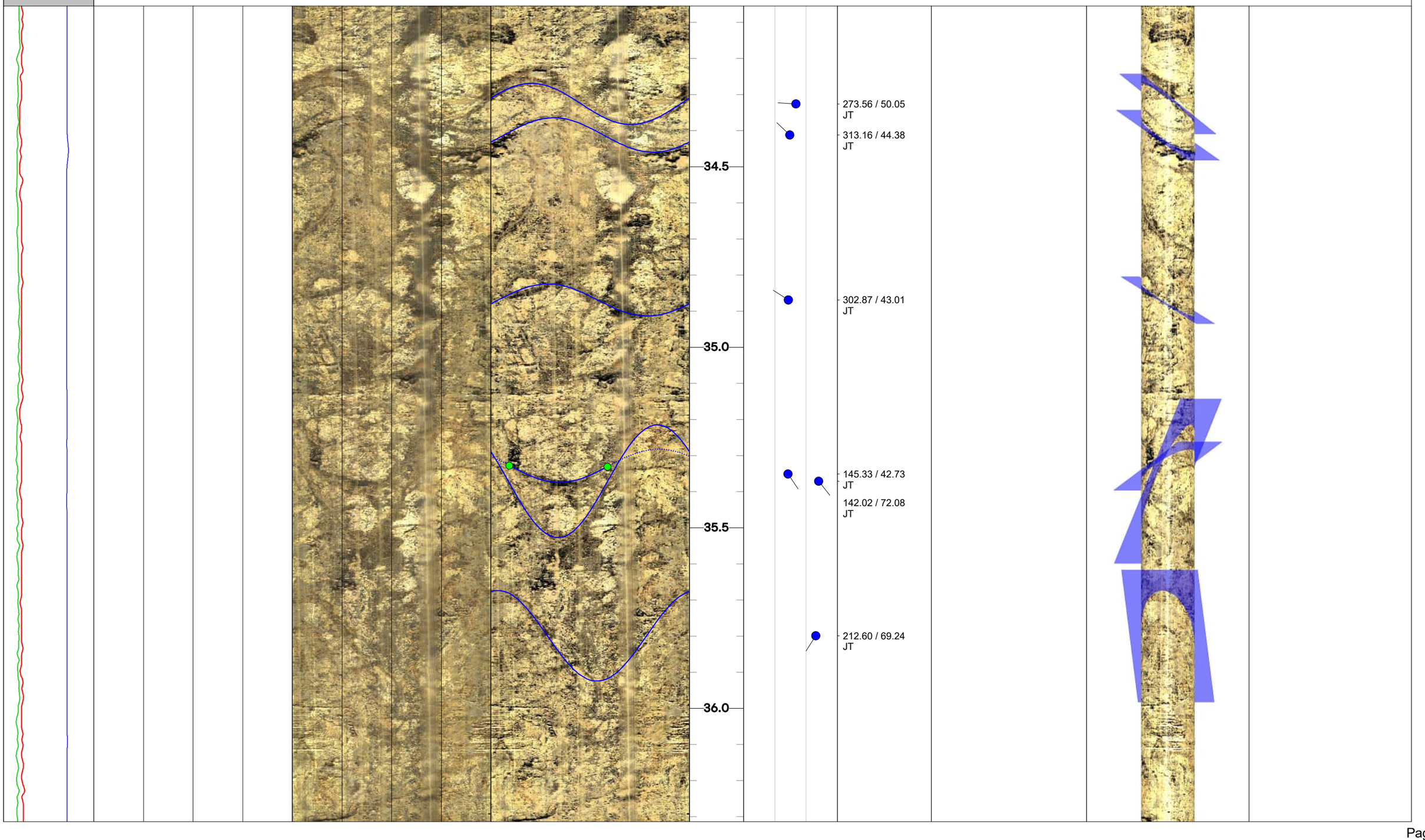
Tilt
0 deg 5
Azimuth
0 deg 360
Calliper-Merged
0 mm 140
Radius from Centralized TravelTime-NM
46 mm 54
0° 90° 180° 270° 0°
Image-NM
0° 90° 180° 270° 0°
Amplitude-NM
0 10000
0° 90° 180° 270° 0°
ImageProc-NM
0° 90° 180° 270° 0°
Structures
0° 90° 180° 270° 0°
Depth
1m:10m
Structures - True
0 90
Dip Direction / Dip
Comments
3D Optical
-0°
3D Acoustic
-0°



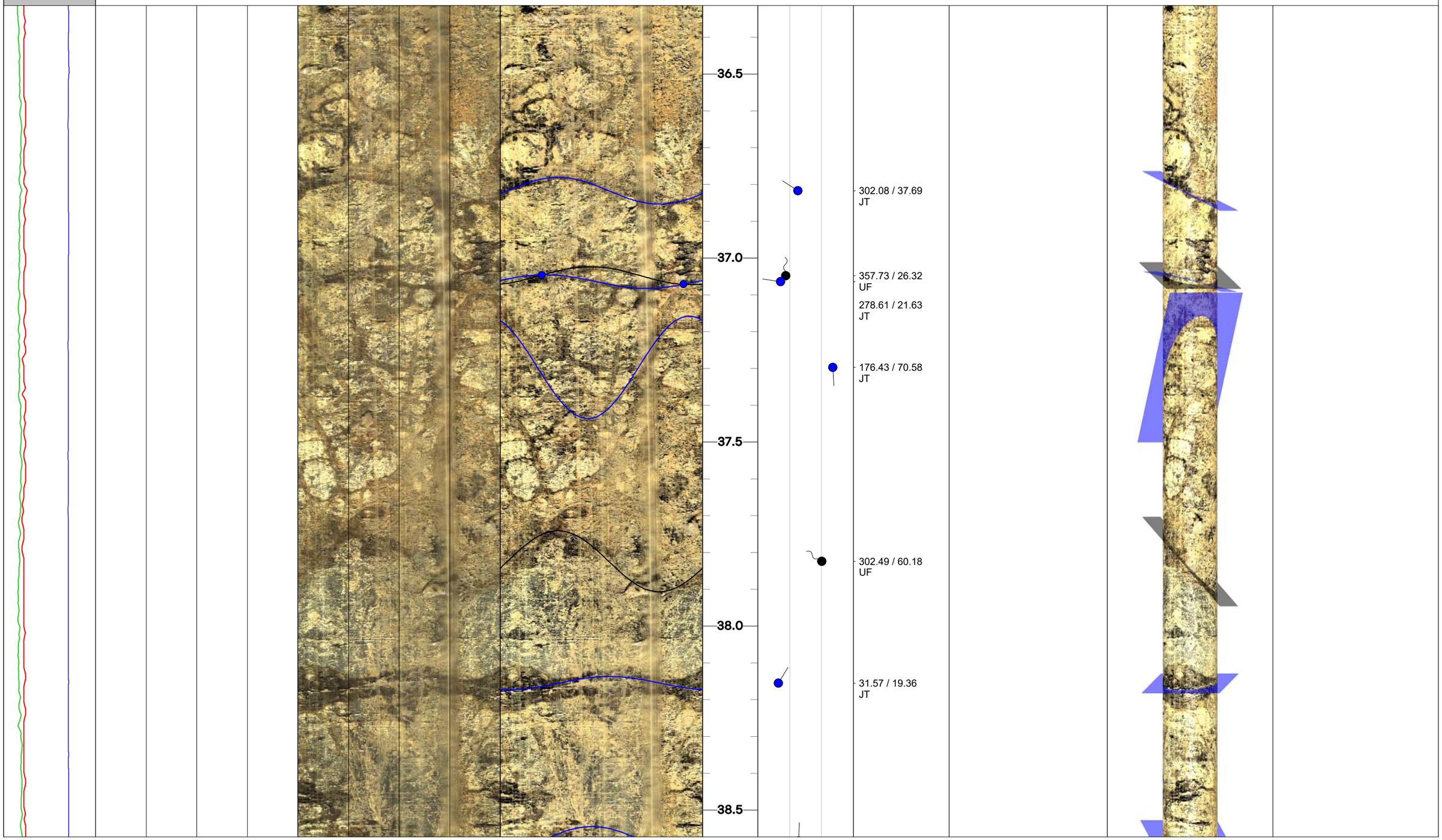
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Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



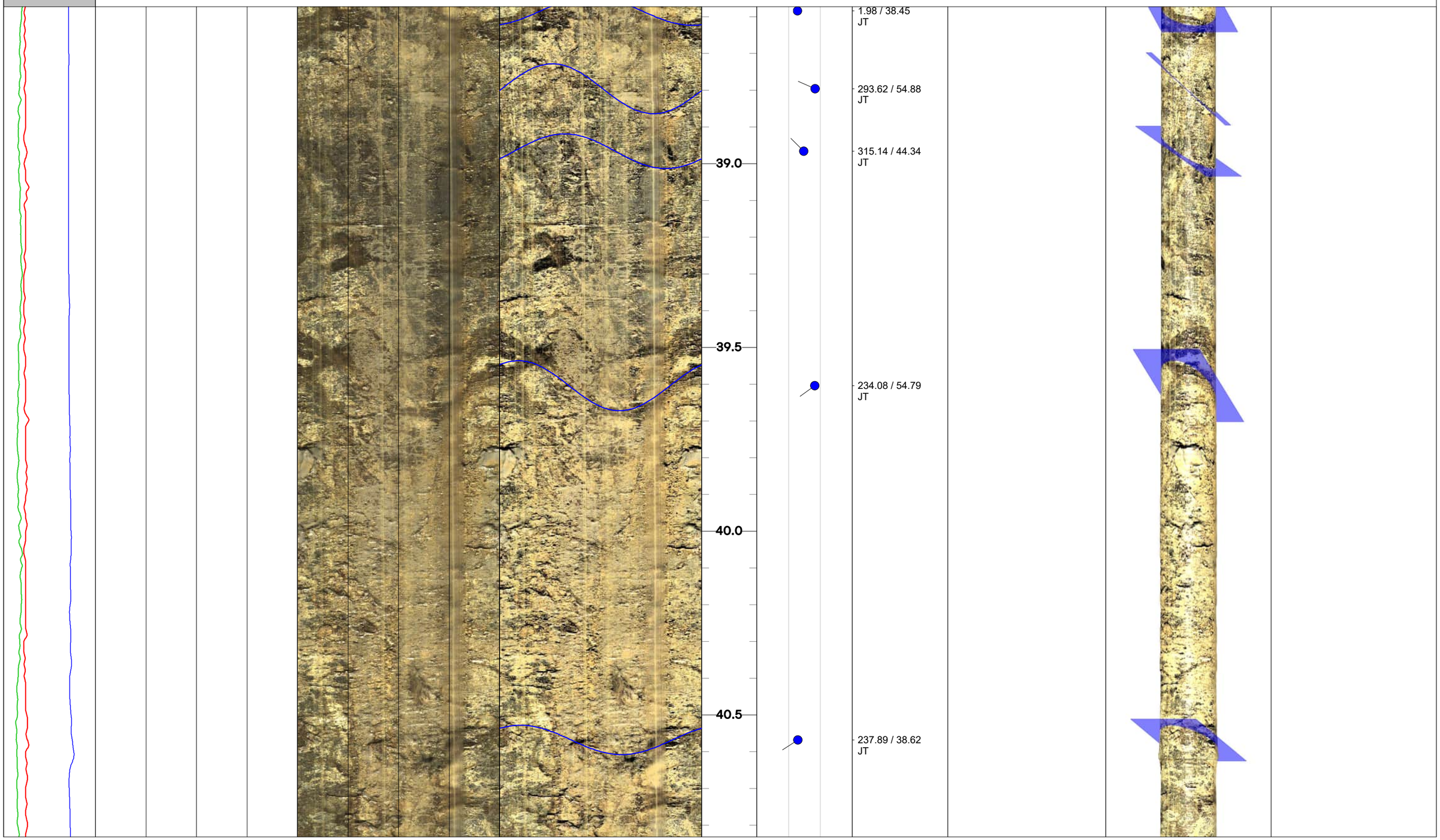
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0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



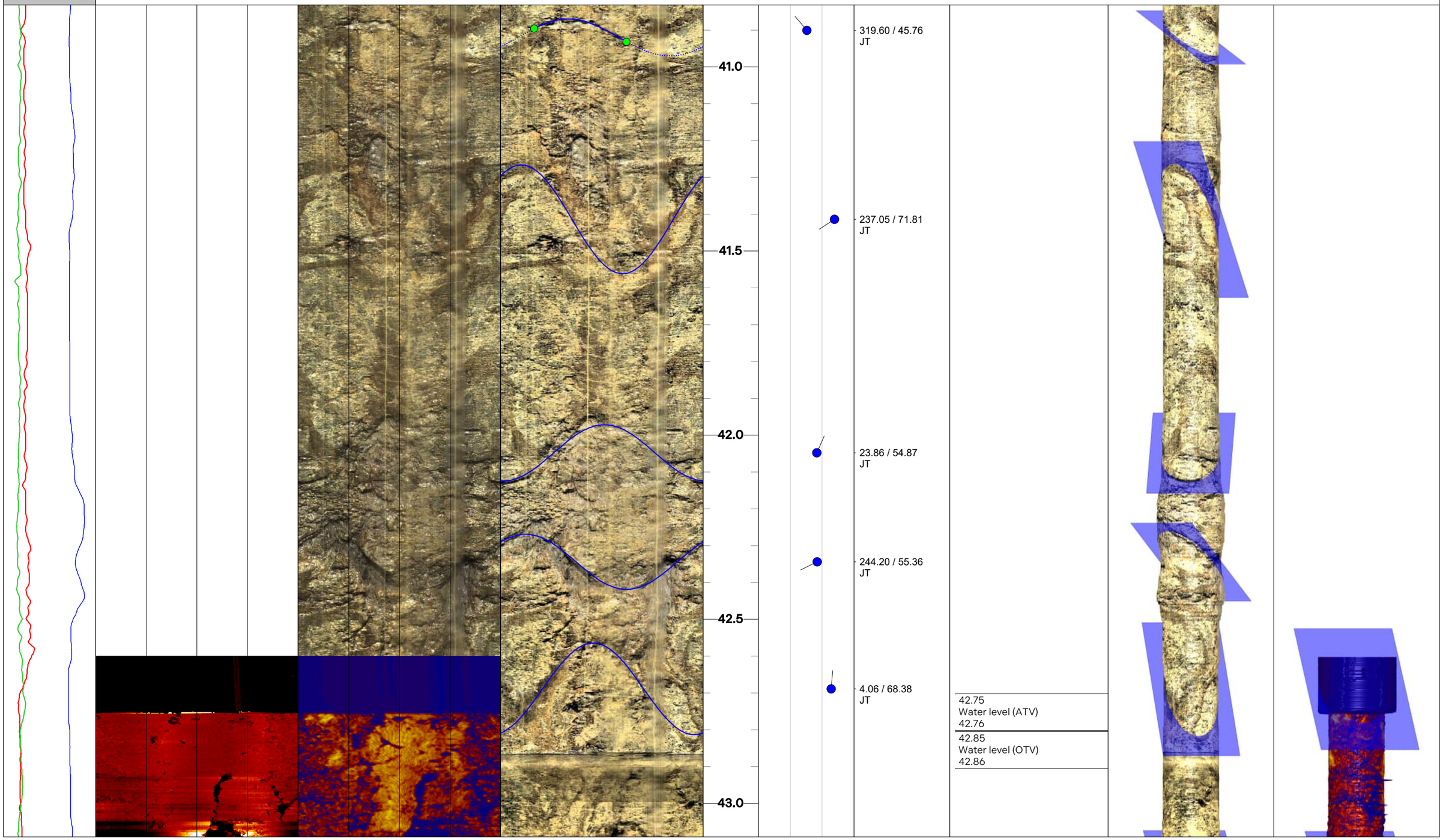
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360	0° 90° 180° 270° 0°	0 10000	0° 90° 180° 270° 0°						
Calliper-Merged		0° 90° 180° 270° 0°							
0 mm 140									



Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360	0° 90° 180° 270° 0°	0 10000	0° 90° 180° 270° 0°						
Calliper-Merged		0° 90° 180° 270° 0°							
0 mm 140									



Tilt
0 deg 5

Azimuth
0 deg 360

Calliper-Merged
0 mm 140

Radius from Centralized TravelTime-NM
46 mm 54
0° 90° 180° 270° 0°

Image-NM
0° 90° 180° 270° 0°

Amplitude-NM
0 10000
0° 90° 180° 270° 0°

ImageProc-NM
0° 90° 180° 270° 0°

Structures
0° 90° 180° 270° 0°

Depth
1m:10m

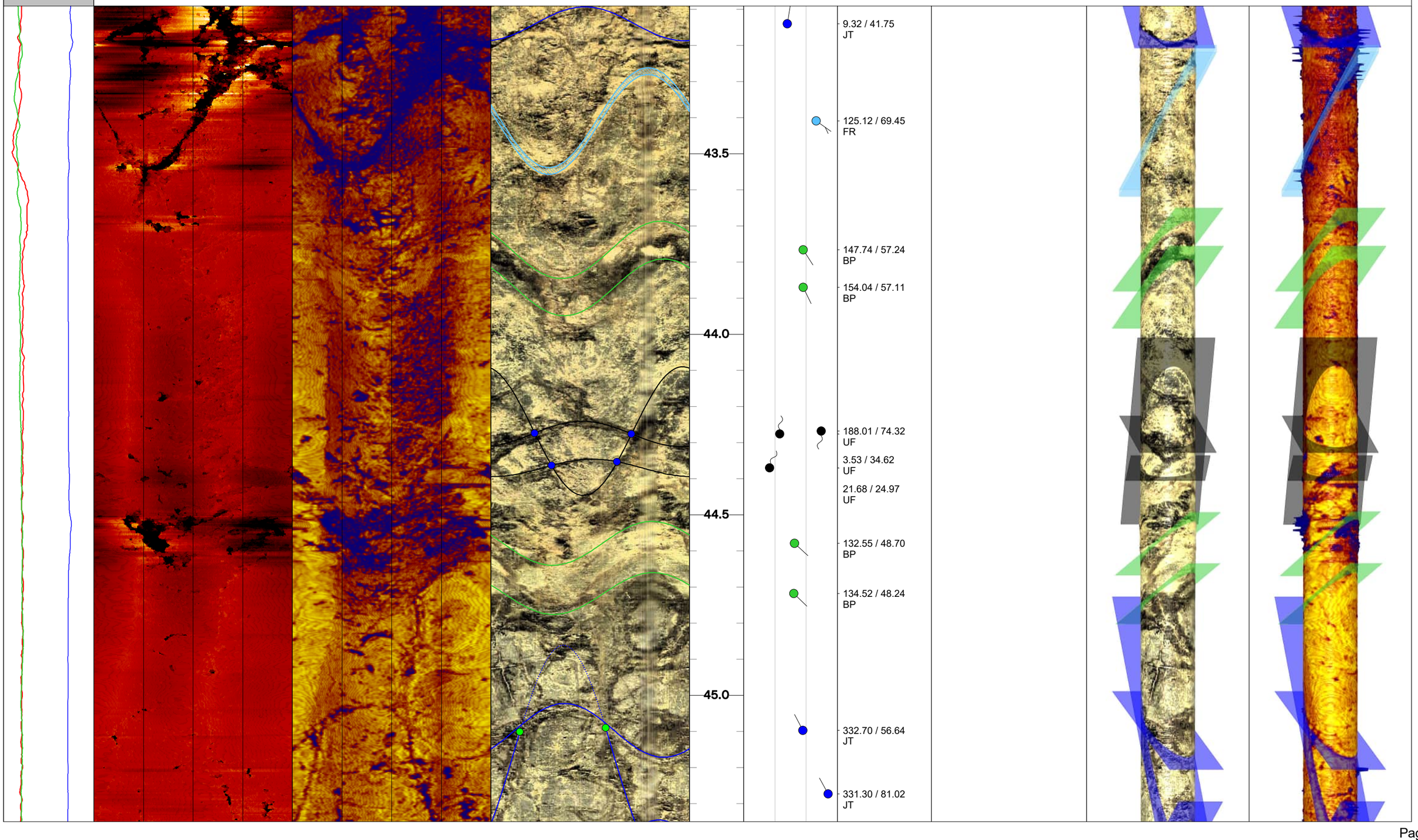
Structures - True
0 90

Dip Direction / Dip

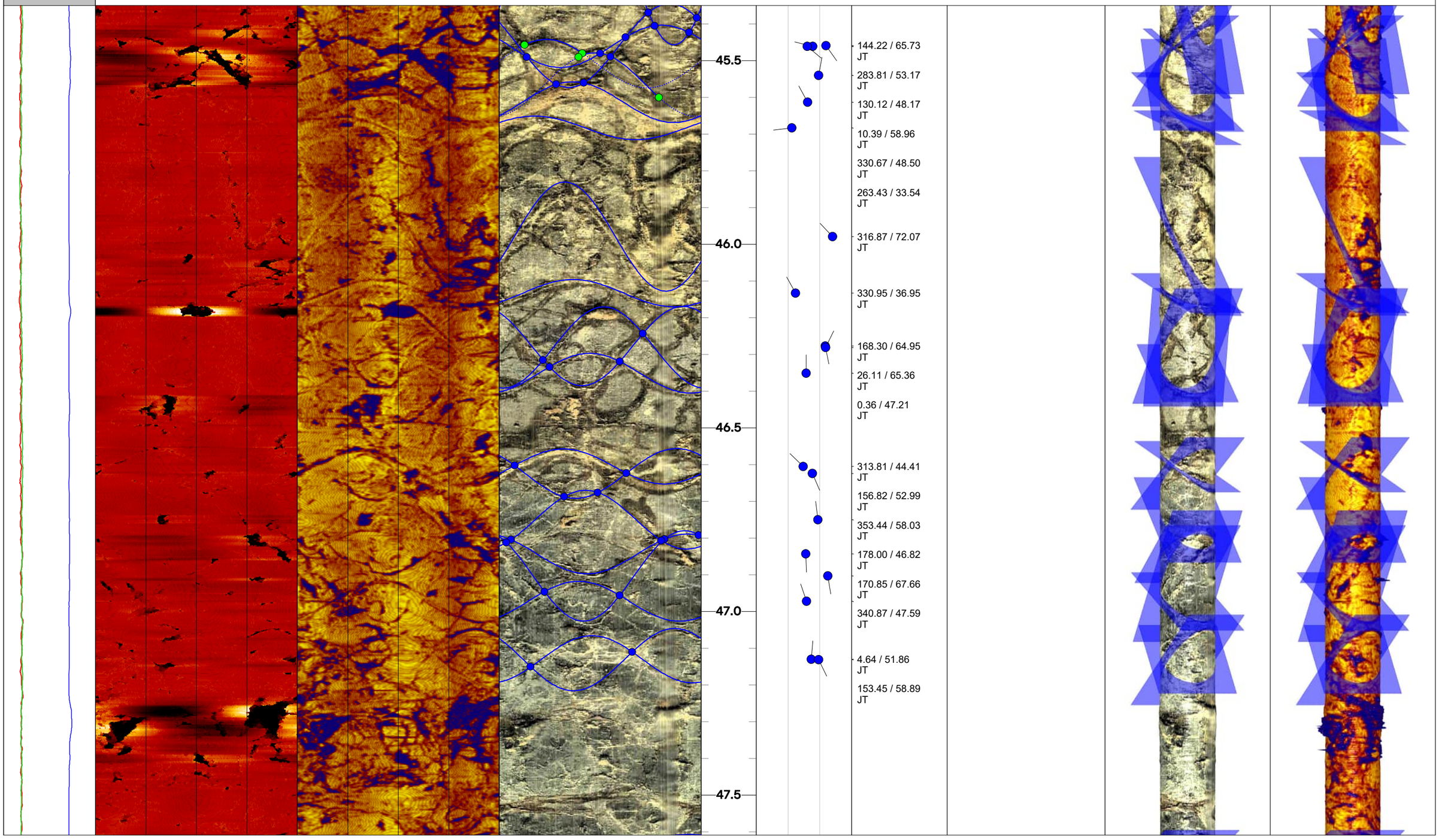
Comments

3D Optical
-0°

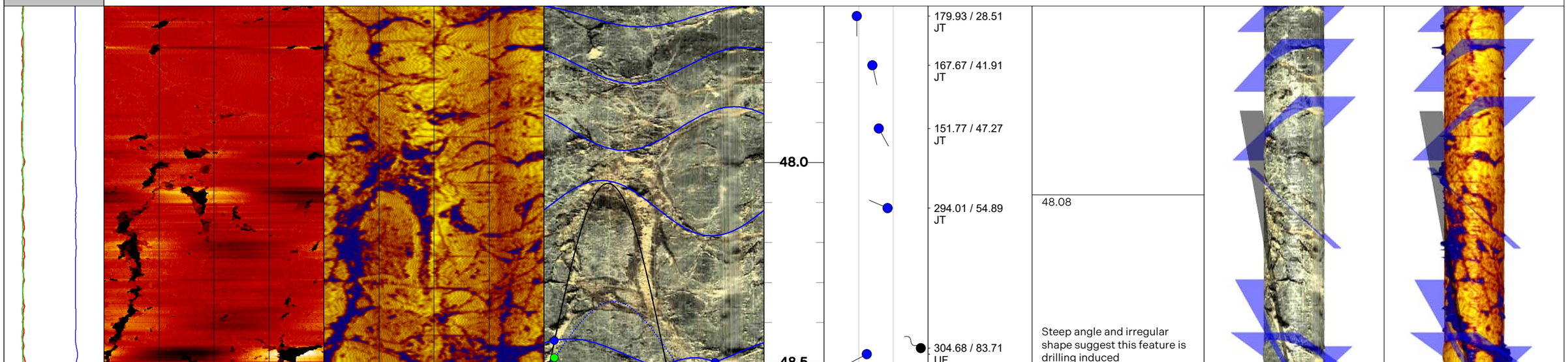
3D Acoustic
-0°



Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									

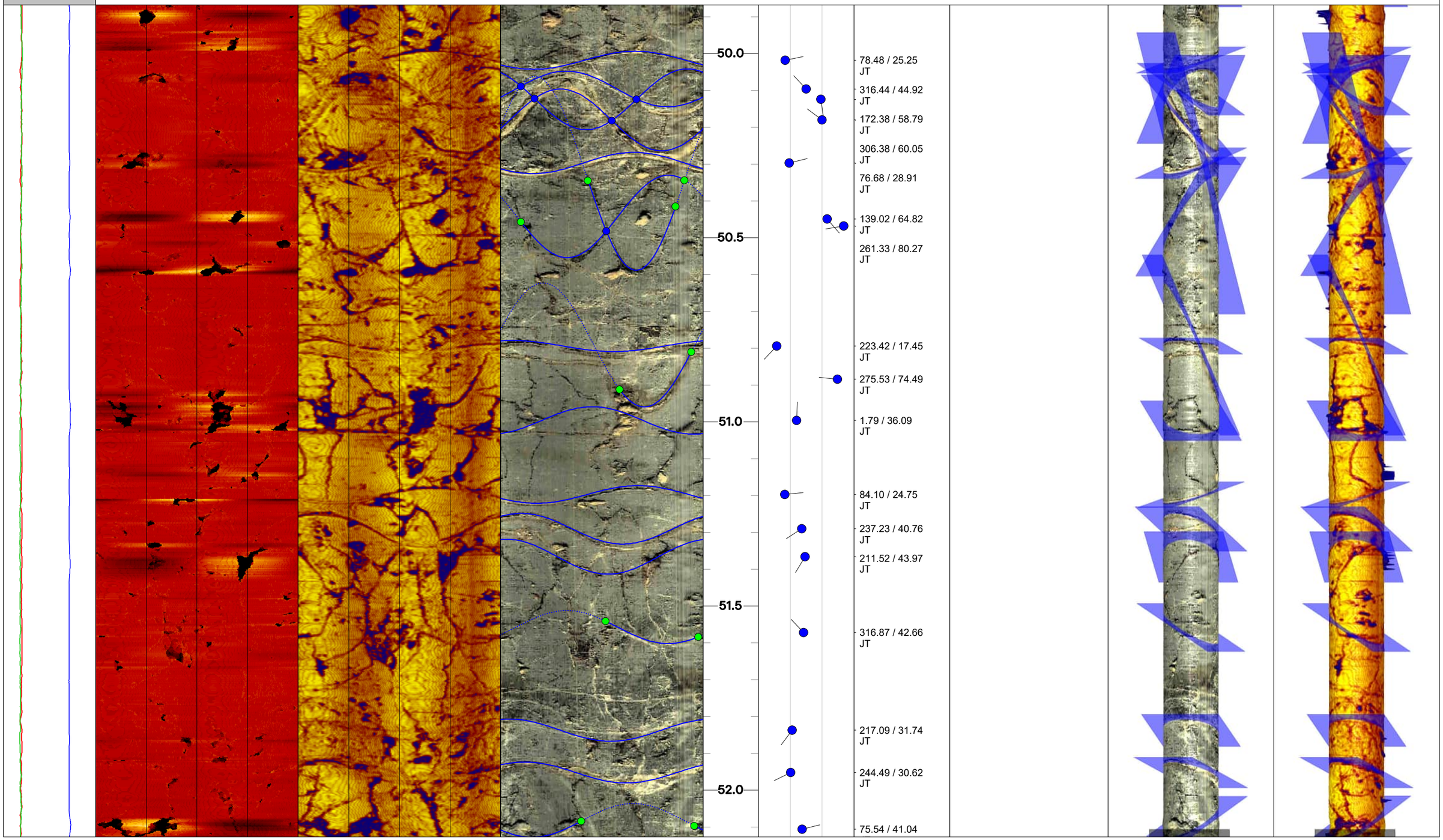


Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									

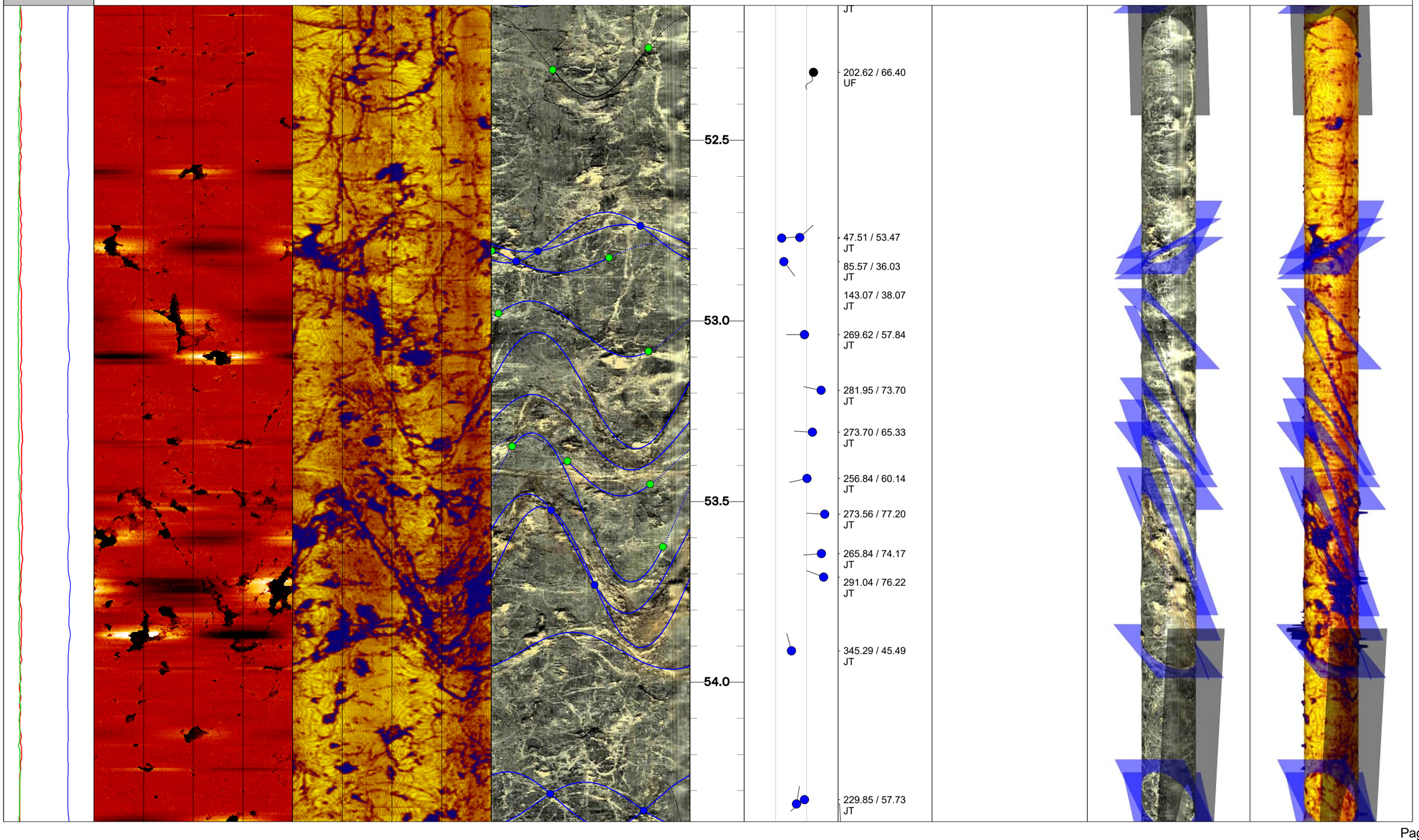


179.93 / 28.51 JT	
167.67 / 41.91 JT	
151.77 / 47.27 JT	
294.01 / 54.89 JT	
	48.08
304.68 / 83.71 UF	Steep angle and irregular shape suggest this feature is drilling induced
242.45 / 37.06 JT	
313.58 / 68.35 JT	
85.45 / 50.47 JT	
131.09 / 38.28 JT	
	48.83
12.17 / 36.00 JT	
298.16 / 78.96 UF	
133.84 / 65.06 UF	
299.38 / 70.89 UF	
258.25 / 40.02 JT	
266.59 / 27.61 JT	
219.61 / 55.78 JT	

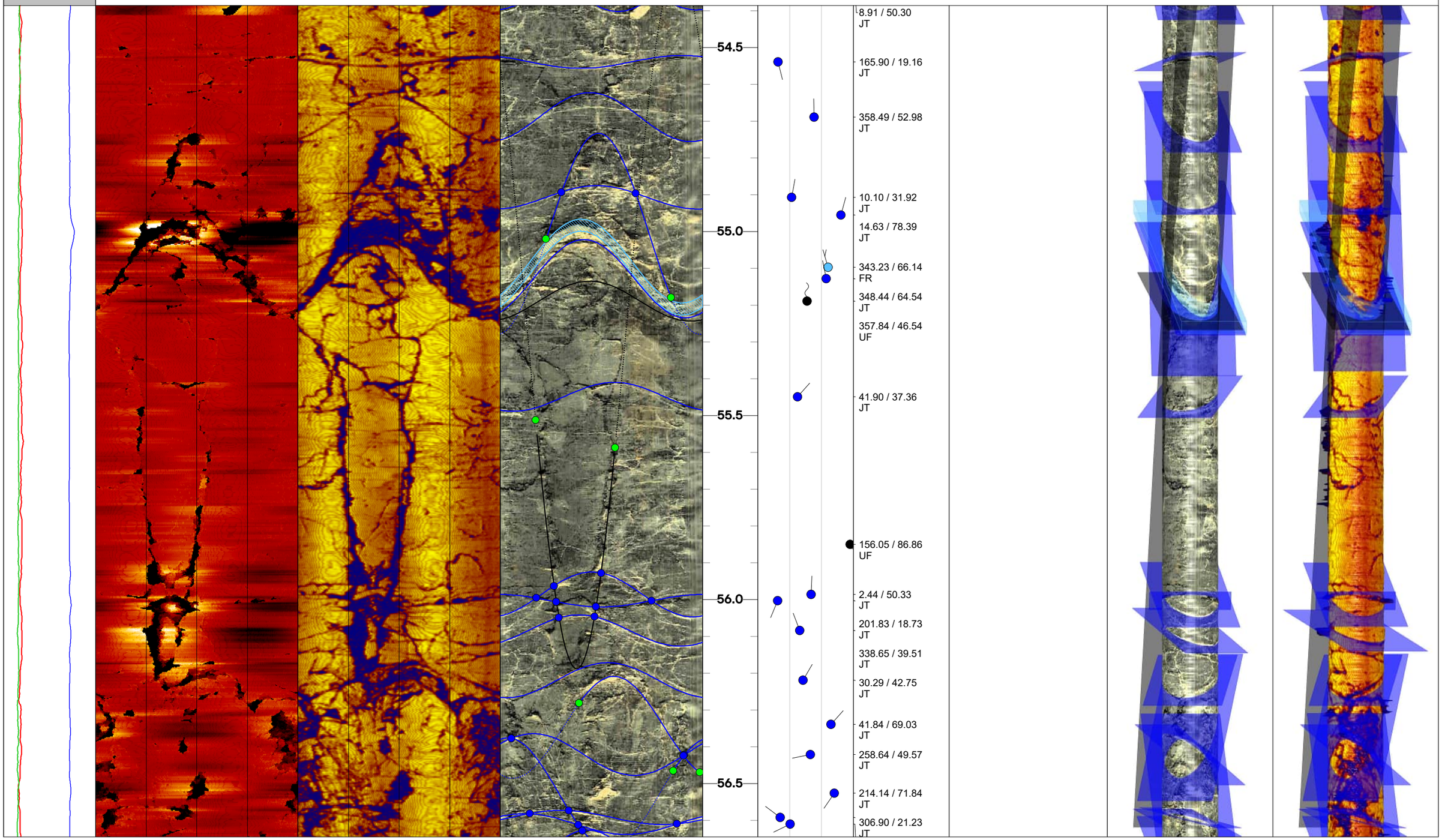
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



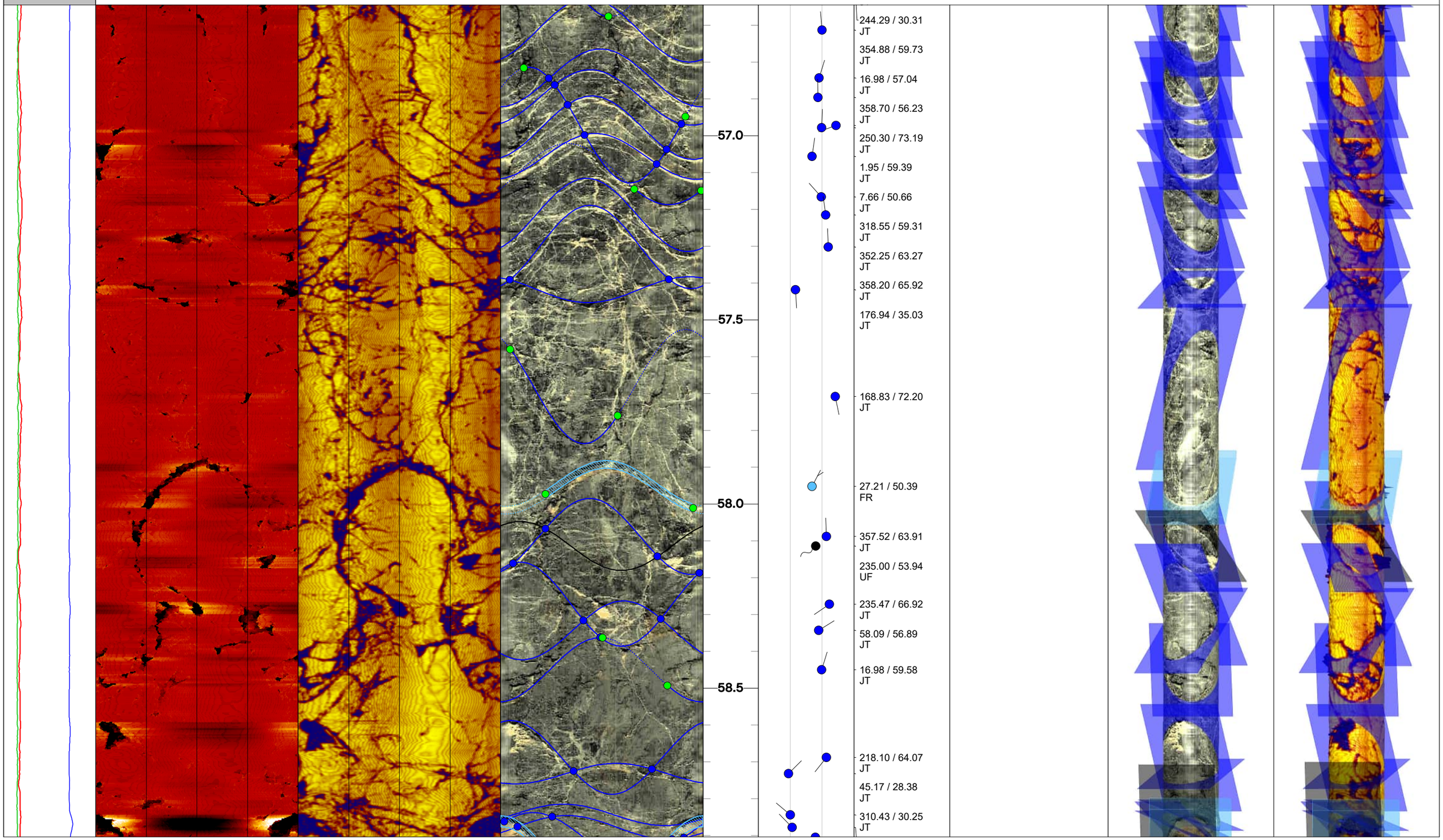
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



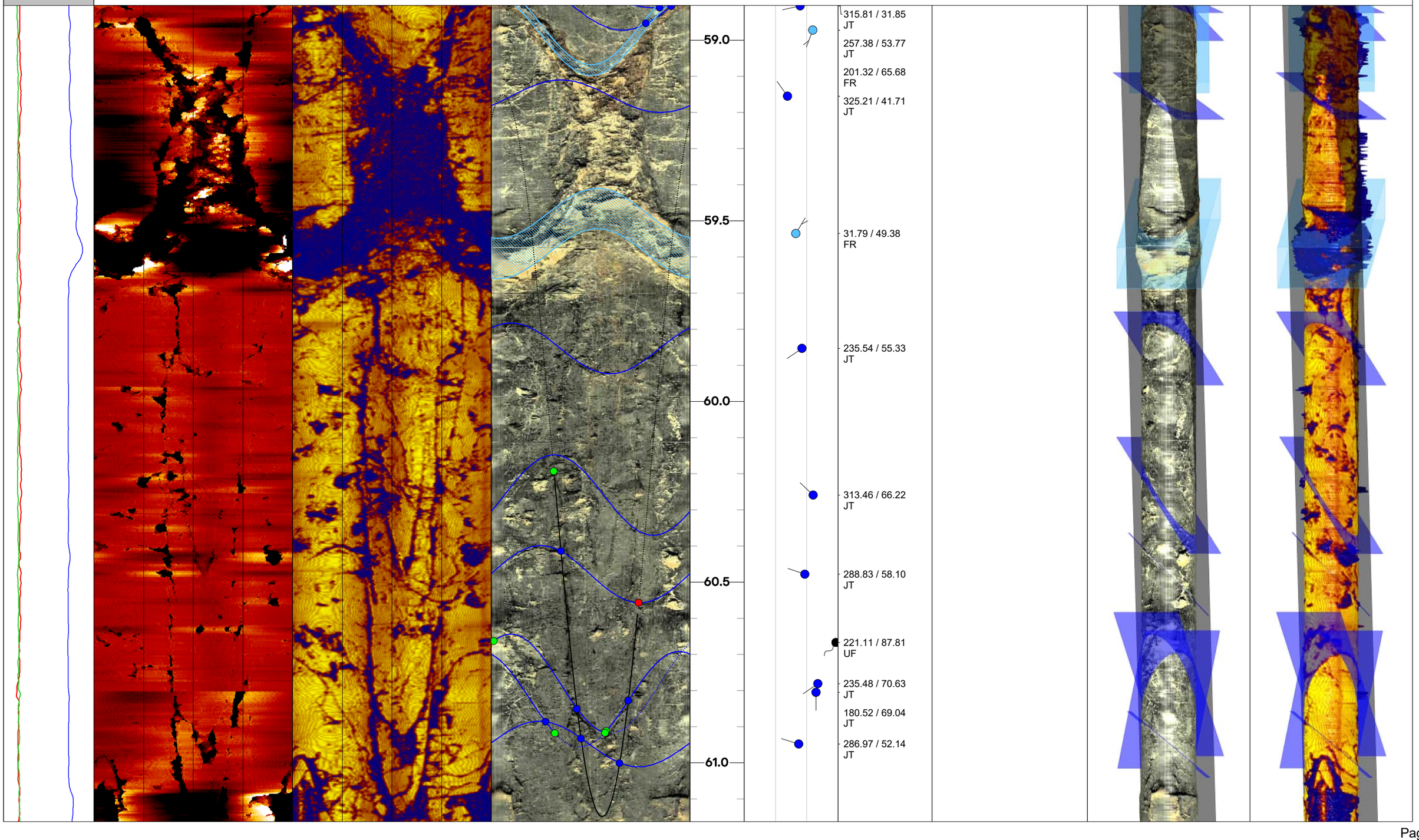
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



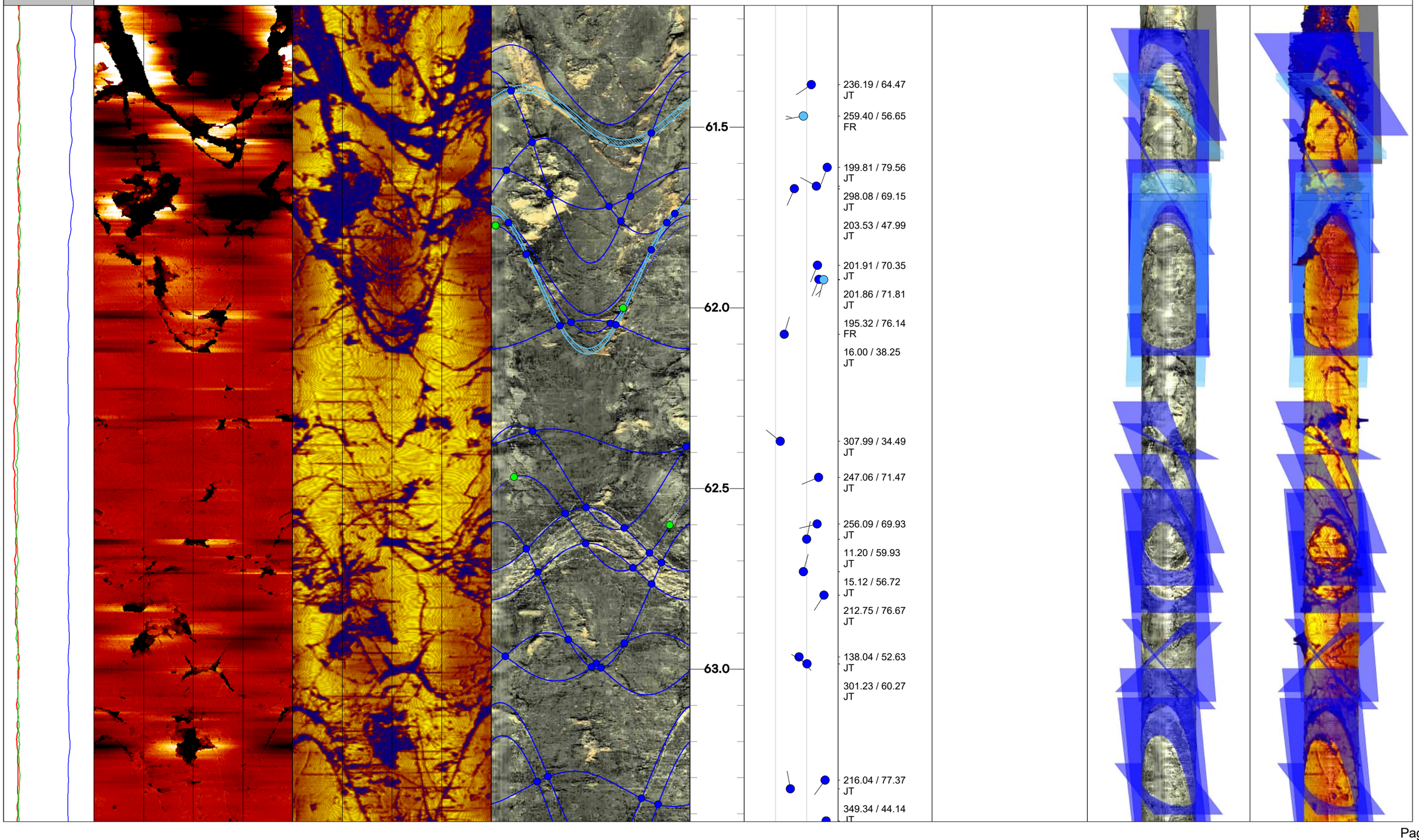
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



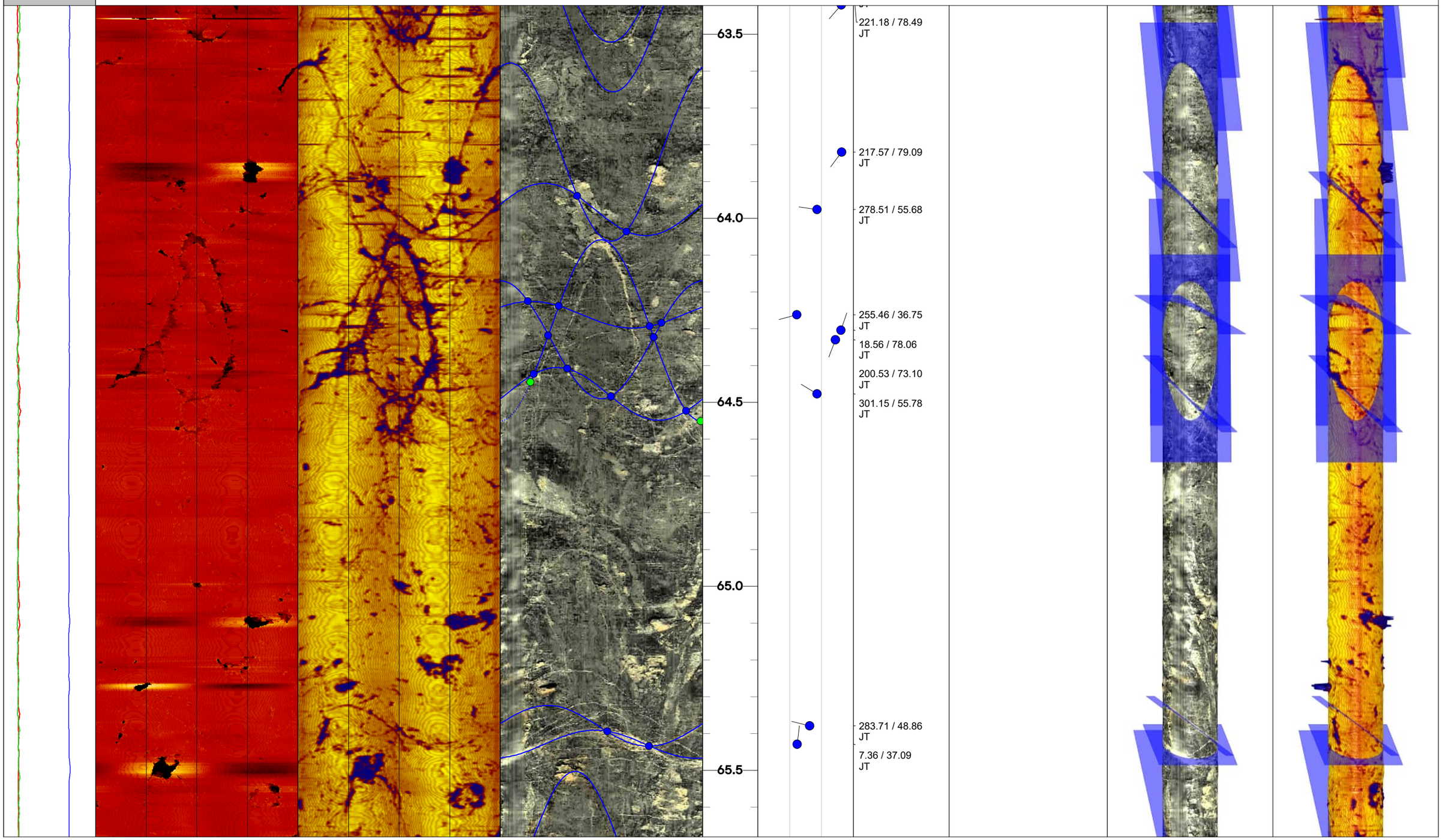
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth	0° 90° 180° 270° 0°	**Amplitude-NM**	**Structures**						
0 deg 360		0 10000	0° 90° 180° 270° 0°						
Calliper-Merged		0° 90° 180° 270° 0°							
0 mm 140									



Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



Tilt
0 deg 5

Azimuth
0 deg 360

Calliper-Merged
0 mm 140

Radius from Centralized TravelTime-NM
46 mm 54
0° 90° 180° 270° 0°

Image-NM
0° 90° 180° 270° 0°

Amplitude-NM
0 10000
0° 90° 180° 270° 0°

ImageProc-NM
0° 90° 180° 270° 0°

Structures
0° 90° 180° 270° 0°

Depth
1m:10m

66.0
66.5
67.0
67.5

Structures - True
0 90

333.15 / 78.95
JT
331.05 / 68.43
JT
325.22 / 68.30
JT
340.95 / 49.11
JT
325.12 / 62.15
JT
316.06 / 31.13
JT
35.42 / 34.43
UF
329.87 / 27.31
JT
297.69 / 43.58
JT
72.45 / 32.35
JT

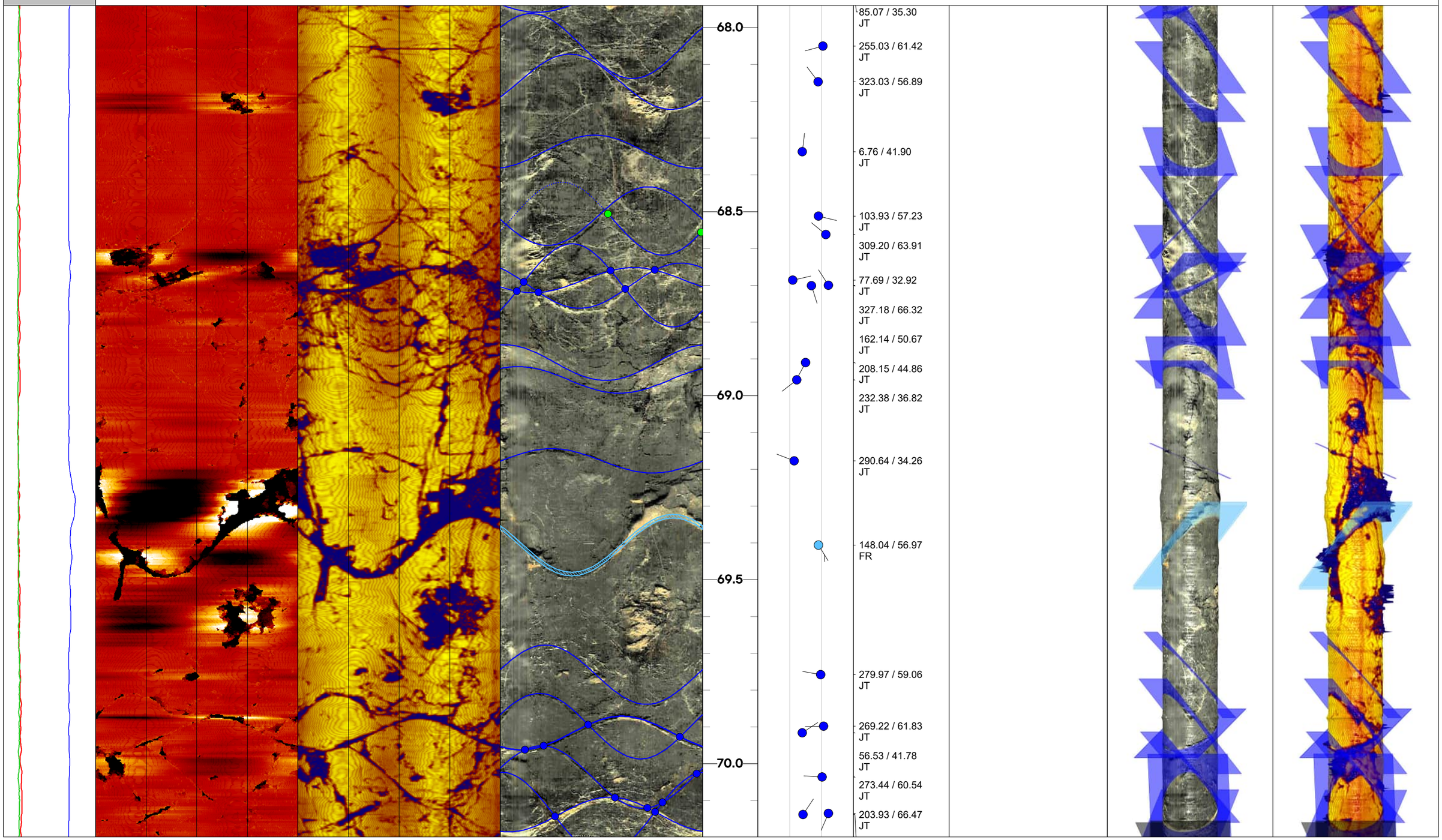
Dip Direction / Dip

Comments

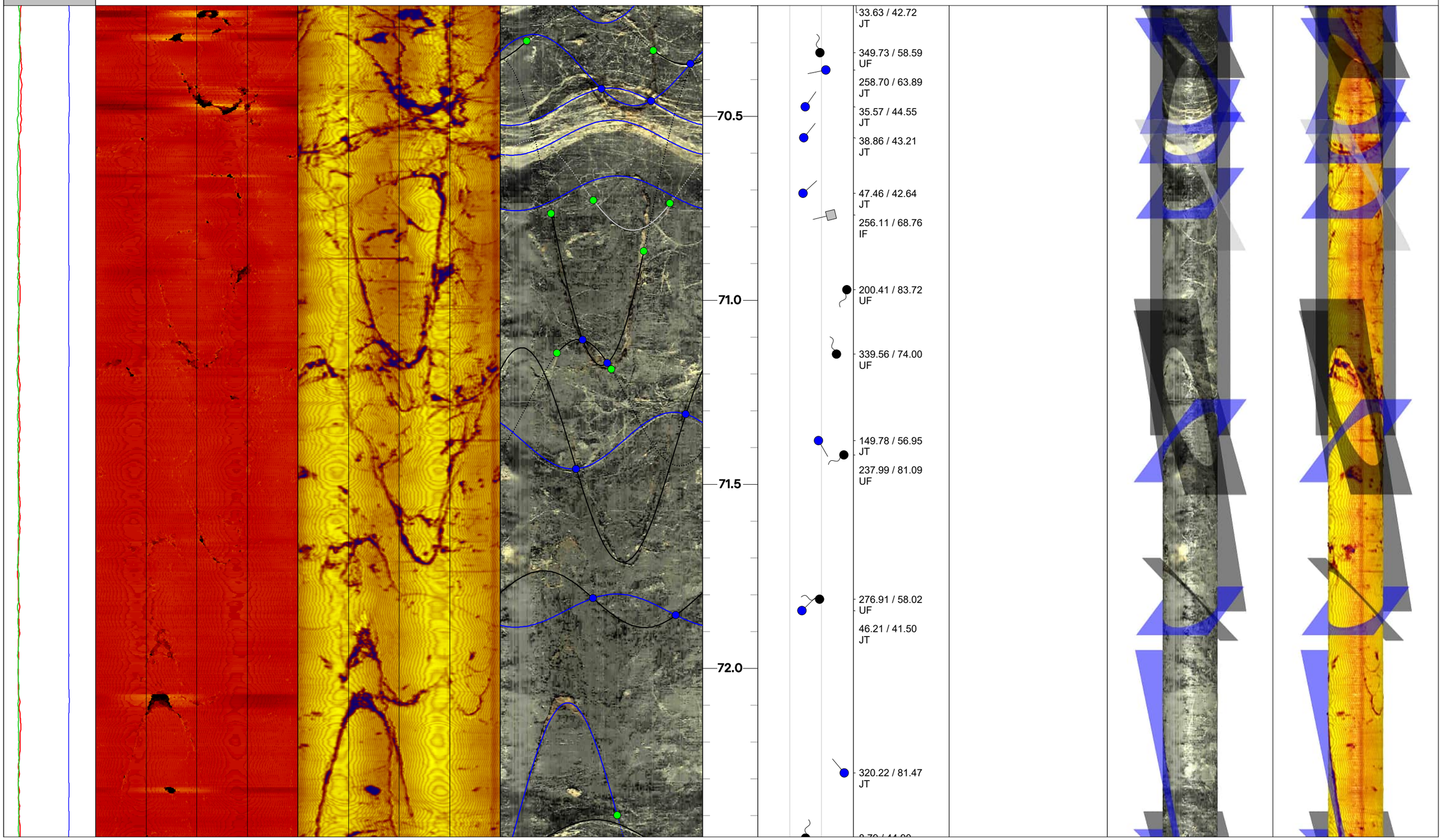
3D Optical
-0°

3D Acoustic
-0°

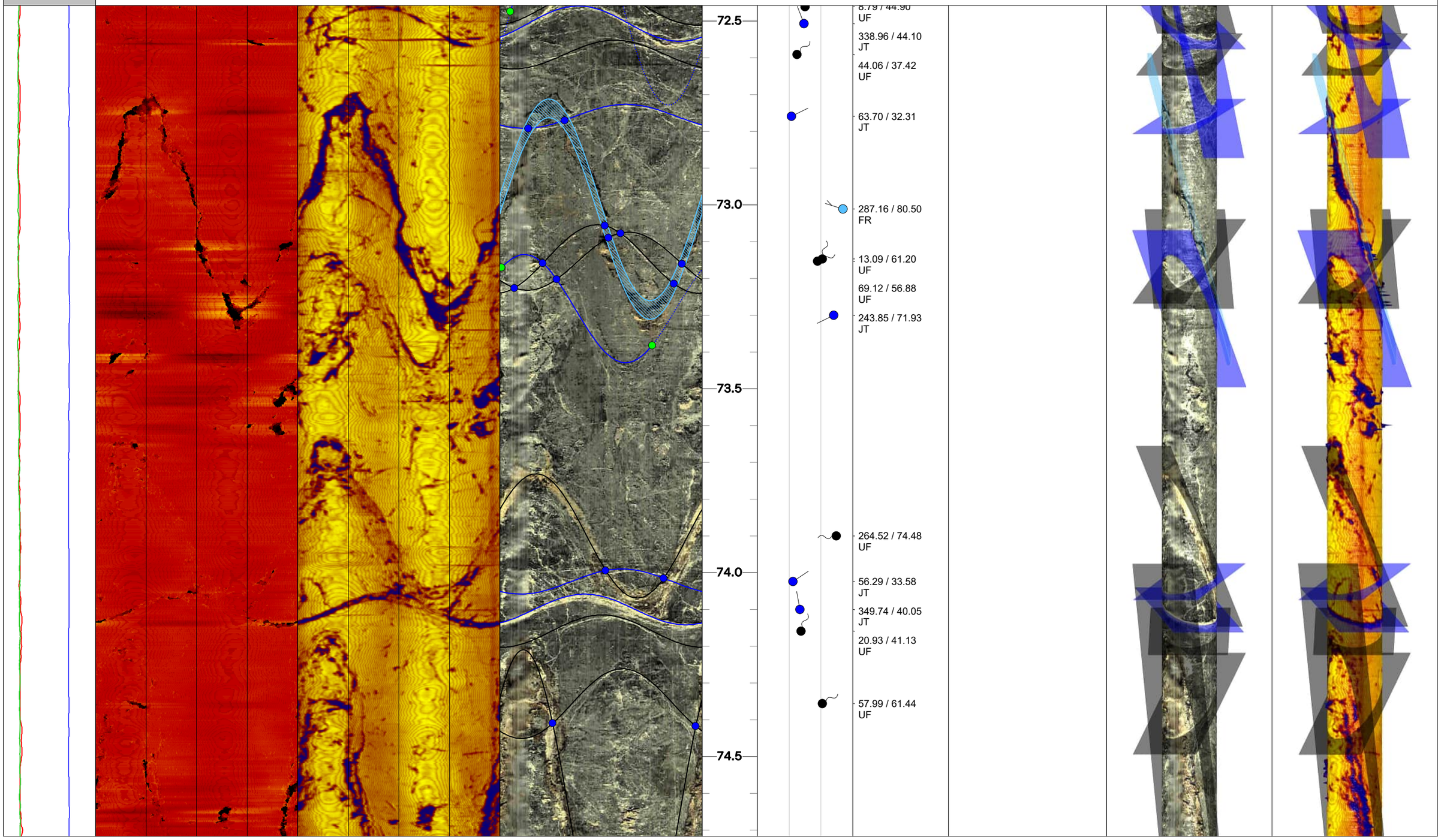
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



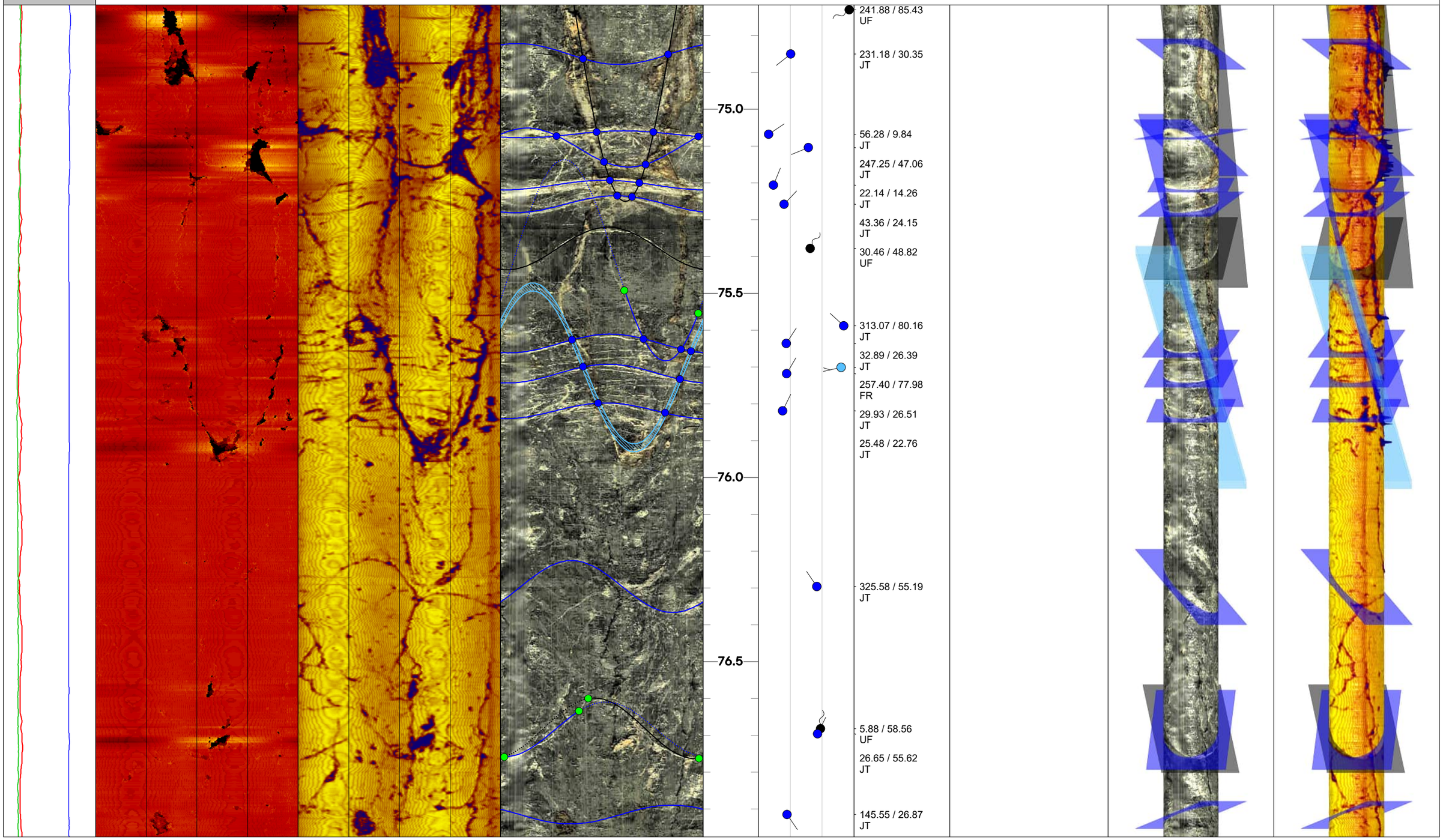
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360	0° 90° 180° 270° 0°	0 10000	0° 90° 180° 270° 0°						
Calliper-Merged		0° 90° 180° 270° 0°							
0 mm 140									



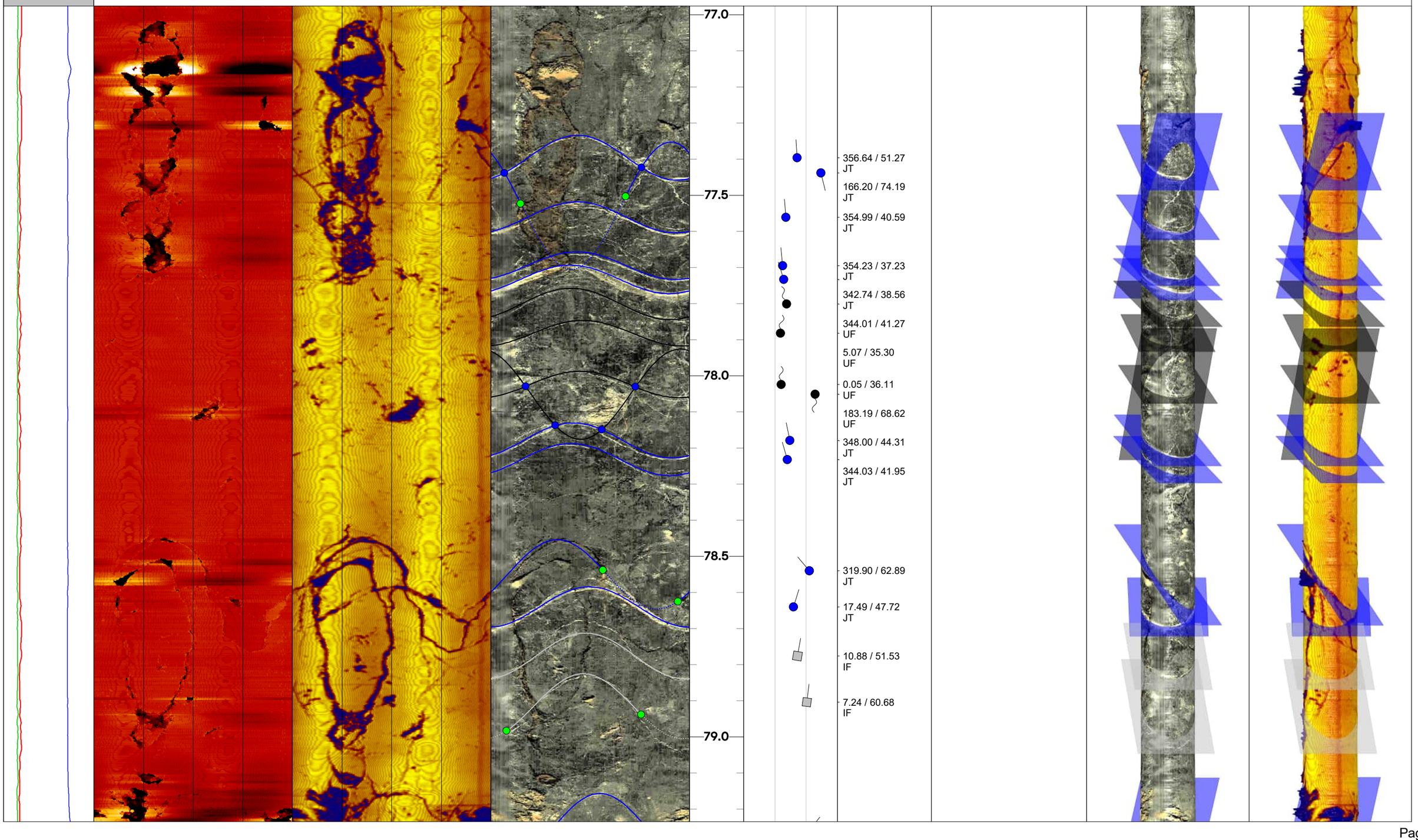
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



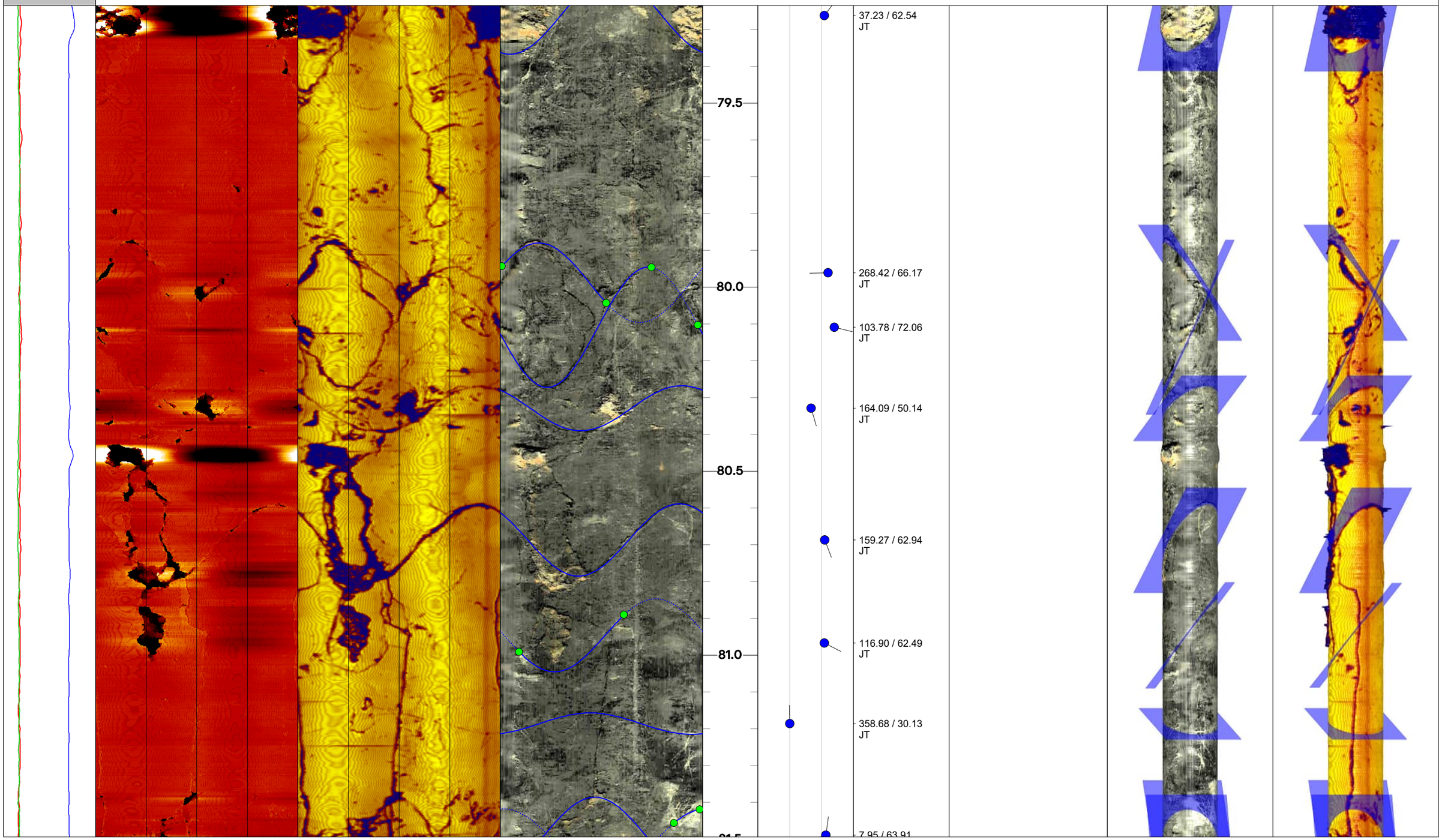
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



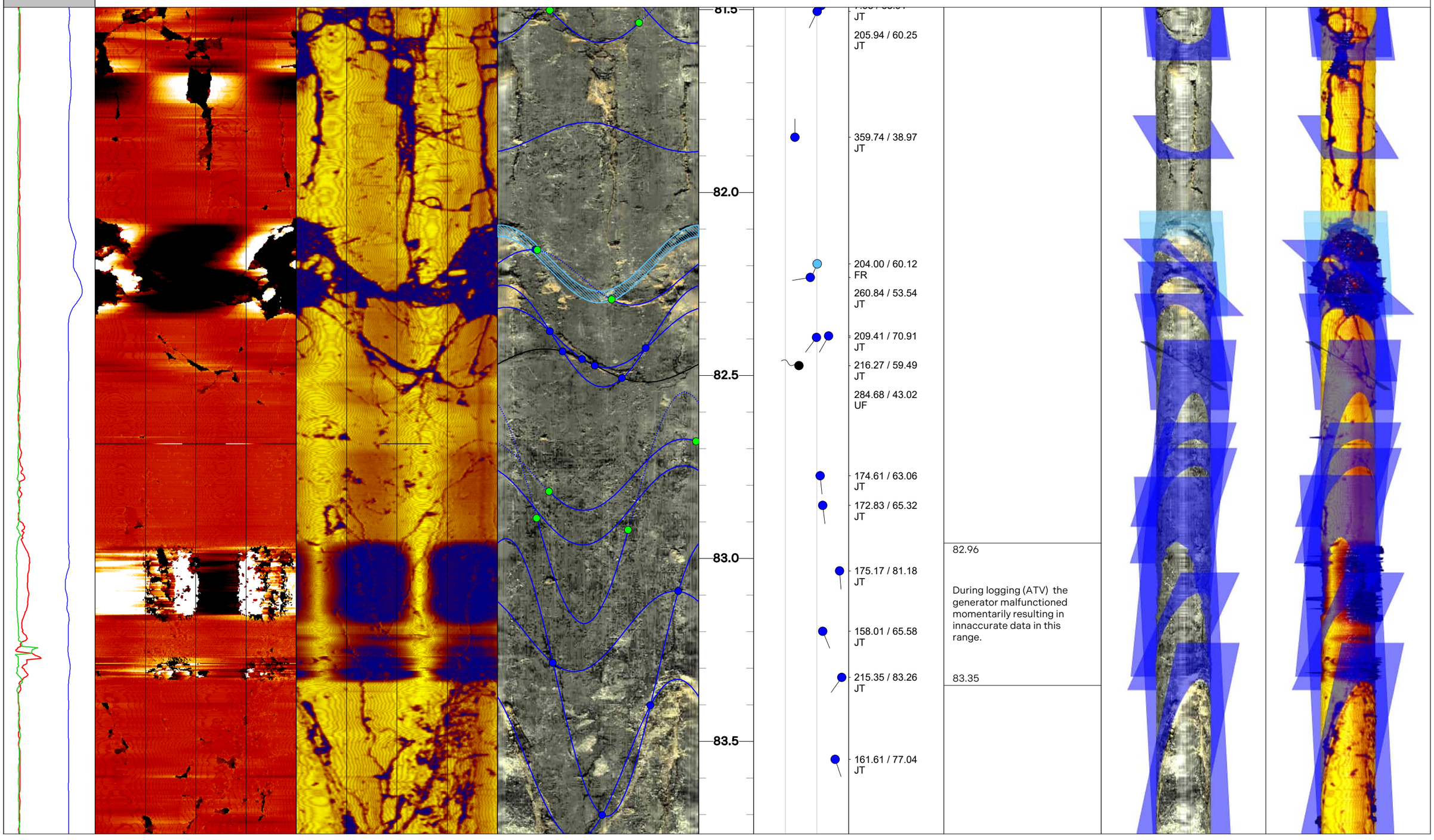
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									

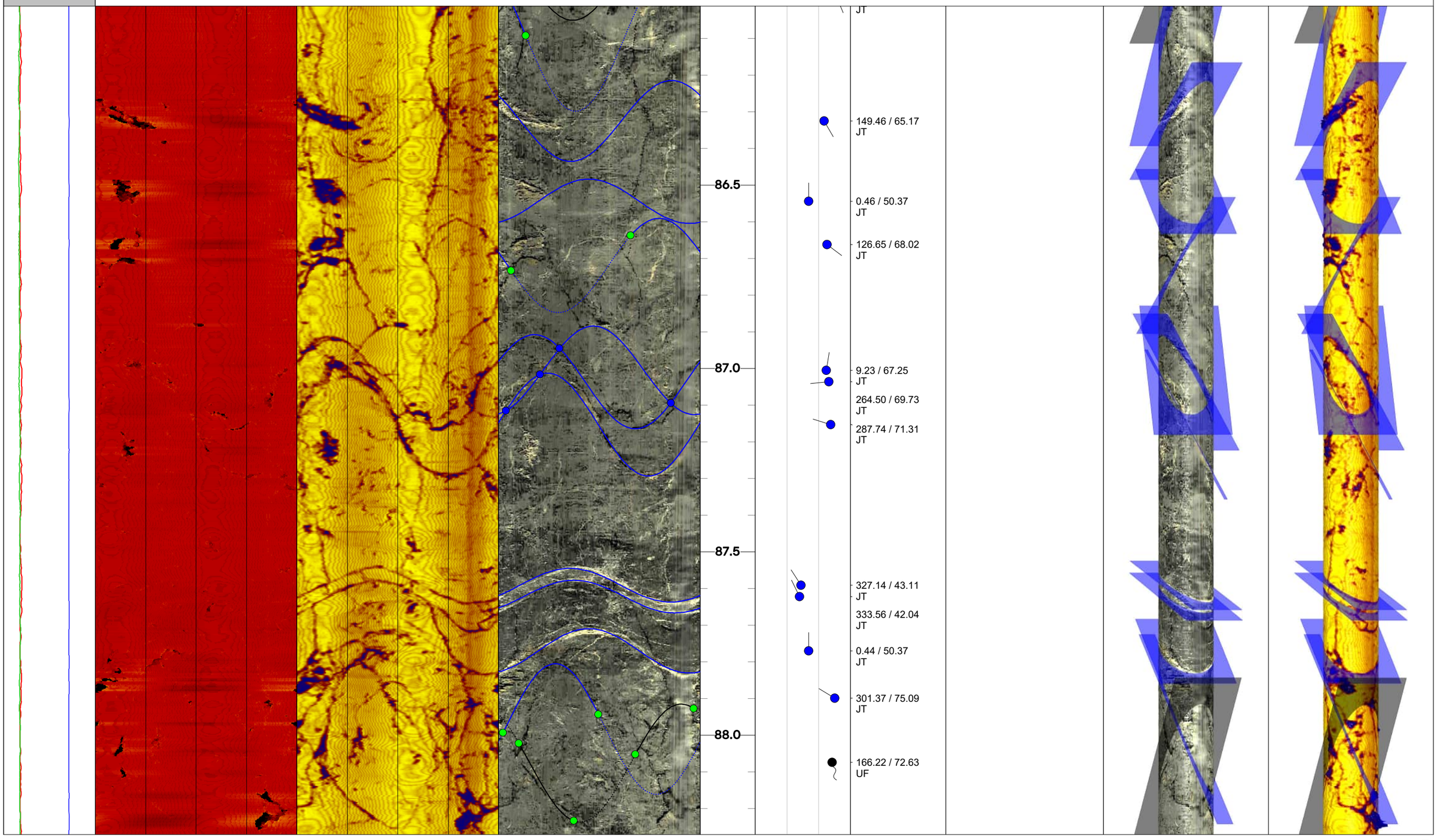


Tilt
0 deg 5
Azimuth
0 deg 360
Calliper-Merged
0 mm 140
Radius from Centralized TravelTime-NM
46 mm 54
0° 90° 180° 270° 0°
Image-NM
0° 90° 180° 270° 0°
Amplitude-NM
0 10000
0° 90° 180° 270° 0°
ImageProc-NM
0° 90° 180° 270° 0°
Structures
0° 90° 180° 270° 0°
Depth
1m:10m
Structures - True
0 90
Dip Direction / Dip
Comments
3D Optical
-0°
3D Acoustic
-0°

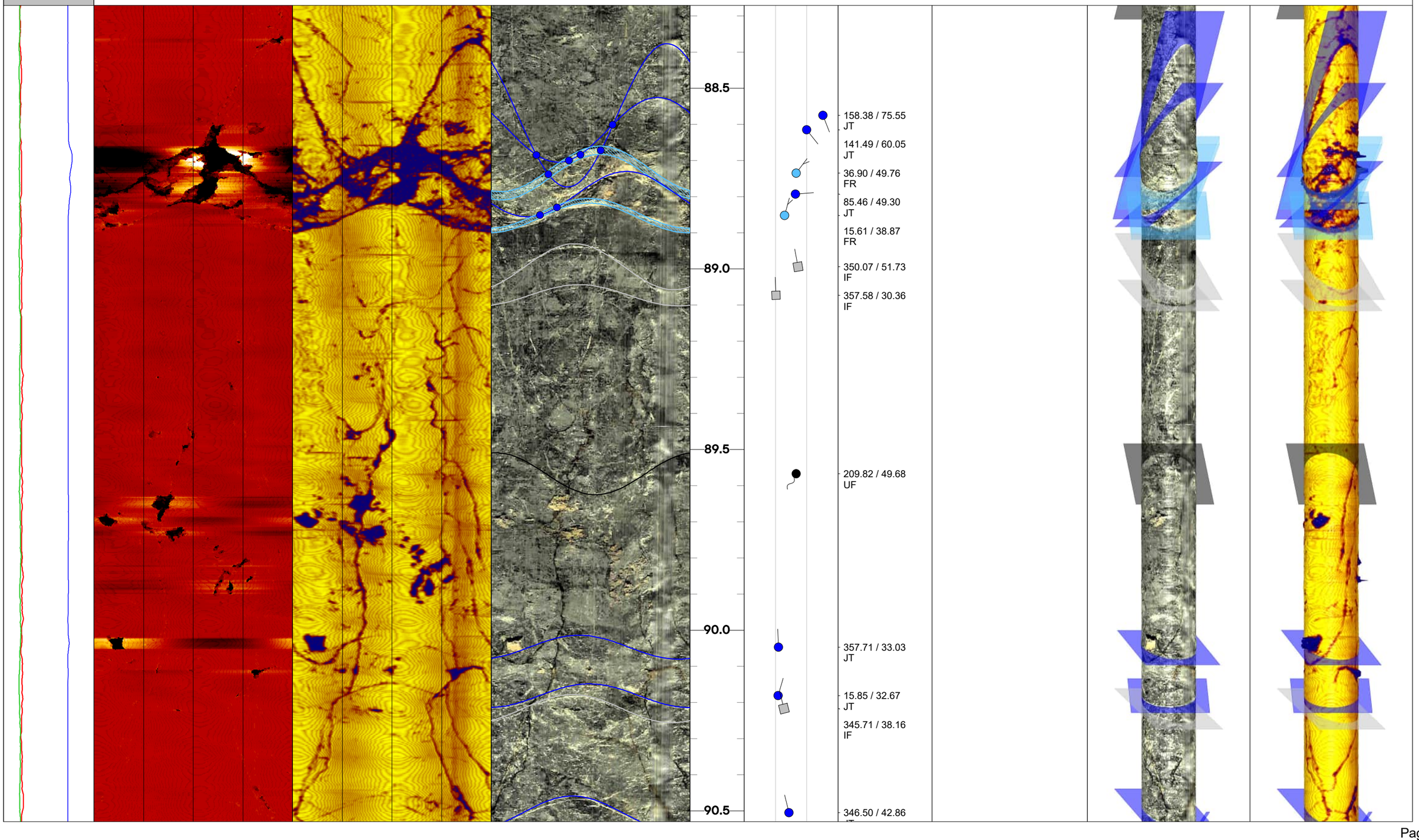
84.0
84.5
85.0
85.5
86.0

212.84 / 74.05
JT
22.64 / 51.09
JT
214.15 / 73.08
JT
1.16 / 39.27
JT
278.78 / 47.36
IF
311.42 / 55.12
IF
340.32 / 82.56
JT
265.71 / 39.13
JT
153.13 / 64.42
UF
144.56 / 70.59
UF
4.37 / 35.60
JT
153.04 / 70.07
UF
157.74 / 76.42

Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



Tilt
0 deg 5

Azimuth
0 deg 360

Calliper-Merged
0 mm 140

Radius from Centralized TravelTime-NM
46 mm 54
0° 90° 180° 270° 0°

Image-NM
0° 90° 180° 270° 0°

Amplitude-NM
0 10000
0° 90° 180° 270° 0°

ImageProc-NM
0° 90° 180° 270° 0°

Structures
0° 90° 180° 270° 0°

Depth
1m:10m

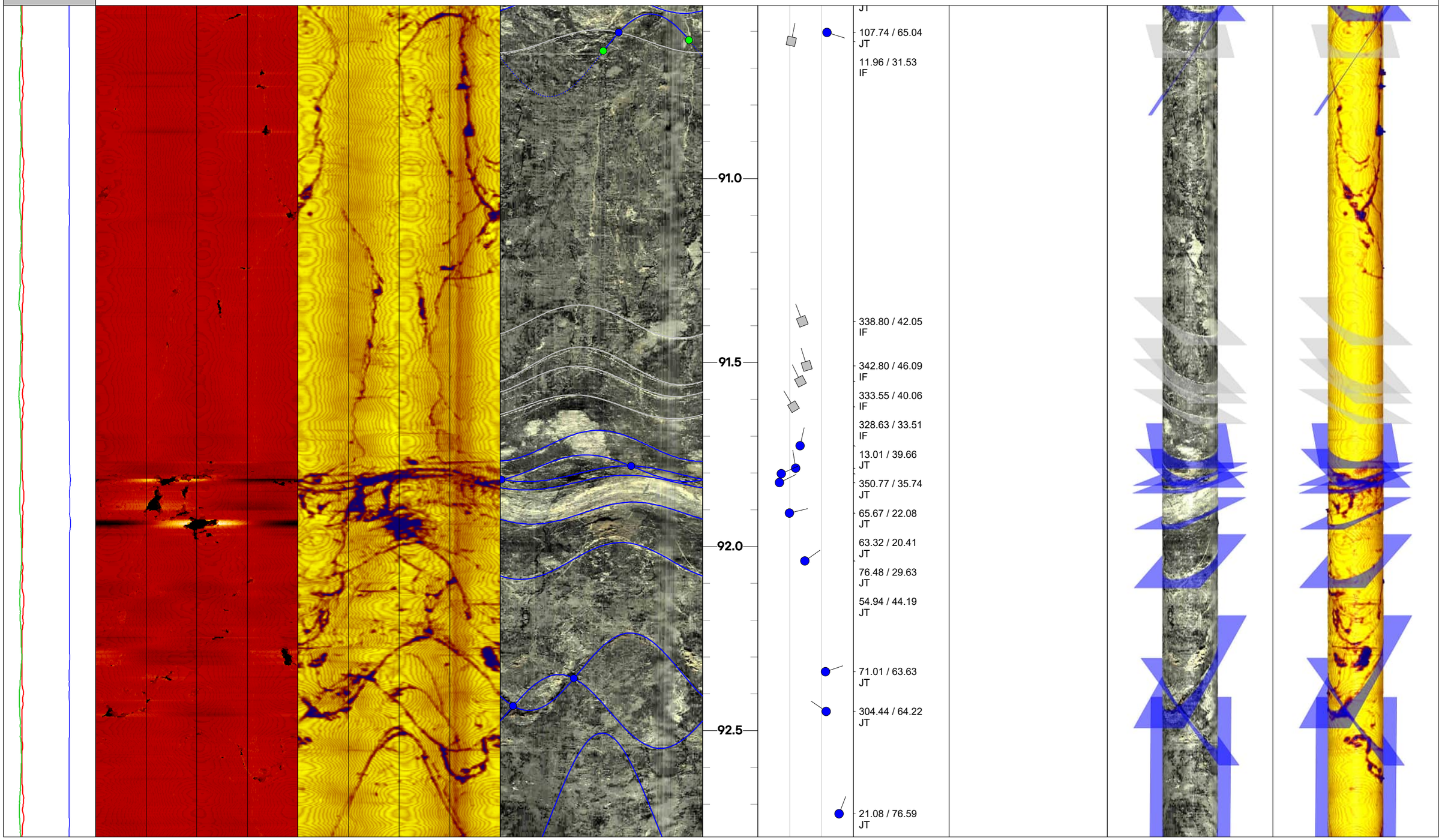
Structures - True
0 90

Dip Direction / Dip

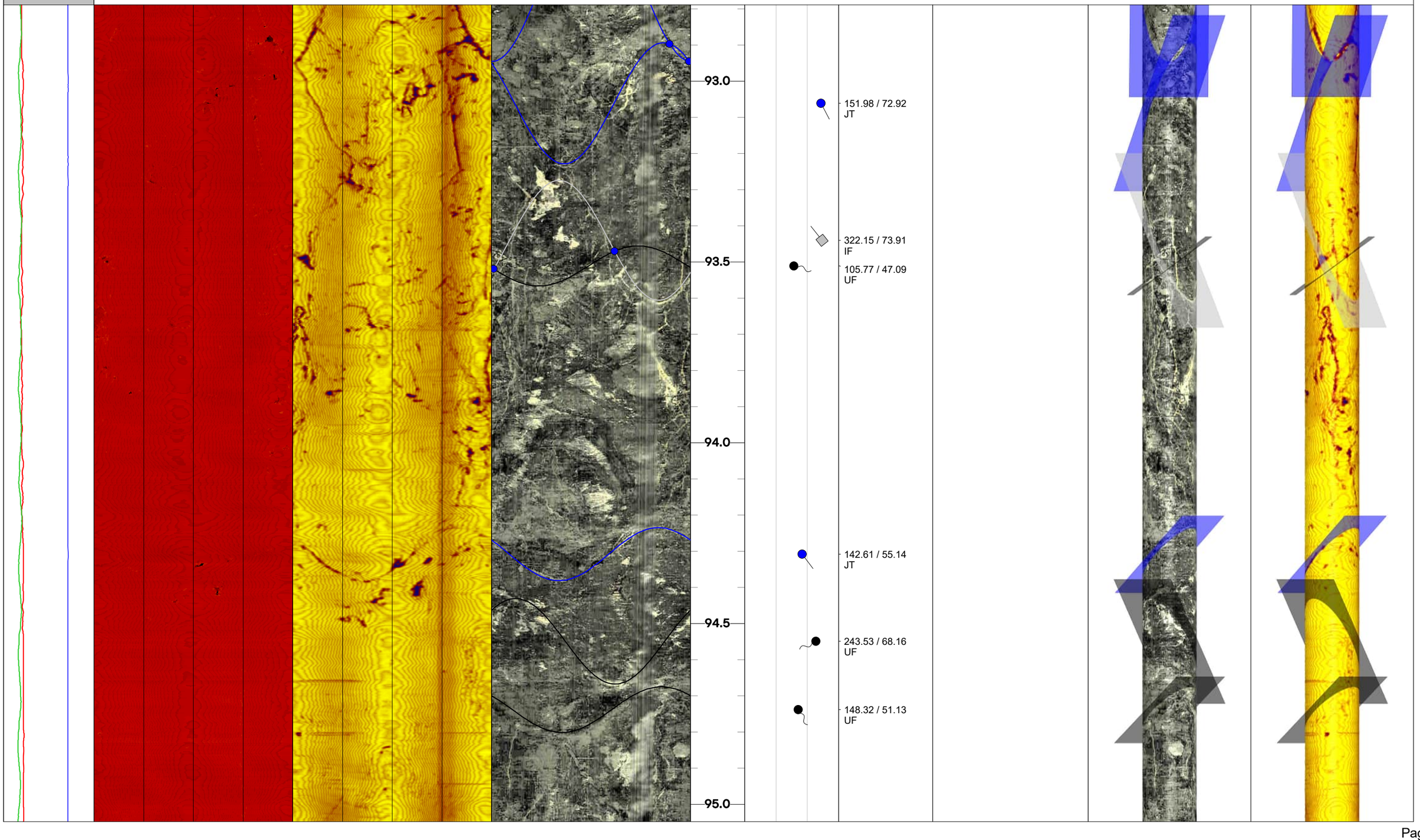
Comments

3D Optical
-0°

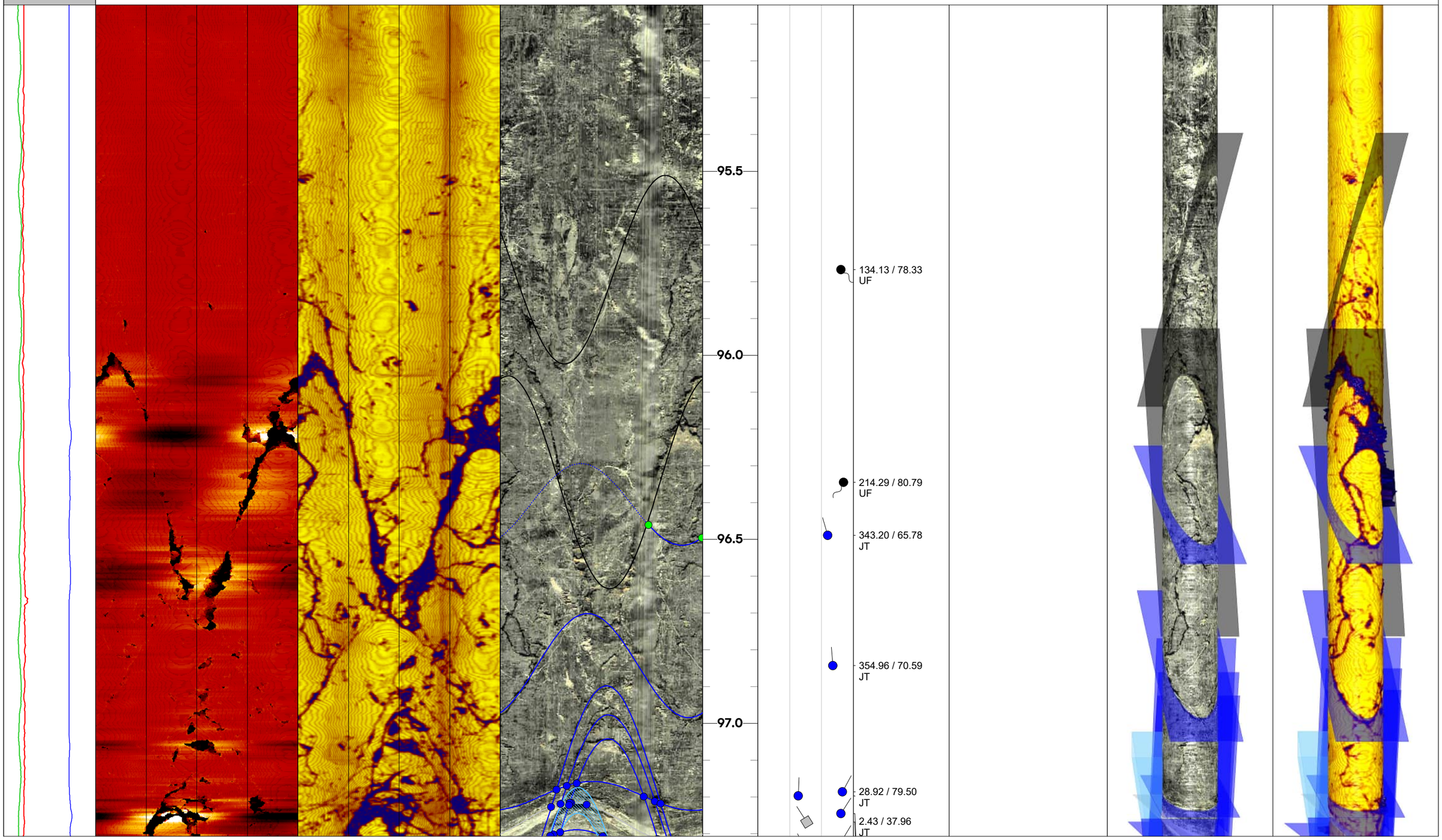
3D Acoustic
-0°



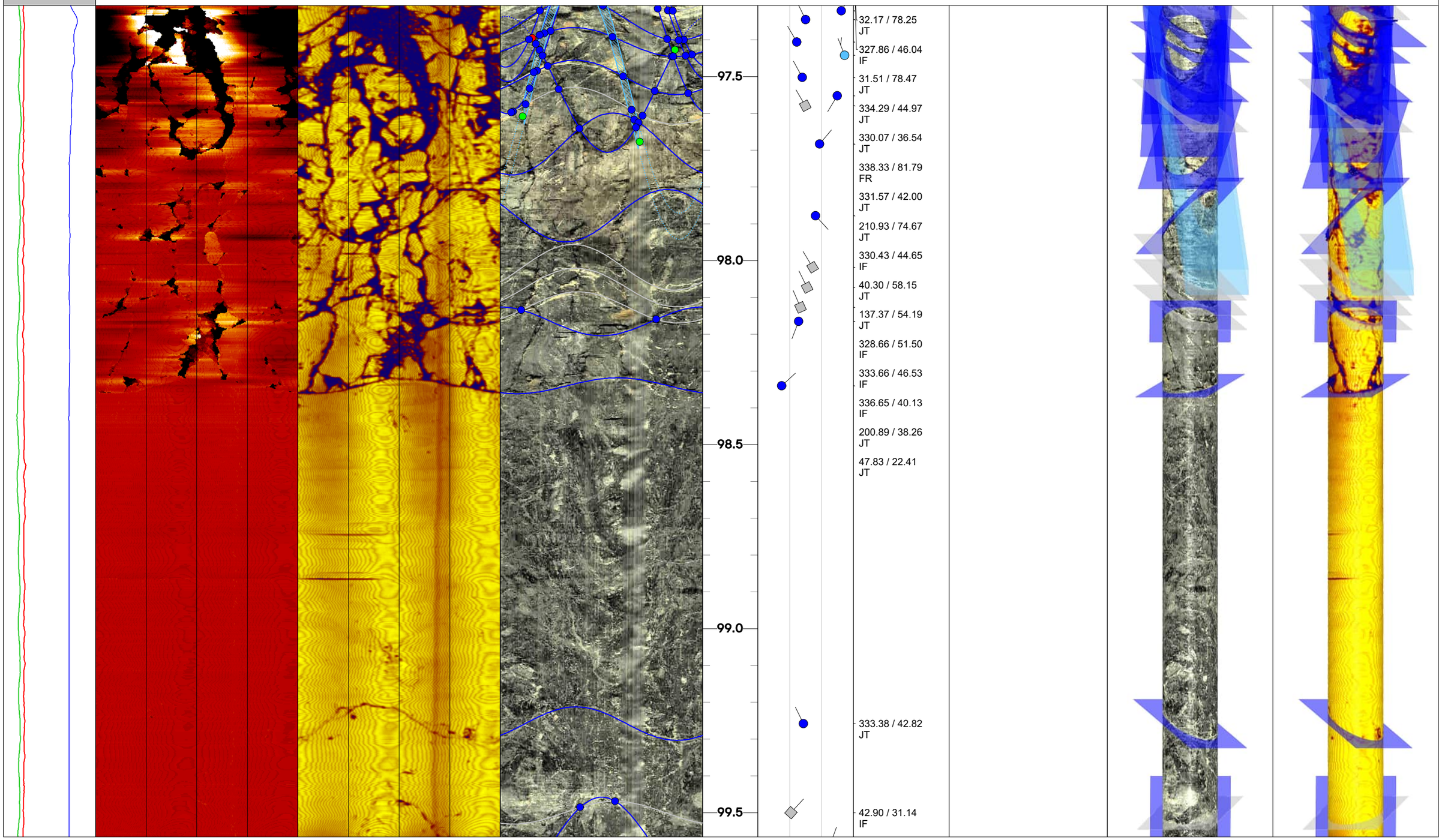
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth	0° 90° 180° 270° 0°	**Amplitude-NM**	**Structures**						
0 deg 360		0 10000	0° 90° 180° 270° 0°						
Calliper-Merged		0° 90° 180° 270° 0°							
0 mm 140									



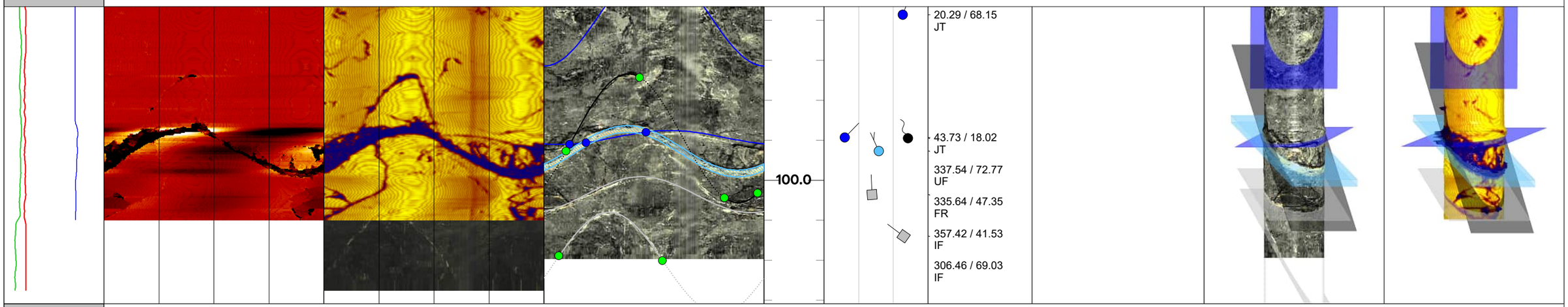
Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



Tilt	Radius from Centralized TravelTime-NM	Image-NM	ImageProc-NM	Depth	Structures - True	Dip Direction / Dip	Comments	3D Optical	3D Acoustic
0 deg 5	46 mm 54 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Azimuth		**Amplitude-NM**	**Structures**						
0 deg 360		0 10000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Calliper-Merged									
0 mm 140									



0 mm 140									
Calliper-Merged									
0 deg 360		0° 90° 180° 270° 0°	0° 90° 180° 270° 0°						
Azimuth		0 10000 **Amplitude-NM**	**Structures**						
0 deg 5	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	1m:10m	0 90			-0°	-0°
Tilt	46 mm 54 **Radius from Centralized TravelTime-NM**	**Image-NM**	**ImageProc-NM**	**Depth**	**Structures - True**	**Dip Direction / Dip**	**Comments**	**3D Optical**	**3D Acoustic**

Appendix E – BGL – PC120 Addendum Report

Project Reference: BGL000206A

22 October 2026

Stevenson Aggregates Limited
Private Bag 94000,
Manukau City,
Auckland 2241

Attention: Bryn Llewellyn

Clevedon Quarry Pit Extension – PC120 Slope Stability Addendum Report

1 Introduction

Stevenson Aggregates Limited (SAL - the Client) are looking to expand their quarry operations at Clevedon Quarry, which includes a 50-year Life of Quarry (LoQ) plan into the 'Special-Purpose-Quarry Zone' and partly into the adjoining Rural Production Zone.

Baseline Geotechnical Limited (BGL) was engaged to prepare a geotechnical assessment report[1] to support consenting for this quarry expansion. which is expected to proceed under the Fast-Track Approvals Act 2024 (FFTA). We understand that the proposed quarry extension falls within areas of high and very high susceptibility to shallow and large-scale landslides as outlined in Auckland Council Geomaps and therefore the amendments in Proposed Plan Change 120 (PC120) to Chapter 36 of the Auckland Unitary Plan – Operative in Part (AUP) may apply.

This addendum report follows a step-by-step process of the proportional, risk-based framework required under policy E36.3[2] and the methodology set out in Appendix 24 (Chapter M[3]) of PC120.

2 Stage 1 – Desk study hazard assessment

Stage 1 comprises a desktop study to identify if there is a landslide hazard that could affect the site, or the location in which the activity is proposed. The Clevedon Quarry extension is mapped as being highly to very highly susceptible to both shallow and large-scale landslides in Auckland Council Geomaps. However, as

[1] Baseline Geotechnical Limited (15 October 2026), Clevedon Quarry Extension: Geotechnical Feasibility Assessment Report – Proposed Quarry Extension. Job ref: BGL000206A v1.2. Report prepared for Stevenson Aggregates Limited.
[2] Auckland Council, Auckland Unitary Plan Operative in part – E36 Natural Hazards and Flooding – E36.3 Policies
[3] Auckland Council (November 2025), Auckland Unitary Plan Operative in part – Proposed Plan Change 120 (PC120) – Housing Intensification and Resilience. Chapter M Appendices, Appendix 24.

noted on the Geomaps website, the maps are intended as a regional overview and do not replace site-specific assessments. A site-specific quantitative slope stability assessment was undertaken as part of the Geotechnical Feasibility Assessment report.

3 Stage 2 – Risk assessment method selection

Stage 2 uses the findings of the desk study to determine the appropriate landslide risk assessment method to apply. As assessed and discussed in our geotechnical assessment report[1], we have adopted a return period of 1 in 250 years for our seismic scenario which is the critical stability case.

Our analysis results indicate that the remnant cut slopes can achieve an acceptable level of stability with a calculated maximum displacement of 19 mm under the seismic case considered. The associated slope stability risk is therefore considered to be 'low'.

Slope instability risks can be managed and mitigated by the recommended conditions of consent in Section 10 of our report[1]. As the slope instability risk is low, Appendix 24 Methodology 1 (semi-quantitative risk assessment) has therefore been adopted.

4 Stage 3 – Risk assessment

Method 1 uses the engineering geological model for the site, as discussed in our report[1], to identify three landslide hazard scenarios and then determine the landslide risk classification for each scenario by combining likelihood and consequence. The three scenarios are evaluated: (a) slope instability within the residual soils and completely weathered greywacke; (b) structurally controlled single-batter scale failure within the greywacke sandstone; and (c) deep seated multi-batter scale failure within the greywacke sandstone.

The landslide scenarios and semi quantitative landslide risk assessment following mitigation is presented in Table 4-1 below.

Table 4-1: Landslide semi-quantitative risk assessment in accordance with Appendix 24 (Chapter M)

Scenario		Likelihood	Consequence	Risk Classification
High Likelihood	Slope instability residual soils and completely weathered greywacke.	Possible	Minor	Low (acceptable)
Median Likelihood	Structurally controlled, single-batter scale failure within the greywacke sandstone	Unlikely	Medium	Low (acceptable)
Maximum Credible	Structurally controlled, multi-batter scale failure within the greywacke sandstone	Rare	Medium	Low (acceptable)

5 Stage 4 – Conclusion

Based on the assessment above, it is considered that the proposed extension to Clevedon Quarry has a Low (acceptable) slope instability risk for all three landslide scenarios. The areas classified as being highly and very highly susceptible to landslides do not reflect the actual level of risk on site when considering the proposed site modifications, existing operations, and the engineering contingency measures proposed[1]. On

the basis of the assessment above, the proposed extension is consistent with the PC120 E36 objectives and policies and with Appendix 24.

6 Applicability

This report has been prepared for the exclusive use of our client Stevenson Aggregates Limited, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We trust that this letter report meets your present requirements. If you have any queries or wish to discuss any aspect, please contact the undersigned.

For and on behalf of Baseline Geotechnical Limited



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Charles Li

Engineering Geologist

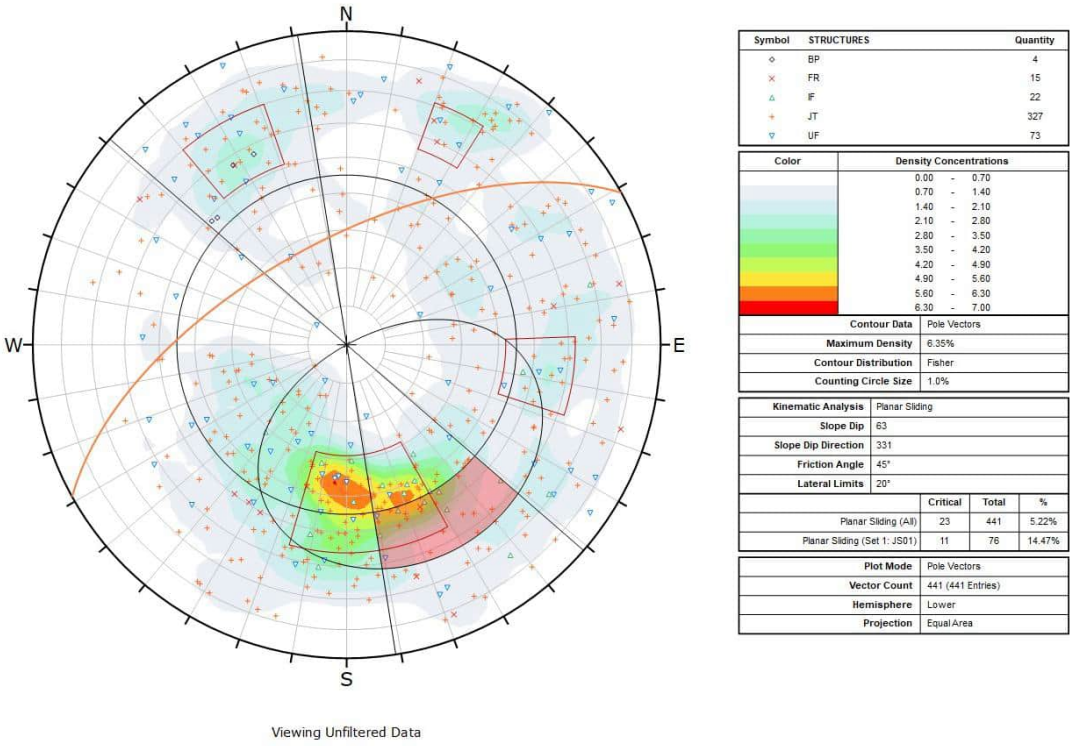


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Cameron Lines

Director

Appendix F – Kinematic analysis results



Symbol	STRUCTURES	Quantity
◇	BP	4
×	FR	15
△	IF	22
+	JT	327
▽	UF	73

Color	Density Concentrations
	0.00 - 0.70
	0.70 - 1.40
	1.40 - 2.10
	2.10 - 2.80
	2.80 - 3.50
	3.50 - 4.20
	4.20 - 4.90
	4.90 - 5.60
	5.60 - 6.30
	6.30 - 7.00

Contour Data	Pole Vectors
Maximum Density	6.35%
Contour Distribution	Fisher
Counting Circle Size	1.0%

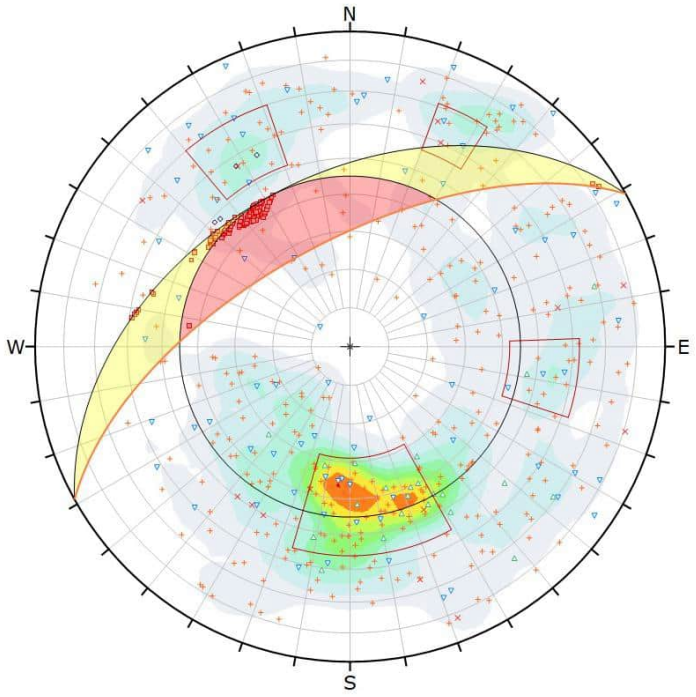
Kinematic Analysis	Planar Sliding
Slope Dip	63
Slope Dip Direction	331
Friction Angle	45°
Lateral Limits	20°

	Critical	Total	%
Planar Sliding (All)	23	441	5.22%
Planar Sliding (Set 1: JS01)	11	76	14.47%

Plot Mode	Pole Vectors
Vector Count	441 (441 Entries)
Hemisphere	Lower
Projection	Equal Area

Viewing Unfiltered Data

Figure F.1: Kinematic analysis of bench-scale planar failure mechanism in proposed South wall.



Symbol	STRUCTURES	Quantity
◇	BP	4
×	FR	15
△	IF	22
+	JT	327
▽	UF	73

Symbol	Feature
▫	Critical Intersection

Color	Density Concentrations
	0.00 - 0.70
	0.70 - 1.40
	1.40 - 2.10
	2.10 - 2.80
	2.80 - 3.50
	3.50 - 4.20
	4.20 - 4.90
	4.90 - 5.60
	5.60 - 6.30
	6.30 - 7.00

Contour Data	Pole Vectors
Maximum Density	6.35%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Wedge Sliding
Slope Dip	63
Slope Dip Direction	331
Friction Angle	45°

	Critical	Total	%
Wedge Sliding	181	3254	5.56%

Plot Mode	Pole Vectors
Vector Count	441 (441 Entries)
Intersection Mode	All Set Planes
Intersections Count	3254
Hemisphere	Lower
Projection	Equal Area

Viewing Unfiltered Data

Figure F.2: Kinematic analysis of bench-scale wedge failure mechanism in proposed South wall.

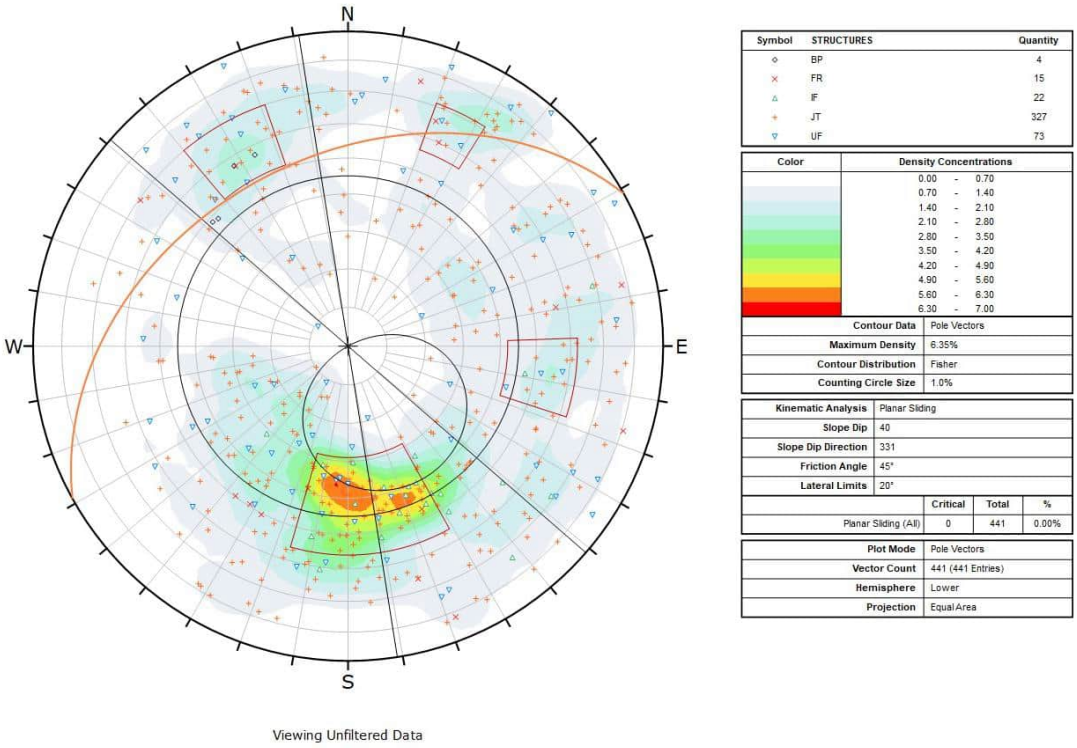


Figure F.3: Kinematic analysis of slope-scale planar failure mechanism in proposed South wall.

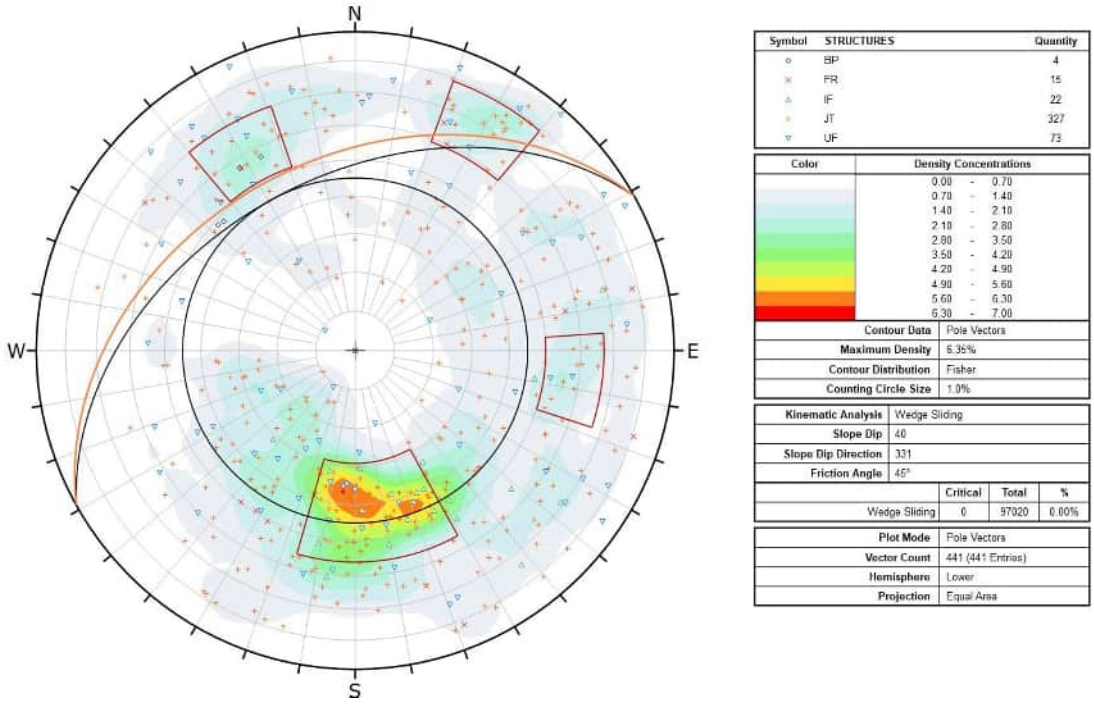
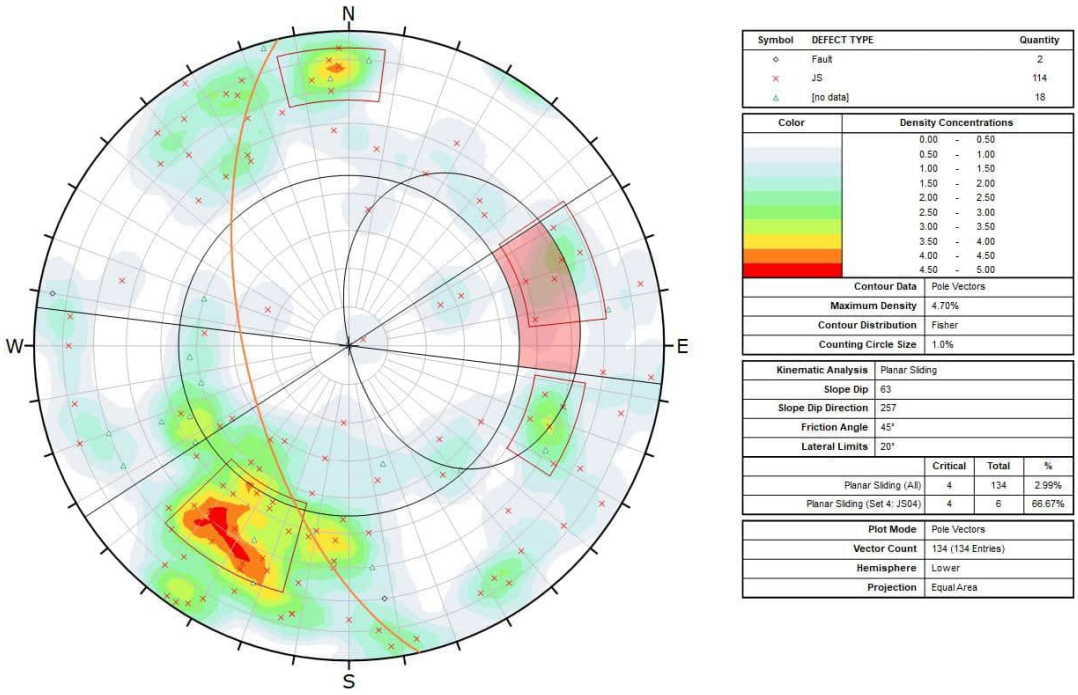


Figure F.4: Kinematic analysis of slope-scale wedge failure mechanism in proposed South wall.



Symbol	DEFECT TYPE	Quantity
◇	Fault	2
×	JS	114
△	[no data]	18

Color	Density Concentrations
	0.00 - 0.50
	0.50 - 1.00
	1.00 - 1.50
	1.50 - 2.00
	2.00 - 2.50
	2.50 - 3.00
	3.00 - 3.50
	3.50 - 4.00
	4.00 - 4.50
	4.50 - 5.00

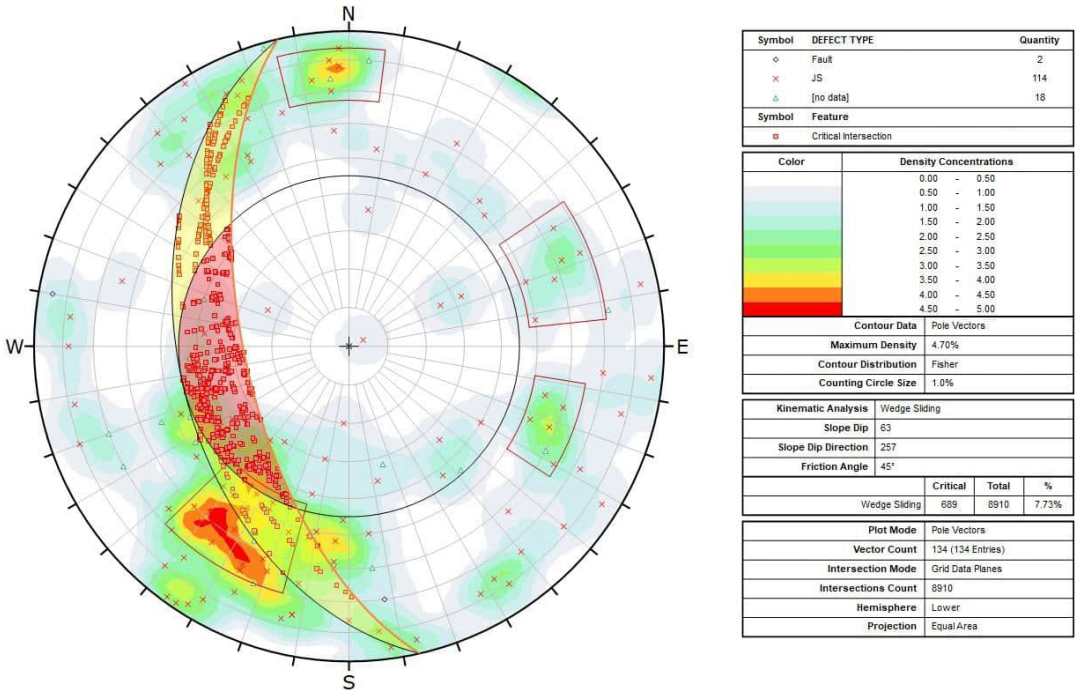
Contour Data	Pole Vectors
Maximum Density	4.70%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Planar Sliding
Slope Dip	63
Slope Dip Direction	257
Friction Angle	45°
Lateral Limits	20°

	Critical	Total	%
Planar Sliding (All)	4	134	2.99%
Planar Sliding (Set 4: JS04)	4	6	66.67%

Plot Mode	Pole Vectors
Vector Count	134 (134 Entries)
Hemisphere	Lower
Projection	Equal Area

Figure F.5: Kinematic analysis of bench-scale planar failure mechanism in proposed East wall.



Symbol	DEFECT TYPE	Quantity
◇	Fault	2
×	JS	114
△	[no data]	18
Symbol	Feature	
▫	Critical Intersection	

Color	Density Concentrations
	0.00 - 0.50
	0.50 - 1.00
	1.00 - 1.50
	1.50 - 2.00
	2.00 - 2.50
	2.50 - 3.00
	3.00 - 3.50
	3.50 - 4.00
	4.00 - 4.50
	4.50 - 5.00

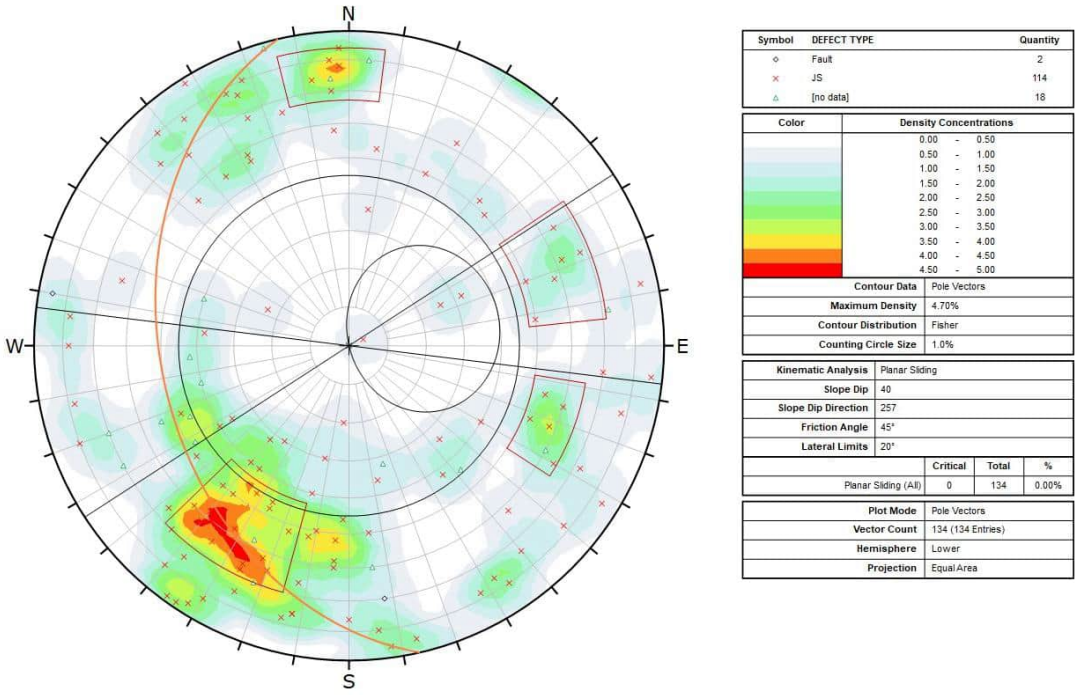
Contour Data	Pole Vectors
Maximum Density	4.70%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Wedge Sliding
Slope Dip	63
Slope Dip Direction	257
Friction Angle	45°

	Critical	Total	%
Wedge Sliding	689	8910	7.73%

Plot Mode	Pole Vectors
Vector Count	134 (134 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	8910
Hemisphere	Lower
Projection	Equal Area

Figure F.6: Kinematic analysis of bench-scale wedge failure mechanism in proposed East wall.



Symbol	DEFECT TYPE	Quantity
◇	Fault	2
×	JS	114
△	[no data]	18

Color	Density Concentrations
	0.00 - 0.50
	0.50 - 1.00
	1.00 - 1.50
	1.50 - 2.00
	2.00 - 2.50
	2.50 - 3.00
	3.00 - 3.50
	3.50 - 4.00
	4.00 - 4.50
	4.50 - 5.00

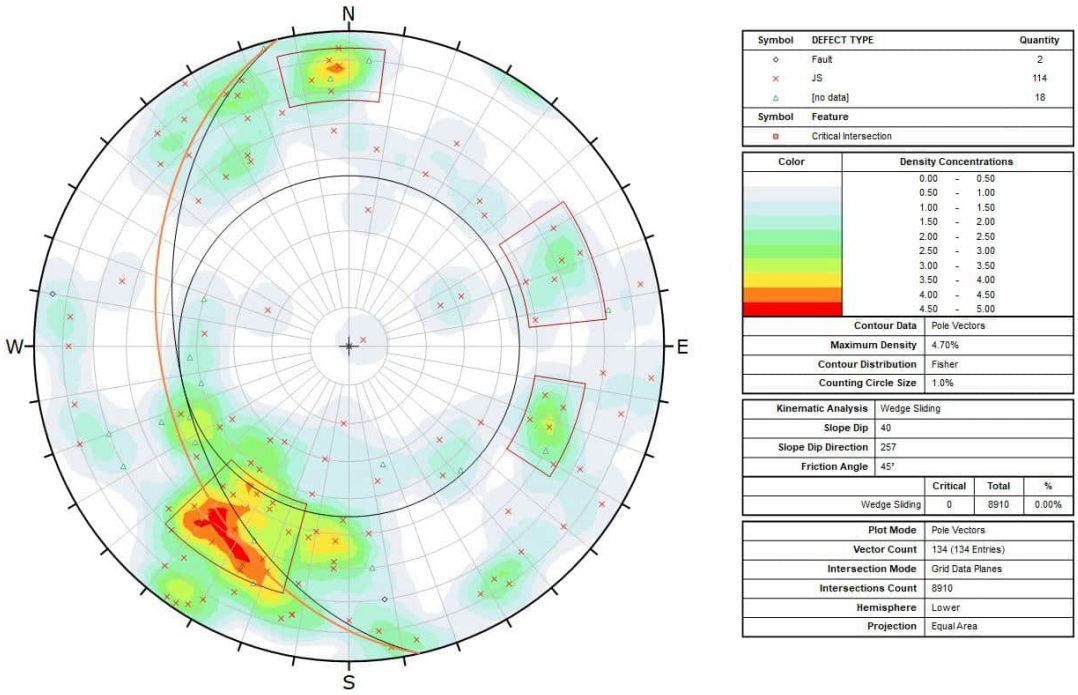
Contour Data	Pole Vectors
Maximum Density	4.70%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Planar Sliding
Slope Dip	40
Slope Dip Direction	257
Friction Angle	45°
Lateral Limits	20°

	Critical	Total	%
Planar Sliding (All)	0	134	0.00%

Plot Mode	Pole Vectors
Vector Count	134 (134 Entries)
Hemisphere	Lower
Projection	Equal Area

Figure F.7: Kinematic analysis of slope-scale planar failure mechanism in proposed East wall.



Symbol	DEFECT TYPE	Quantity
◇	Fault	2
×	JS	114
△	[no data]	18
Symbol	Feature	
▫	Critical Intersection	

Color	Density Concentrations
	0.00 - 0.50
	0.50 - 1.00
	1.00 - 1.50
	1.50 - 2.00
	2.00 - 2.50
	2.50 - 3.00
	3.00 - 3.50
	3.50 - 4.00
	4.00 - 4.50
	4.50 - 5.00

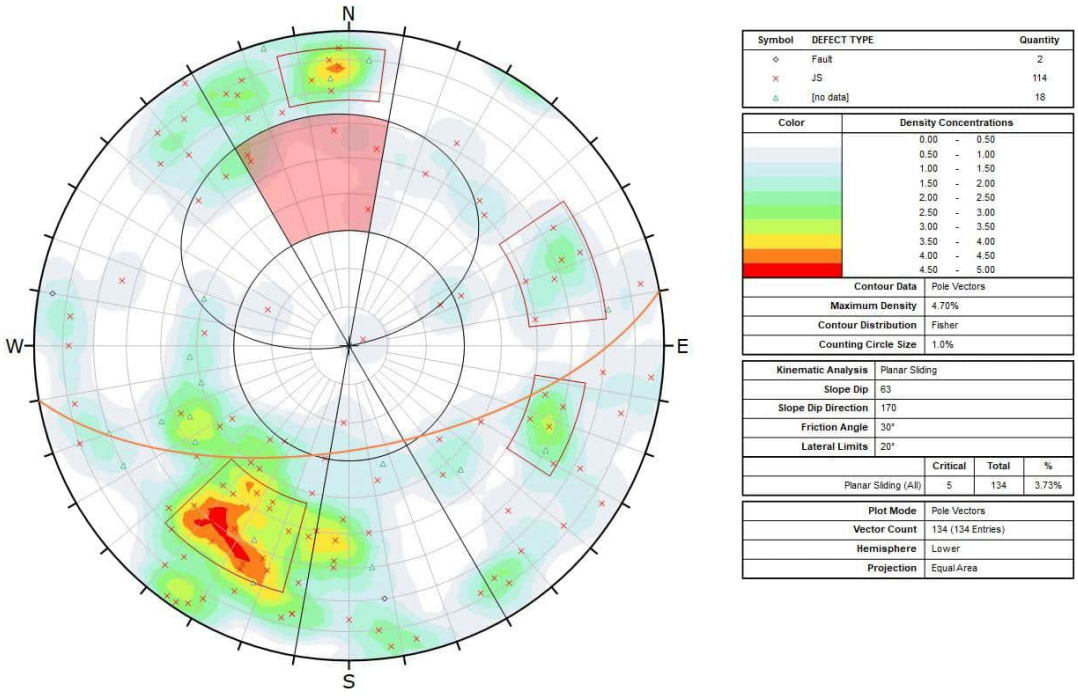
Contour Data	Pole Vectors
Maximum Density	4.70%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Wedge Sliding
Slope Dip	40
Slope Dip Direction	257
Friction Angle	45°

	Critical	Total	%
Wedge Sliding	0	8910	0.00%

Plot Mode	Pole Vectors
Vector Count	134 (134 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	8910
Hemisphere	Lower
Projection	Equal Area

Figure F.8: Kinematic analysis of slope-scale wedge failure mechanism in proposed East wall.



Symbol	DEFECT TYPE	Quantity
◇	Fault	2
×	JS	114
△	[no data]	18

Color	Density Concentrations
	0.00 - 0.50
	0.50 - 1.00
	1.00 - 1.50
	1.50 - 2.00
	2.00 - 2.50
	2.50 - 3.00
	3.00 - 3.50
	3.50 - 4.00
	4.00 - 4.50
	4.50 - 5.00

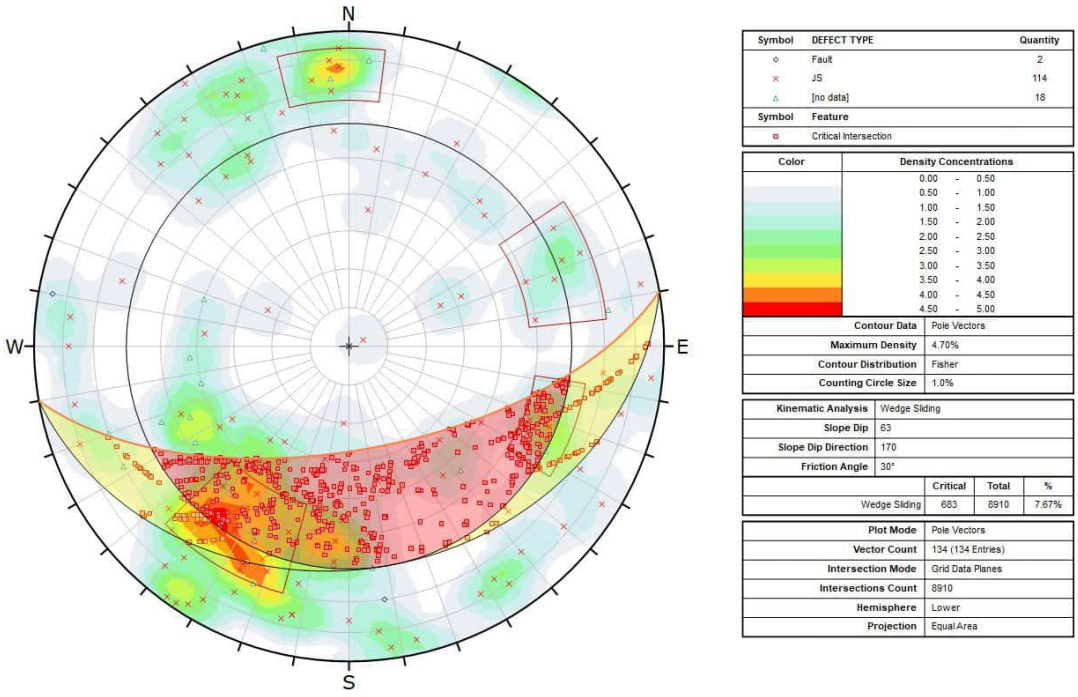
Contour Data	Pole Vectors
Maximum Density	4.70%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Planar Sliding
Slope Dip	63
Slope Dip Direction	170
Friction Angle	30°
Lateral Limits	20°

	Critical	Total	%
Planar Sliding (All)	5	134	3.73%

Plot Mode	Pole Vectors
Vector Count	134 (134 Entries)
Hemisphere	Lower
Projection	Equal Area

Figure F.9: Kinematic analysis of bench-scale planar failure mechanism in proposed North wall.



Symbol	DEFECT TYPE	Quantity
◇	Fault	2
×	JS	114
△	[no data]	18

Symbol	Feature
▫	Critical Intersection

Color	Density Concentrations
	0.00 - 0.50
	0.50 - 1.00
	1.00 - 1.50
	1.50 - 2.00
	2.00 - 2.50
	2.50 - 3.00
	3.00 - 3.50
	3.50 - 4.00
	4.00 - 4.50
	4.50 - 5.00

Contour Data	Pole Vectors
Maximum Density	4.70%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Wedge Sliding
Slope Dip	63
Slope Dip Direction	170
Friction Angle	30°

	Critical	Total	%
Wedge Sliding	683	8910	7.67%

Plot Mode	Pole Vectors
Vector Count	134 (134 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	8910
Hemisphere	Lower
Projection	Equal Area

Figure F.10: Kinematic analysis of bench-scale wedge failure mechanism in proposed North wall.

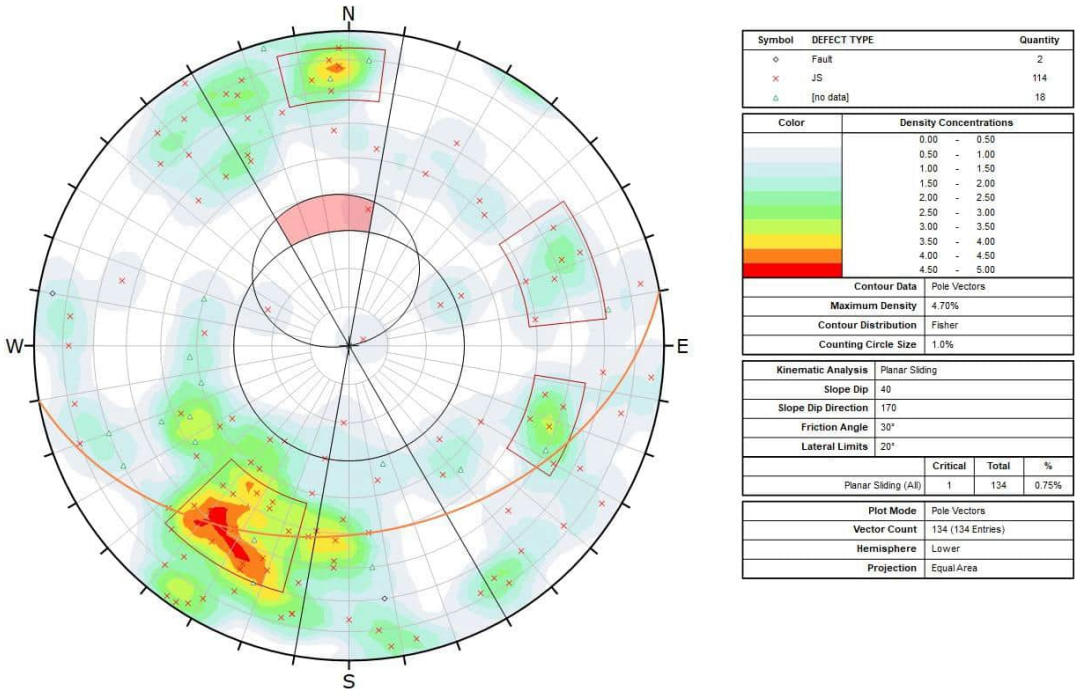


Figure F.11: Kinematic analysis of slope-scale planar failure mechanism in proposed North wall.

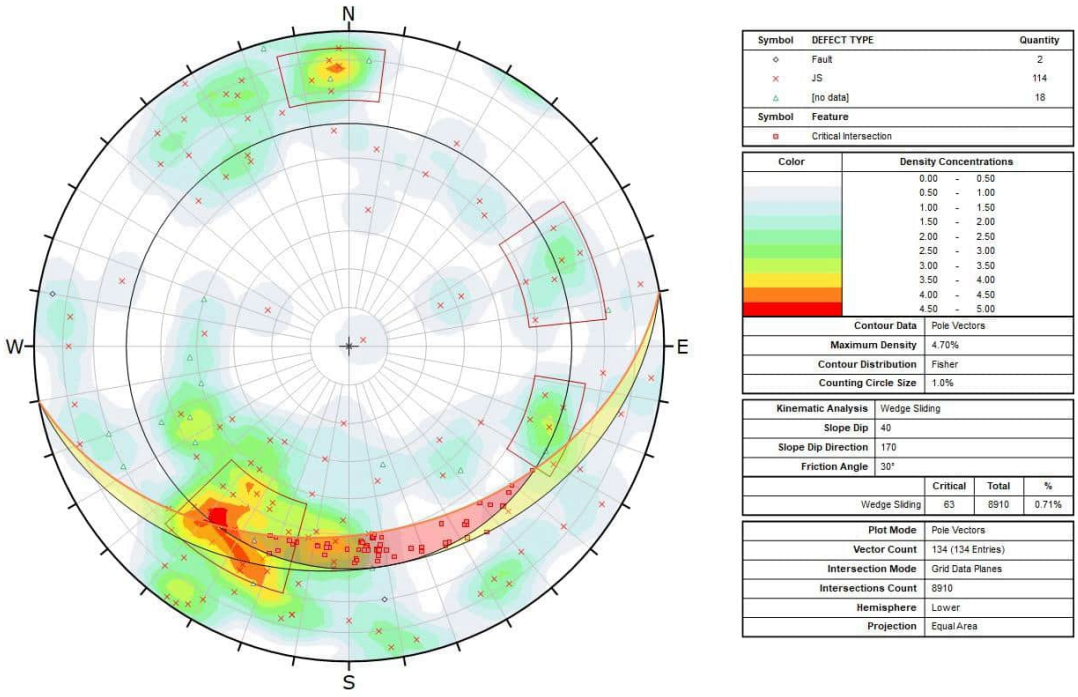
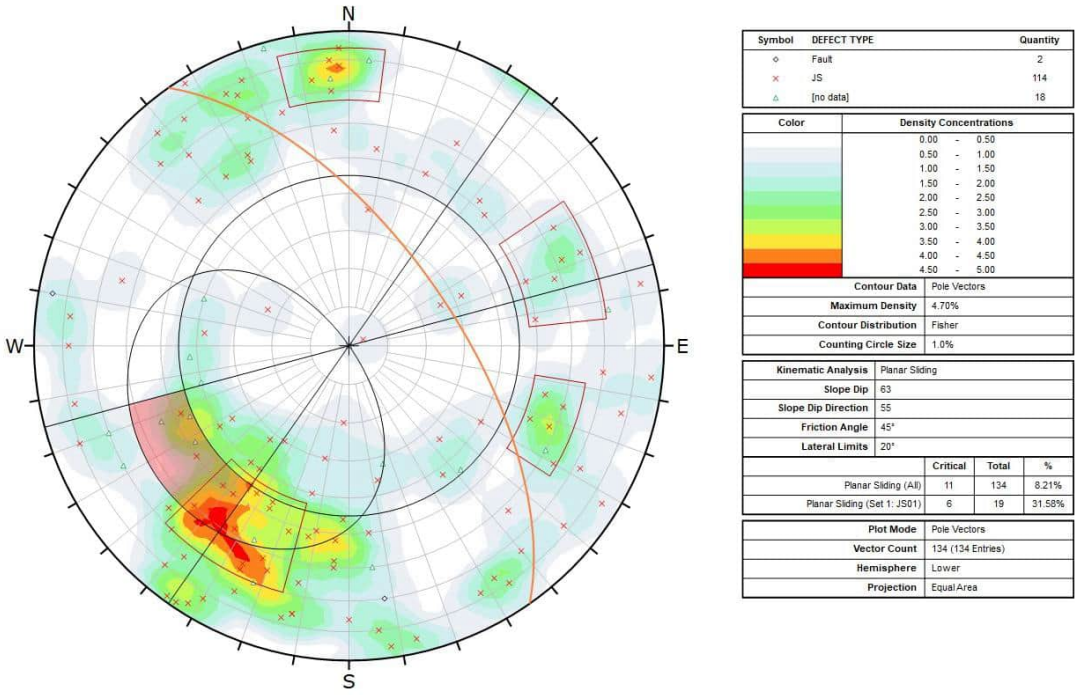


Figure F.12: Kinematic analysis of slope-scale wedge failure mechanism in proposed North wall.



Symbol	DEFECT TYPE	Quantity
◇	Fault	2
×	JS	114
△	[no data]	18

Color	Density Concentrations
	0.00 - 0.50
	0.50 - 1.00
	1.00 - 1.50
	1.50 - 2.00
	2.00 - 2.50
	2.50 - 3.00
	3.00 - 3.50
	3.50 - 4.00
	4.00 - 4.50
	4.50 - 5.00

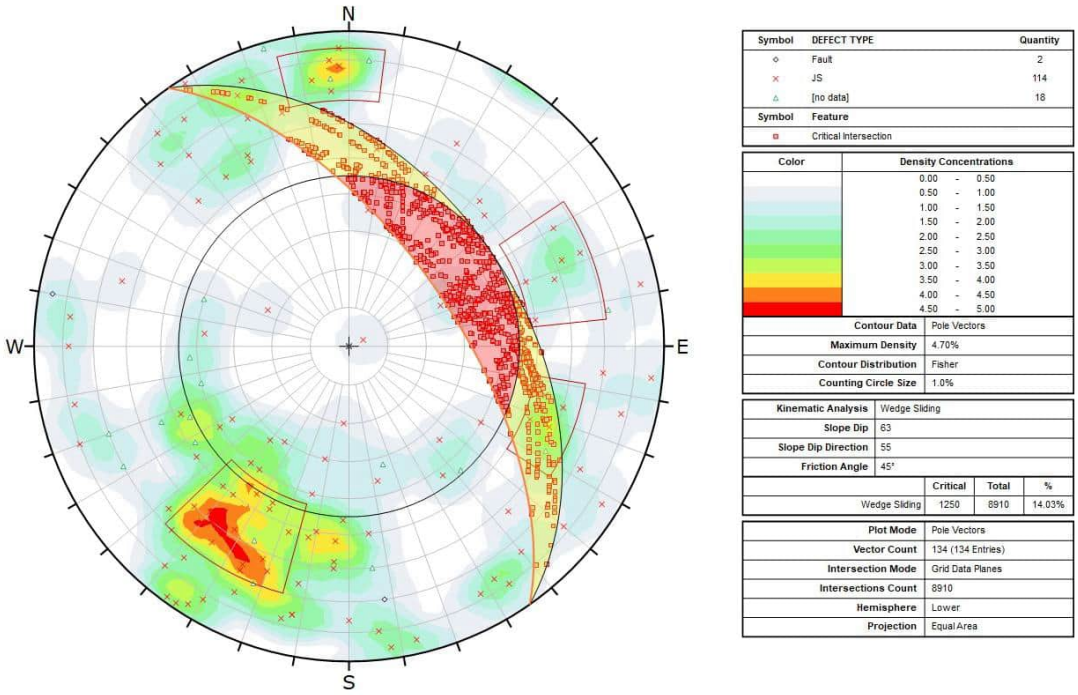
Contour Data	Pole Vectors
Maximum Density	4.70%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Planar Sliding
Slope Dip	63
Slope Dip Direction	55
Friction Angle	45°
Lateral Limits	20°

	Critical	Total	%
Planar Sliding (All)	11	134	8.21%
Planar Sliding (Set 1: JS01)	6	19	31.58%

Plot Mode	Pole Vectors
Vector Count	134 (134 Entries)
Hemisphere	Lower
Projection	Equal Area

Figure F.13: Kinematic analysis of bench-scale planar failure mechanism in proposed West wall.



Symbol	DEFECT TYPE	Quantity
◇	Fault	2
×	JS	114
△	[no data]	18

Symbol	Feature
▫	Critical Intersection

Color	Density Concentrations
	0.00 - 0.50
	0.50 - 1.00
	1.00 - 1.50
	1.50 - 2.00
	2.00 - 2.50
	2.50 - 3.00
	3.00 - 3.50
	3.50 - 4.00
	4.00 - 4.50
	4.50 - 5.00

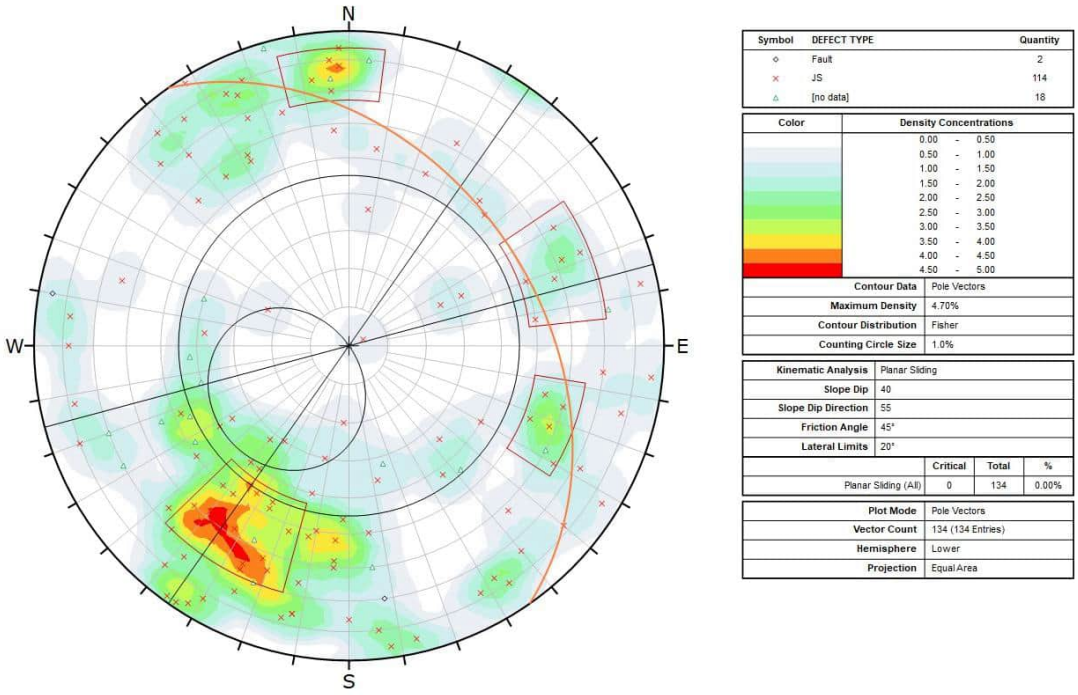
Contour Data	Pole Vectors
Maximum Density	4.70%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Wedge Sliding
Slope Dip	63
Slope Dip Direction	55
Friction Angle	45°

	Critical	Total	%
Wedge Sliding	1250	8910	14.03%

Plot Mode	Pole Vectors
Vector Count	134 (134 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	8910
Hemisphere	Lower
Projection	Equal Area

Figure F.14: Kinematic analysis of bench-scale wedge failure mechanism in proposed West wall.



Symbol	DEFECT TYPE	Quantity
◇	Fault	2
×	JS	114
△	[no data]	18

Color	Density Concentrations
	0.00 - 0.50
	0.50 - 1.00
	1.00 - 1.50
	1.50 - 2.00
	2.00 - 2.50
	2.50 - 3.00
	3.00 - 3.50
	3.50 - 4.00
	4.00 - 4.50
	4.50 - 5.00

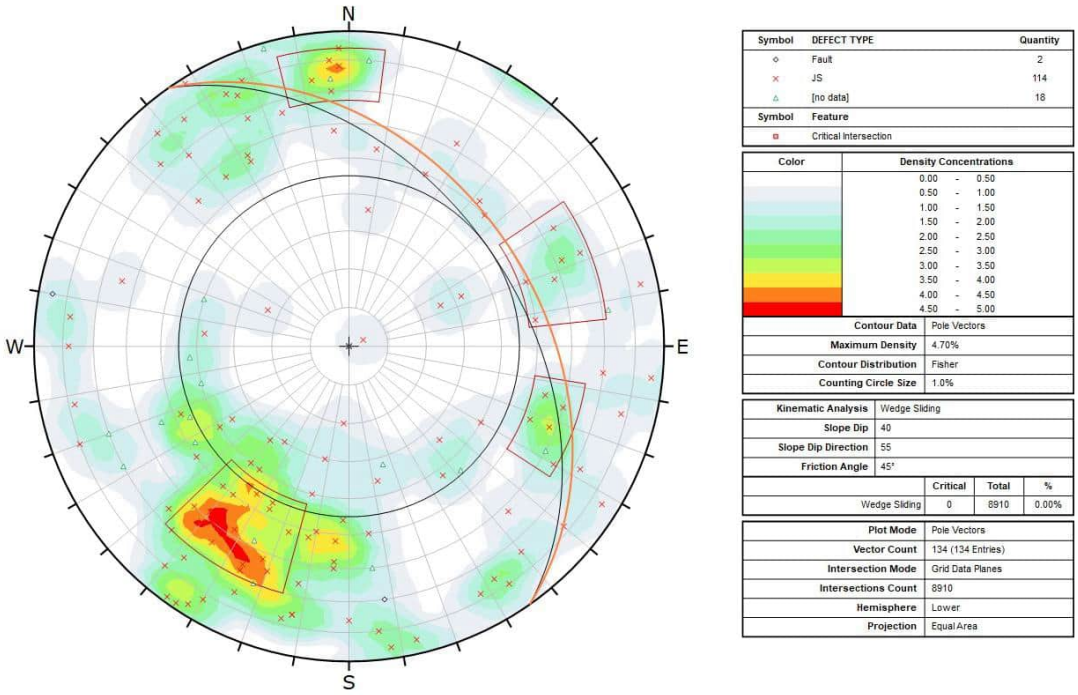
Contour Data	Pole Vectors
Maximum Density	4.70%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Planar Sliding
Slope Dip	40
Slope Dip Direction	55
Friction Angle	45°
Lateral Limits	20°

	Critical	Total	%
Planar Sliding (All)	0	134	0.00%

Plot Mode	Pole Vectors
Vector Count	134 (134 Entries)
Hemisphere	Lower
Projection	Equal Area

Figure F.15: Kinematic analysis of slope-scale planar failure mechanism in proposed West wall.



Symbol	DEFECT TYPE	Quantity
◇	Fault	2
×	JS	114
△	[no data]	18

Symbol	Feature
▫	Critical Intersection

Color	Density Concentrations
	0.00 - 0.50
	0.50 - 1.00
	1.00 - 1.50
	1.50 - 2.00
	2.00 - 2.50
	2.50 - 3.00
	3.00 - 3.50
	3.50 - 4.00
	4.00 - 4.50
	4.50 - 5.00

Contour Data	Pole Vectors
Maximum Density	4.70%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Wedge Sliding
Slope Dip	40
Slope Dip Direction	55
Friction Angle	45°

	Critical	Total	%
Wedge Sliding	0	8910	0.00%

Plot Mode	Pole Vectors
Vector Count	134 (134 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	8910
Hemisphere	Lower
Projection	Equal Area

Figure F.16: Kinematic analysis of slope-scale wedge failure mechanism in proposed West wall.

Appendix G – Greywacke sandstone parameters

Analysis of Rock Strength using RocLab

CW Greywacke Sandstone

Hoek-Brown Classification

intact uniaxial comp. strength (sigci) = 1 MPa
GSI = 35 mi = 11 Disturbance factor (D) = 0
intact modulus (Ei) = 15000 MPa

Hoek-Brown Criterion

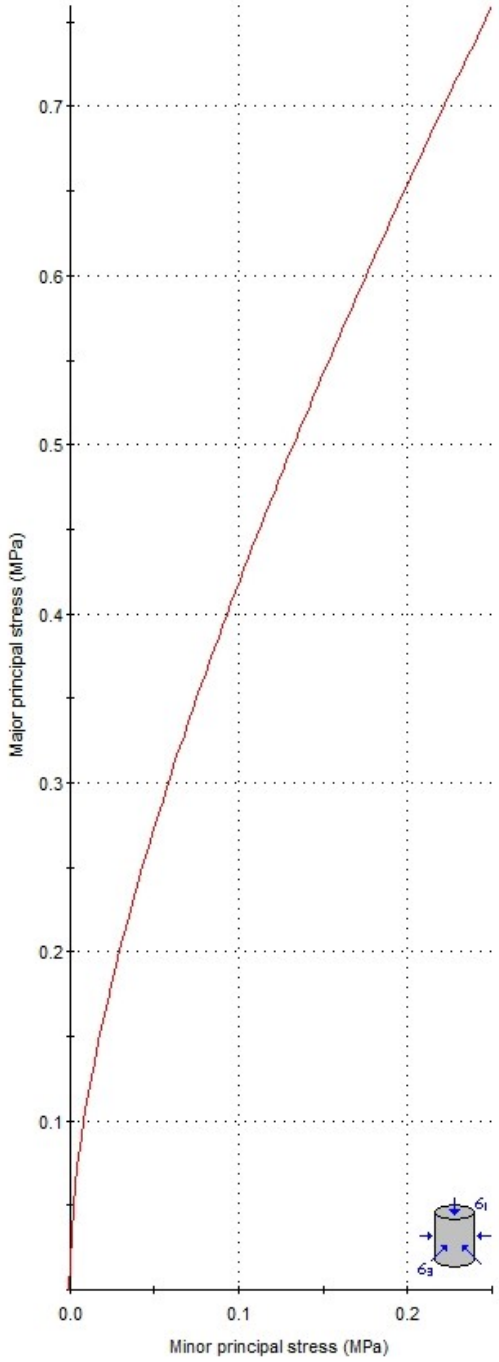
mb = 1.079 s = 0.0007 a = 0.516

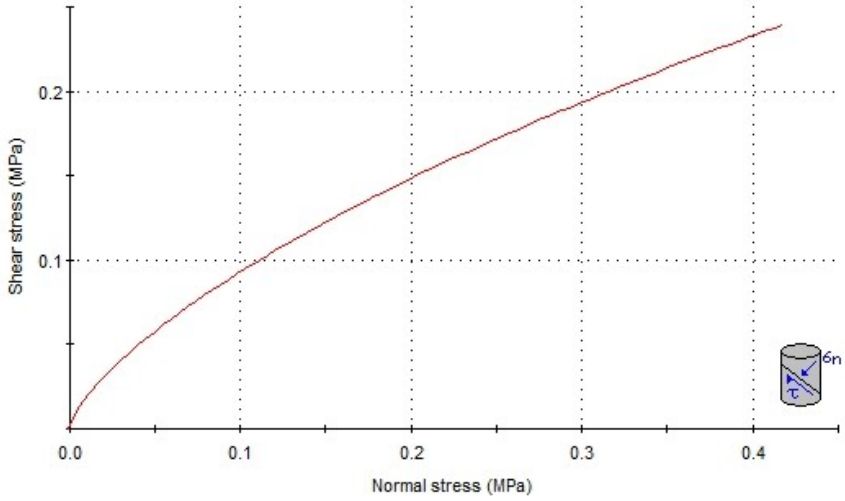
Mohr-Coulomb Fit

cohesion = 0.040 MPa friction angle = 26.87 deg

Rock Mass Parameters

tensile strength = -0.001 MPa
uniaxial compressive strength = 0.024 MPa
global strength = 0.130 MPa
deformation modulus = 1701.11 MPa





Analysis of Rock Strength using RocLab

HW Greywacke Sandstone

Hoek-Brown Classification

intact uniaxial comp. strength (sigci) = 20 MPa
GSI = 40 mi = 11 Disturbance factor (D) = 0
intact modulus (Ei) = 30000 MPa

Hoek-Brown Criterion

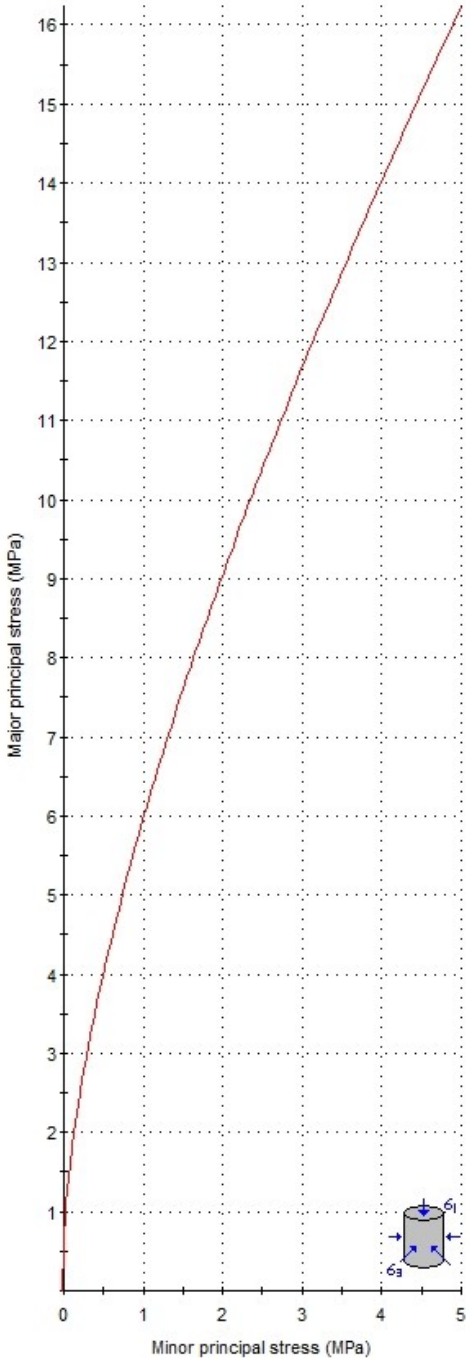
mb = 1.291 s = 0.0013 a = 0.511

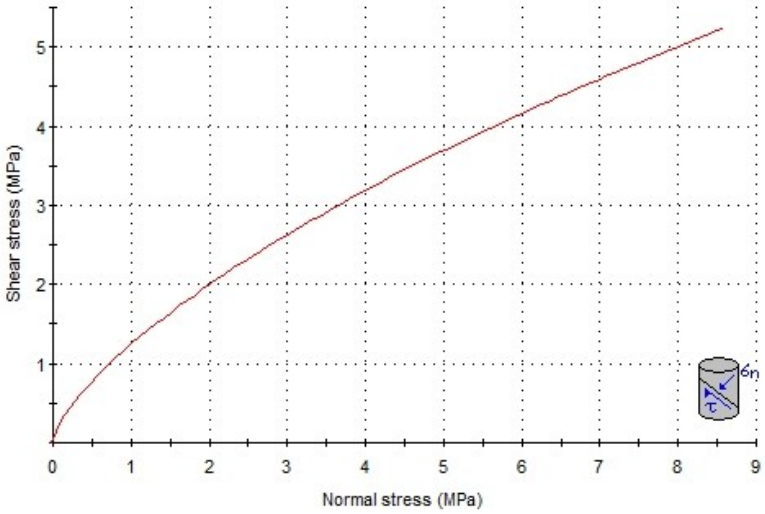
Mohr-Coulomb Fit

cohesion = 0.874 MPa friction angle = 28.36 deg

Rock Mass Parameters

tensile strength = -0.020 MPa
uniaxial compressive strength = 0.661 MPa
global strength = 2.929 MPa
deformation modulus = 4789.57 MPa





Analysis of Rock Strength using RocLab

MW Greywacke Sandstone

Hoek-Brown Classification

intact uniaxial comp. strength (sigci) = 60 MPa
GSI = 50 mi = 11 Disturbance factor (D) = 0
intact modulus (Ei) = 50000 MPa

Hoek-Brown Criterion

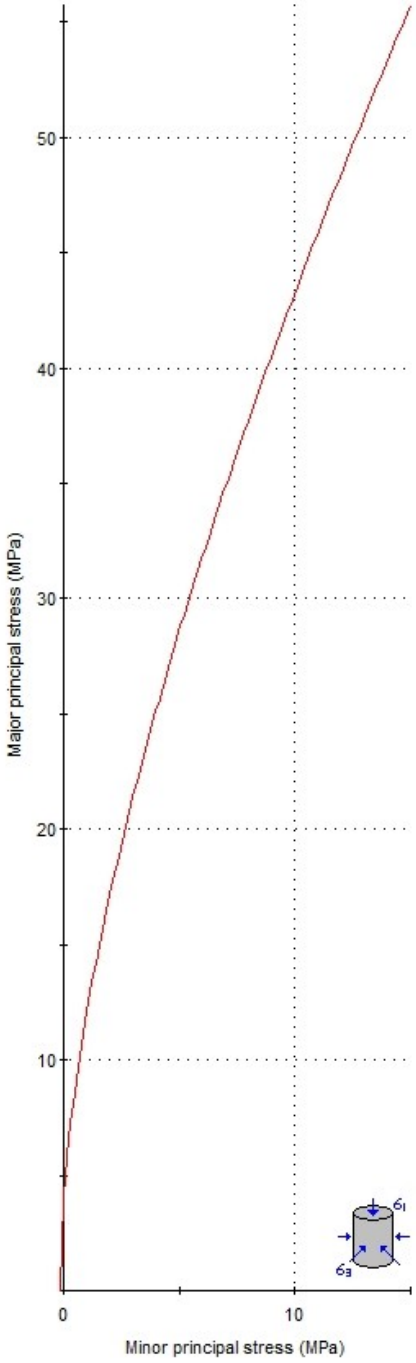
mb = 1.844 s = 0.0039 a = 0.506

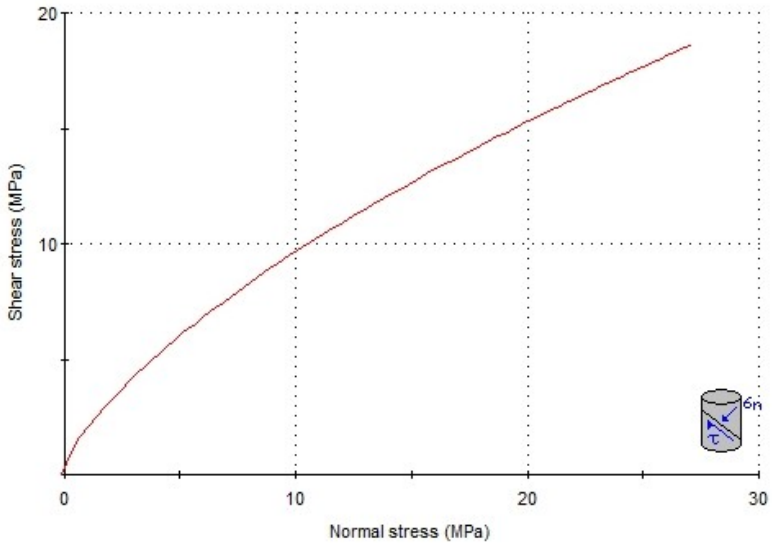
Mohr-Coulomb Fit

cohesion = 3.076 MPa friction angle = 31.33 deg

Rock Mass Parameters

tensile strength = -0.126 MPa
uniaxial compressive strength = 3.614 MPa
global strength = 10.945 MPa
deformation modulus = 15359.30 MPa





Analysis of Rock Strength using RocLab

SW-UW Greywacke Sandstone

Hoek-Brown Classification

intact uniaxial comp. strength (sigci) = 100 MPa
GSI = 65 mi = 11 Disturbance factor (D) = 0
intact modulus (Ei) = 70000 MPa

Hoek-Brown Criterion

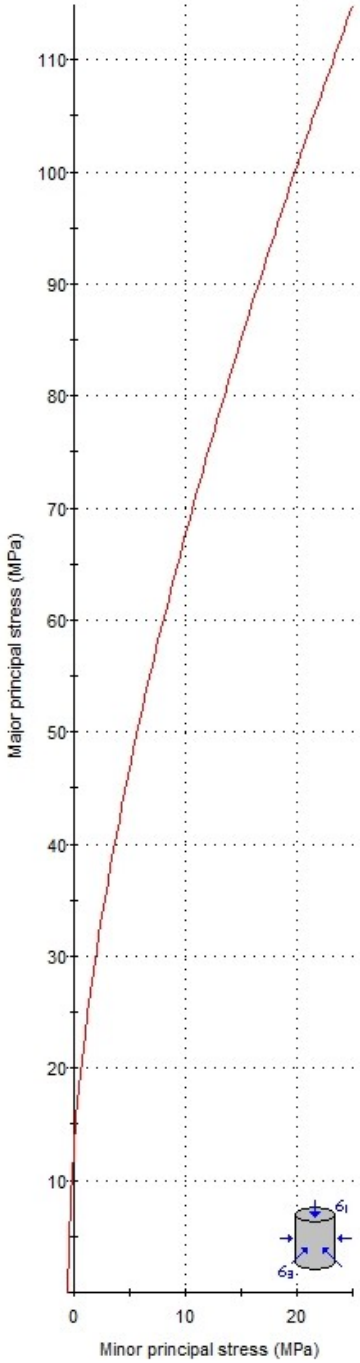
mb = 3.152 s = 0.0205 a = 0.502

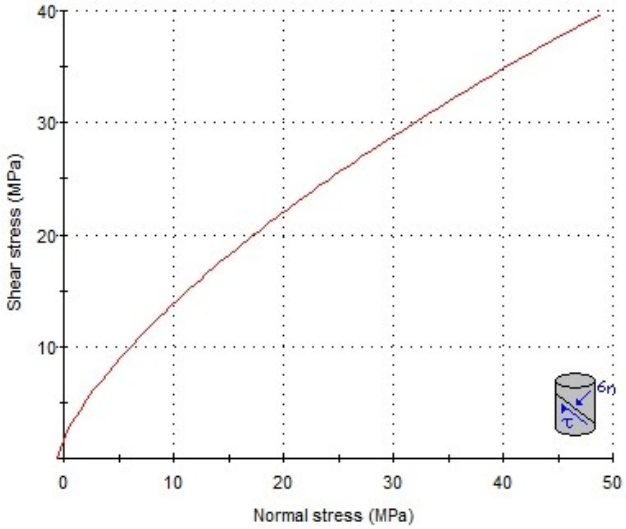
Mohr-Coulomb Fit

cohesion = 6.571 MPa friction angle = 35.74 deg

Rock Mass Parameters

tensile strength = -0.649 MPa
uniaxial compressive strength = 14.197 MPa
global strength = 25.644 MPa
deformation modulus = 44220.36 MPa





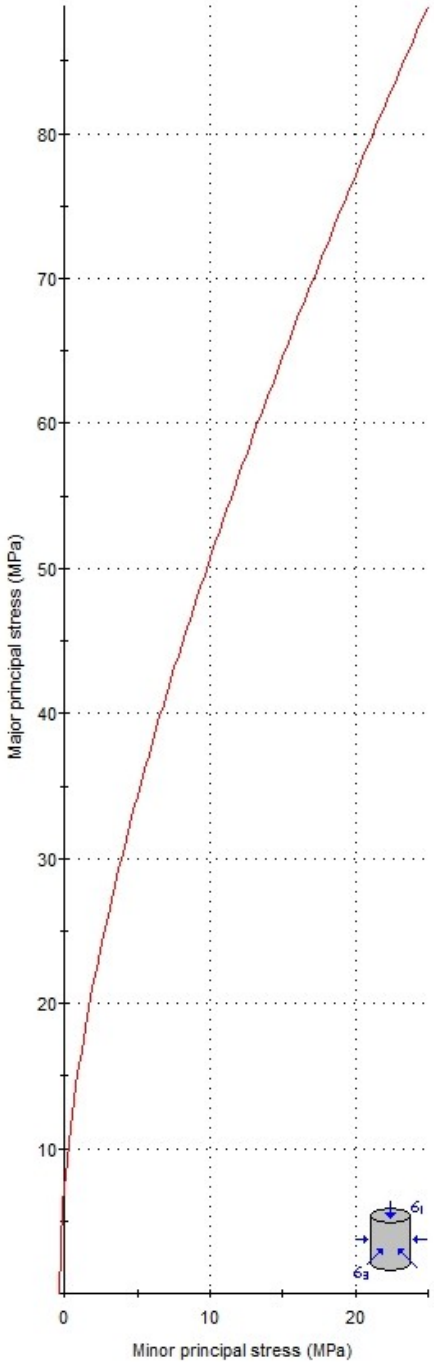
Analysis of Rock Strength using RocLab SW-UW Greywacke Sandstone (Blasted)

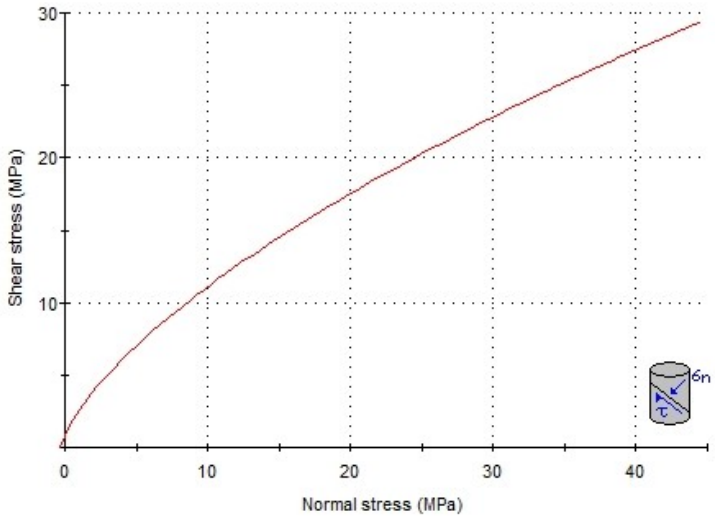
Hoek-Brown Classification
intact uniaxial comp. strength (sigci) = 100 MPa
GSI = 65 mi = 11 Disturbance factor (D) = 0.7
intact modulus (Ei) = 70000 MPa

Hoek-Brown Criterion
mb = 1.608 s = 0.0063 a = 0.502

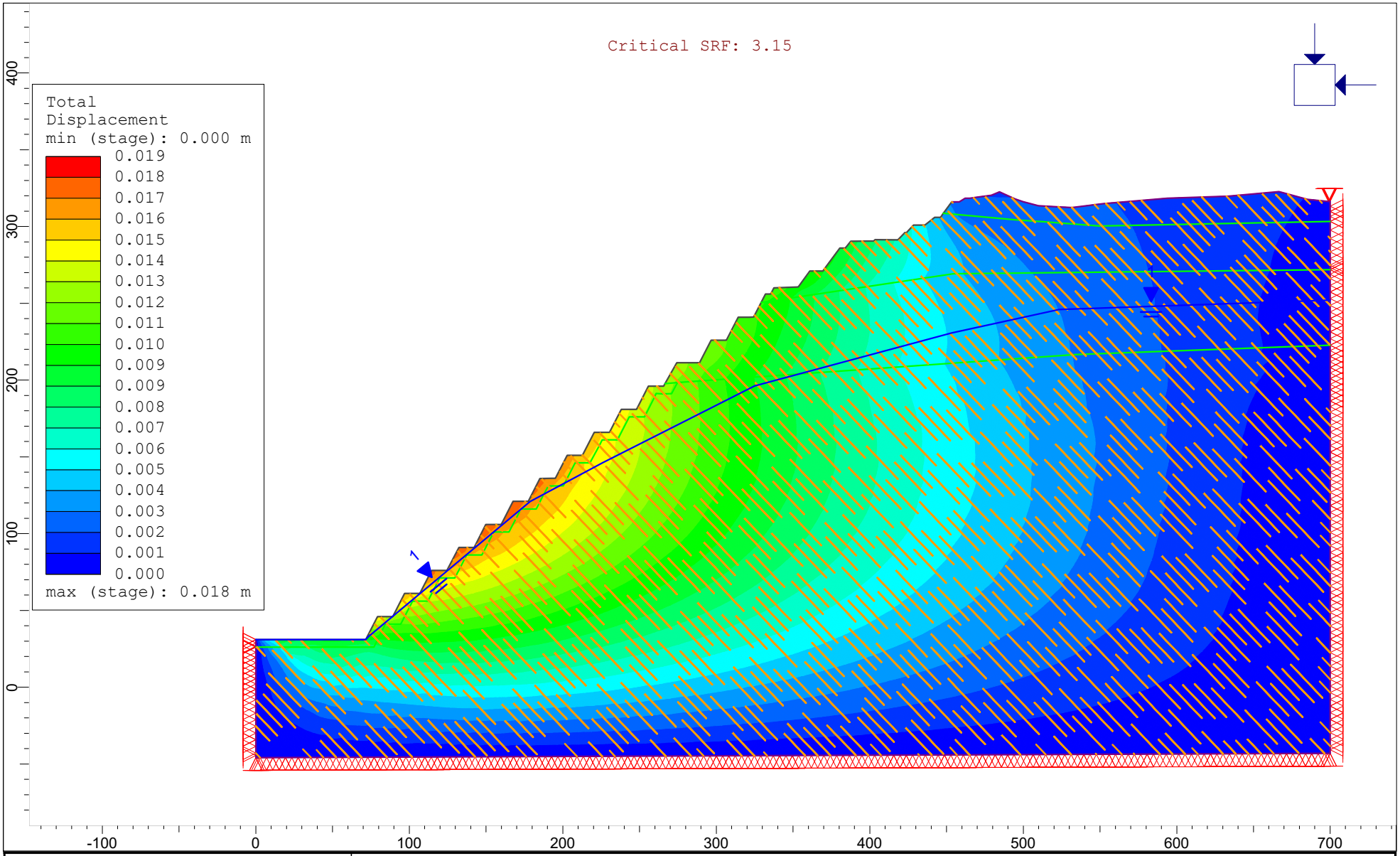
Mohr-Coulomb Fit
cohesion = 5.095 MPa friction angle = 30.11 deg

Rock Mass Parameters
tensile strength = -0.390 MPa
uniaxial compressive strength = 7.837 MPa
global strength = 17.689 MPa
deformation modulus = 18578.10 MPa





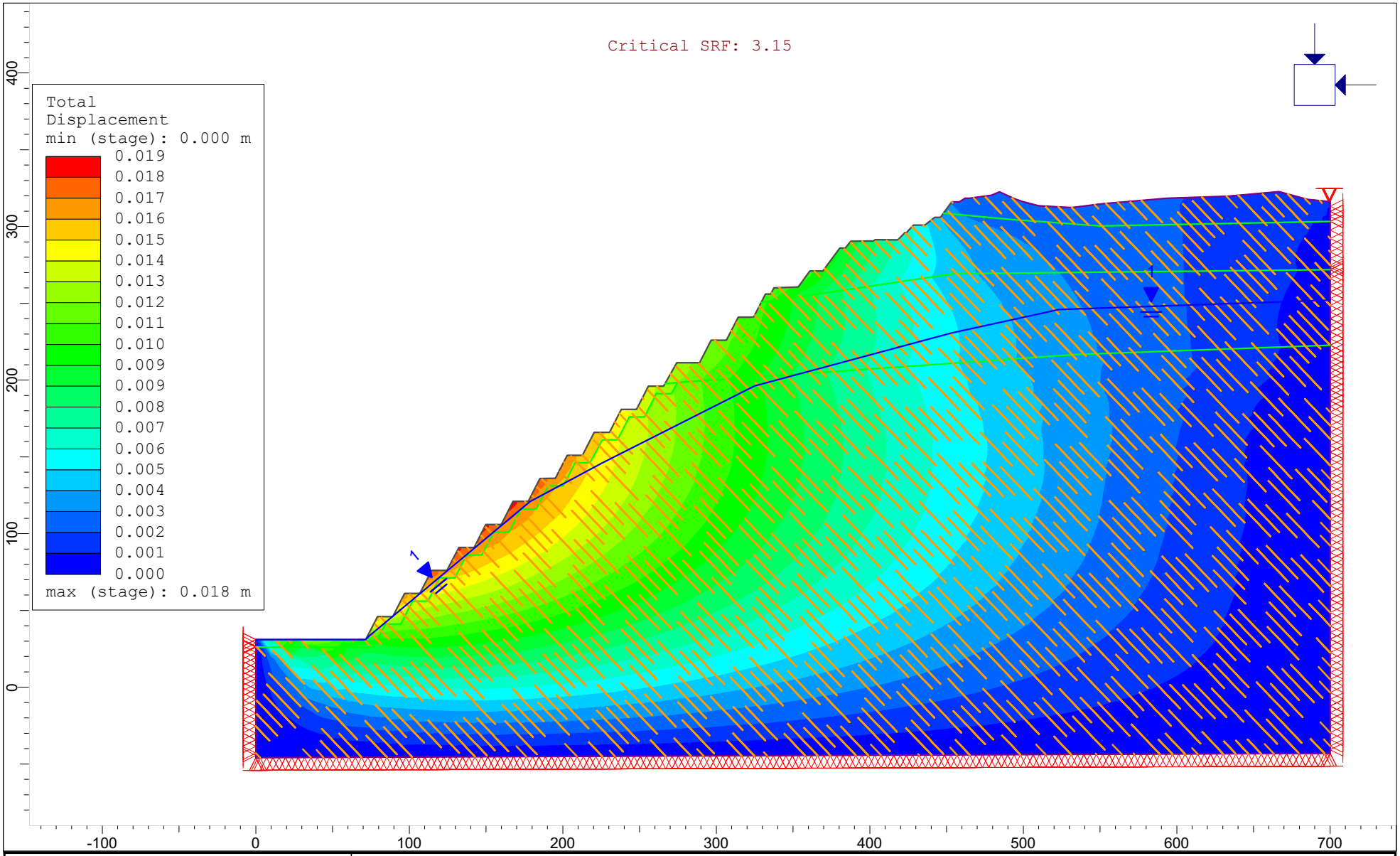
Appendix H – RS2 slope stability analysis results



BASELINE GEOTECHNICAL

INTERPRET 11.029

Project	BGL000206A - Clevedon Quarry Extension			
Analysis Description	East Pit Wall - Static Case [SRF: 1]			
Drawn By	CLi	*Scale*	1:3500	*Company* Baseline Geotechnical Limited
Date	28/09/2026			*File Name* 2026.09.28 - East Wall - V3.fez

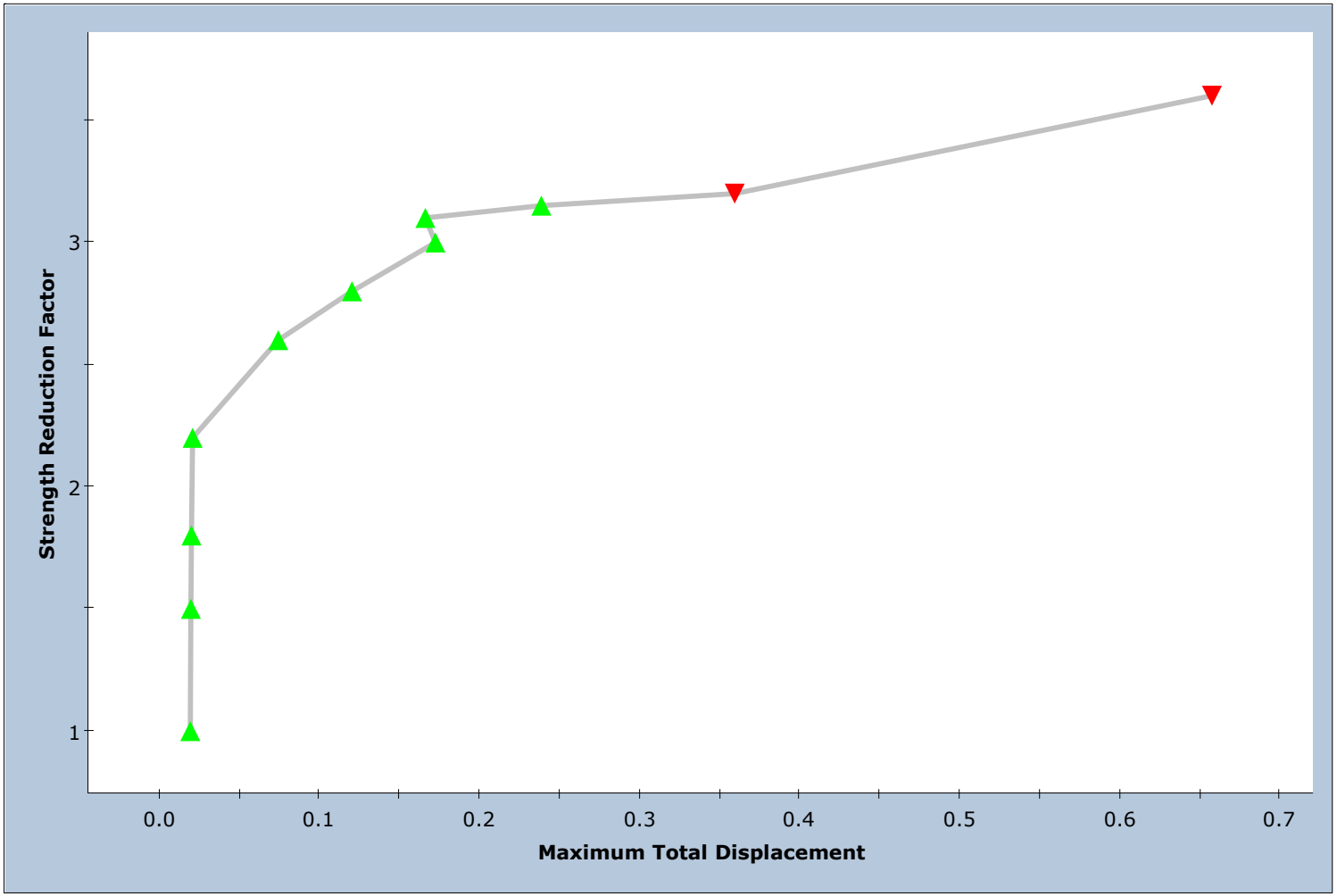


BASELINE GEOTECHNICAL

INTERPRET 11.029

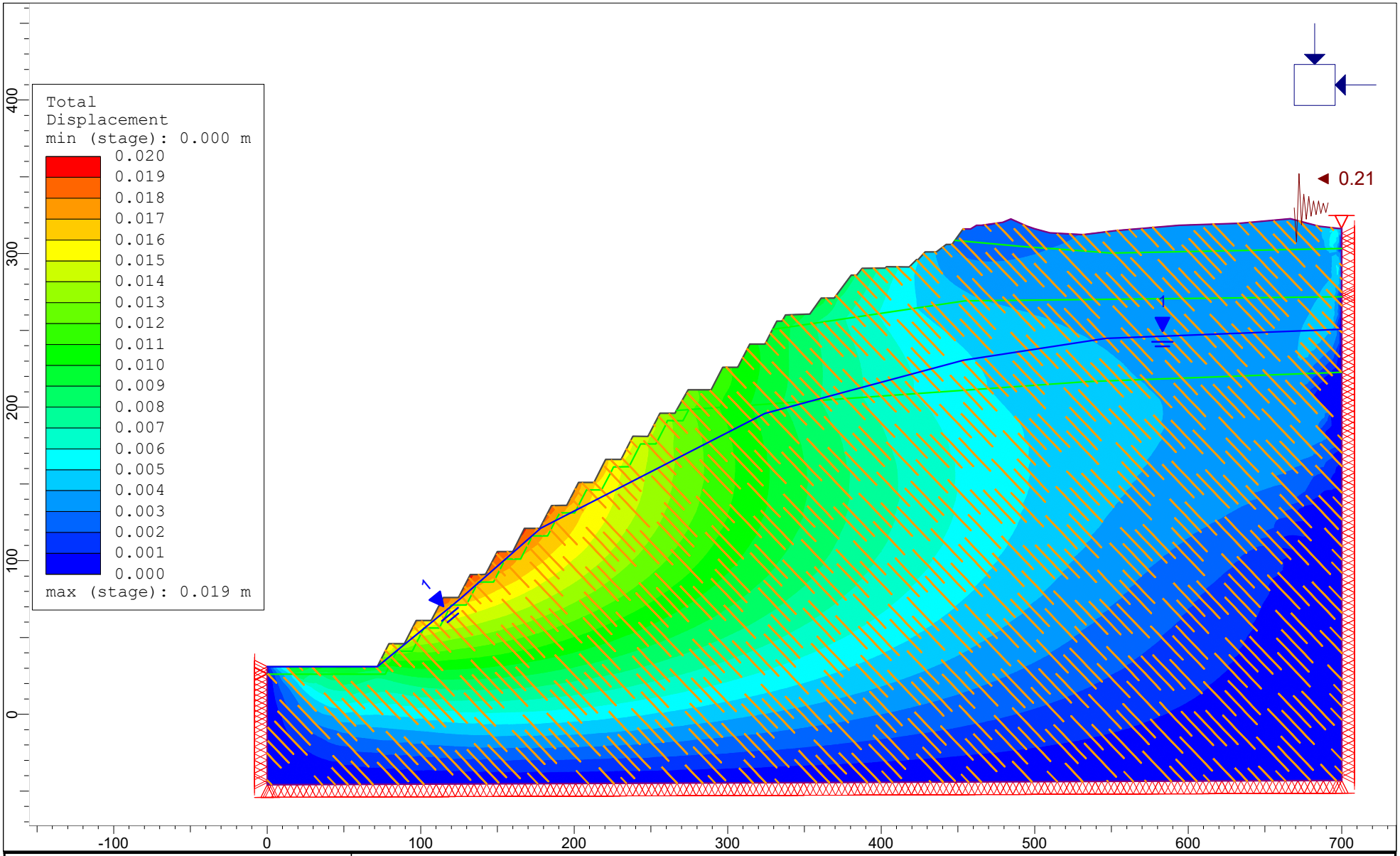
Project	BGL000206A - Clevedon Quarry Extension			
Analysis Description	East Pit Wall - Static Case [SRF: 1.5]			
Drawn By	CLi	*Scale*	1:3500	*Company* Baseline Geotechnical Limited
Date	28/09/2026			*File Name* 2026.09.28 - East Wall - V3.fez

Shear Strength Reduction
Critical SRF: 3.15 at Displacement: 0.239 m



BASELINE GEOTECHNICAL	*Project*	BGL000206A - Clevedon Quarry Extension		
	Analysis Description	East Pit Wall - Static Case [SRF vs. Displacement]		
	Drawn By	CLi	*Scale*	*Company* Baseline Geotechnical Limited
	Date	28/09/2026		*File Name* 2026.09.28 - East Wall - V3.fez

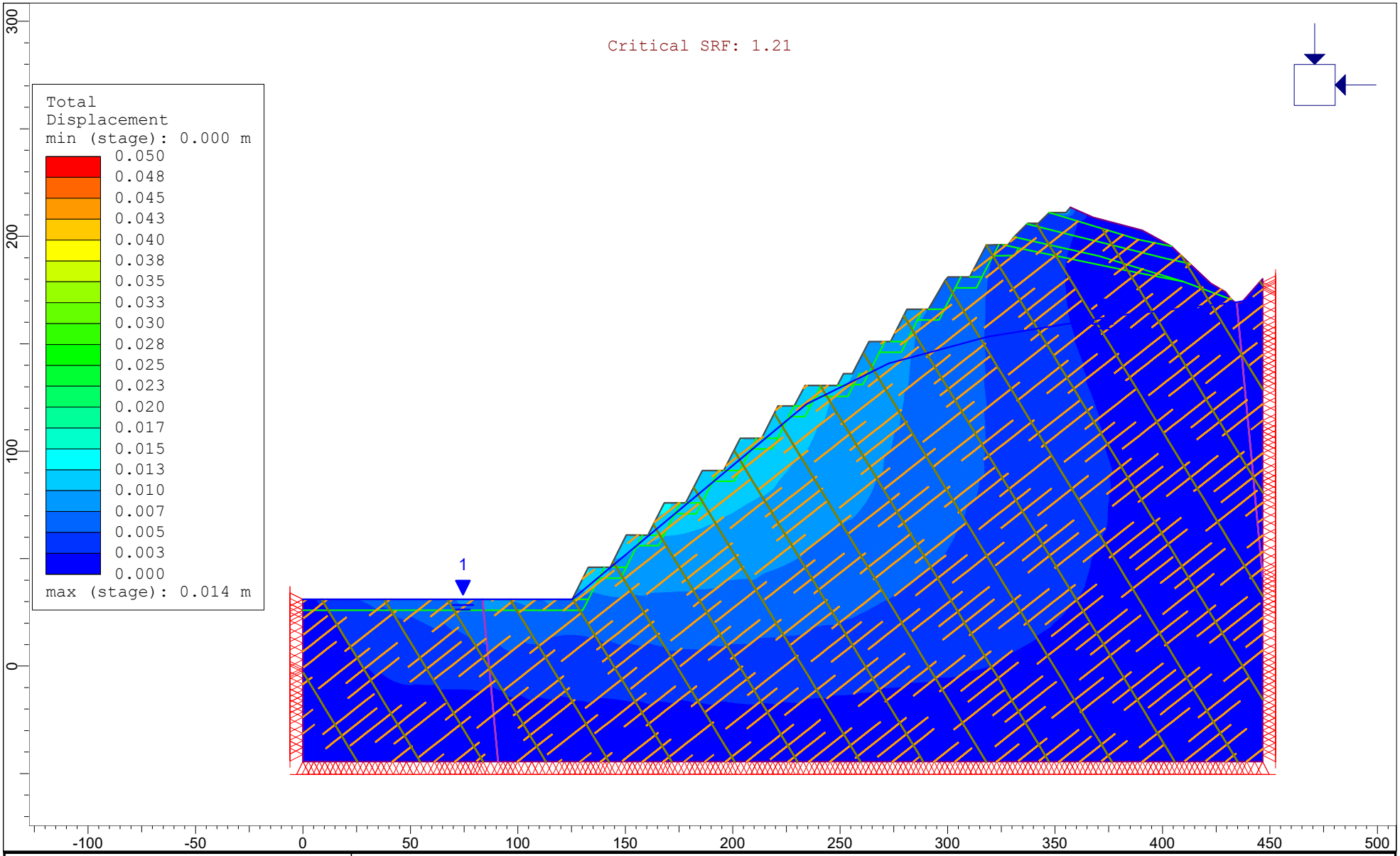
INTERPRET 11.029



BASELINE GEOTECHNICAL

INTERPRET 11.029

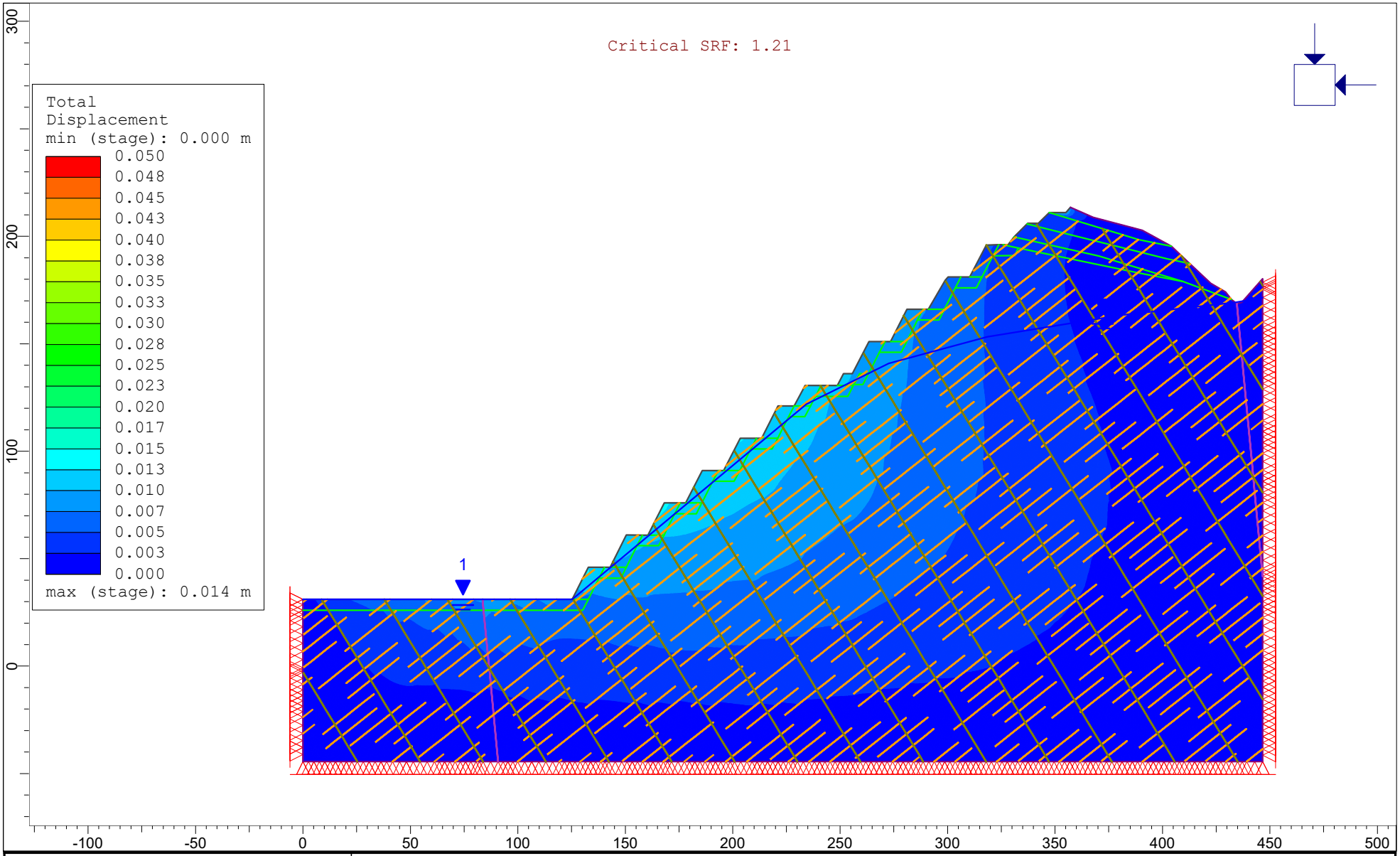
Project	BGL000206A - Clevedon Quarry Extension			
Analysis Description	East Pit Wall - Seismic Case (PGA = 0.21g)			
Drawn By	CLi	*Scale*	1:3500	*Company* Baseline Geotechnical Limited
Date	28/09/2026			*File Name* 2026.09.28 - East Wall - Seismic V3.fez



BASELINE GEOTECHNICAL

INTERPRET 11.029

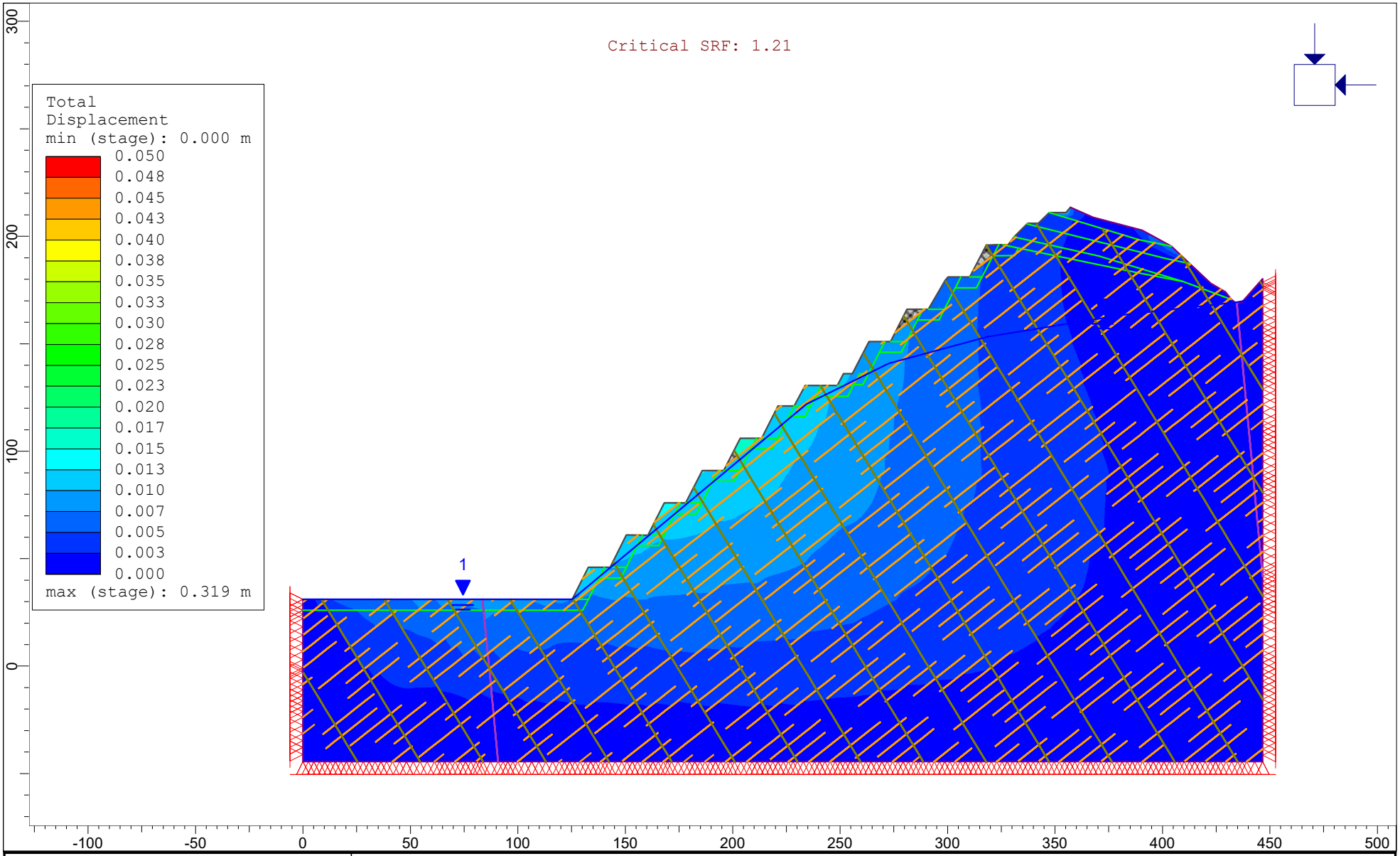
Project	BGL000206A - Clevedon Quarry Extension			
Analysis Description	South Pit Wall - Static Case [SRF: 1.0]			
Drawn By	CLi	*Scale*	1:2500	*Company* Baseline Geotechnical Limited
Date	28/09/2026			*File Name* 2026.09.28 - South Wall -V3.fez



BASELINE GEOTECHNICAL

INTERPRET 11.029

Project	BGL000206A - Clevedon Quarry Extension			
Analysis Description	South Pit Wall - Static Case [SRF: 1.21]			
Drawn By	CLi	*Scale*	1:2500	*Company* Baseline Geotechnical Limited
Date	28/09/2026			*File Name* 2026.09.28 - South Wall -V3.fez

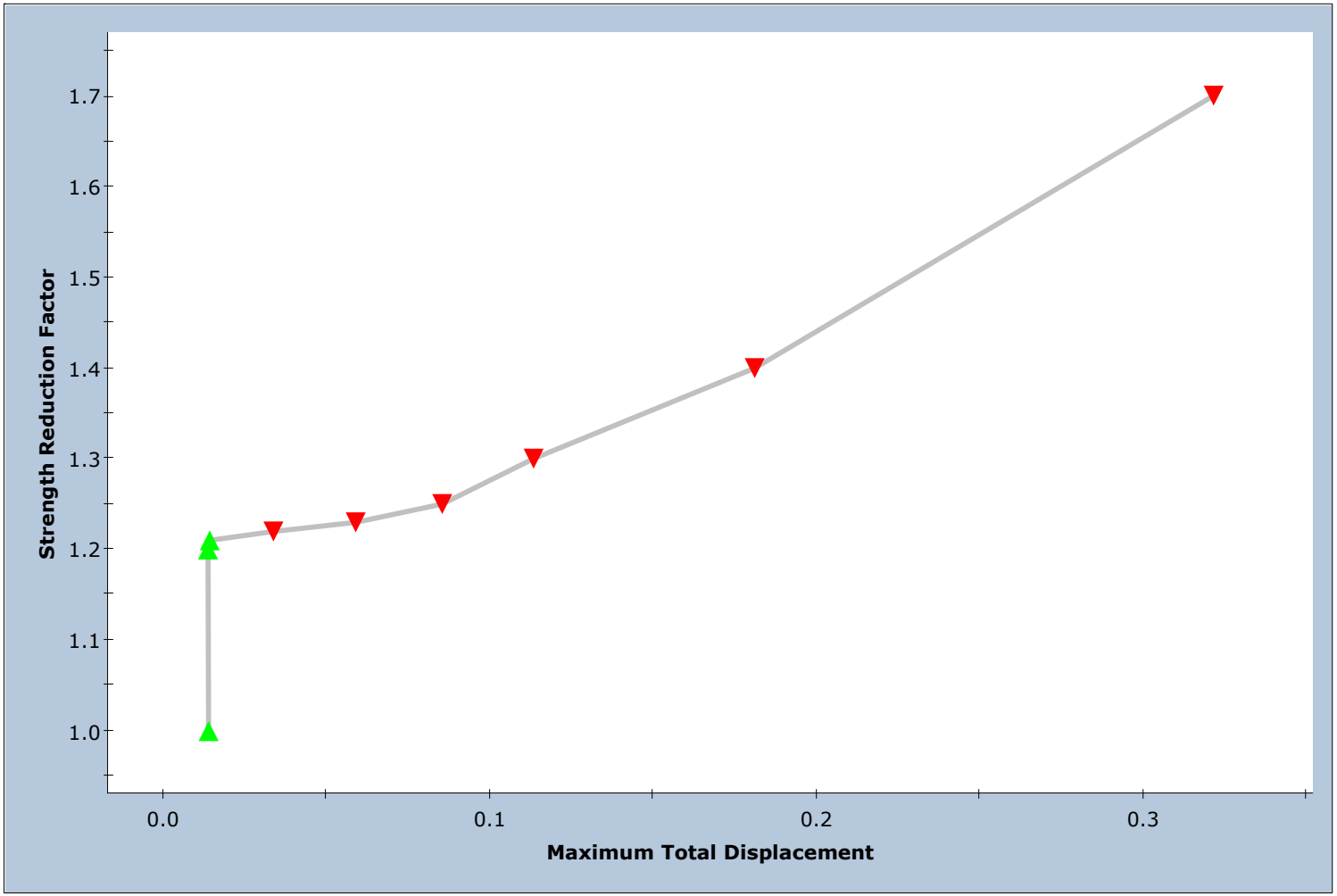


BASELINE GEOTECHNICAL

INTERPRET 11.029

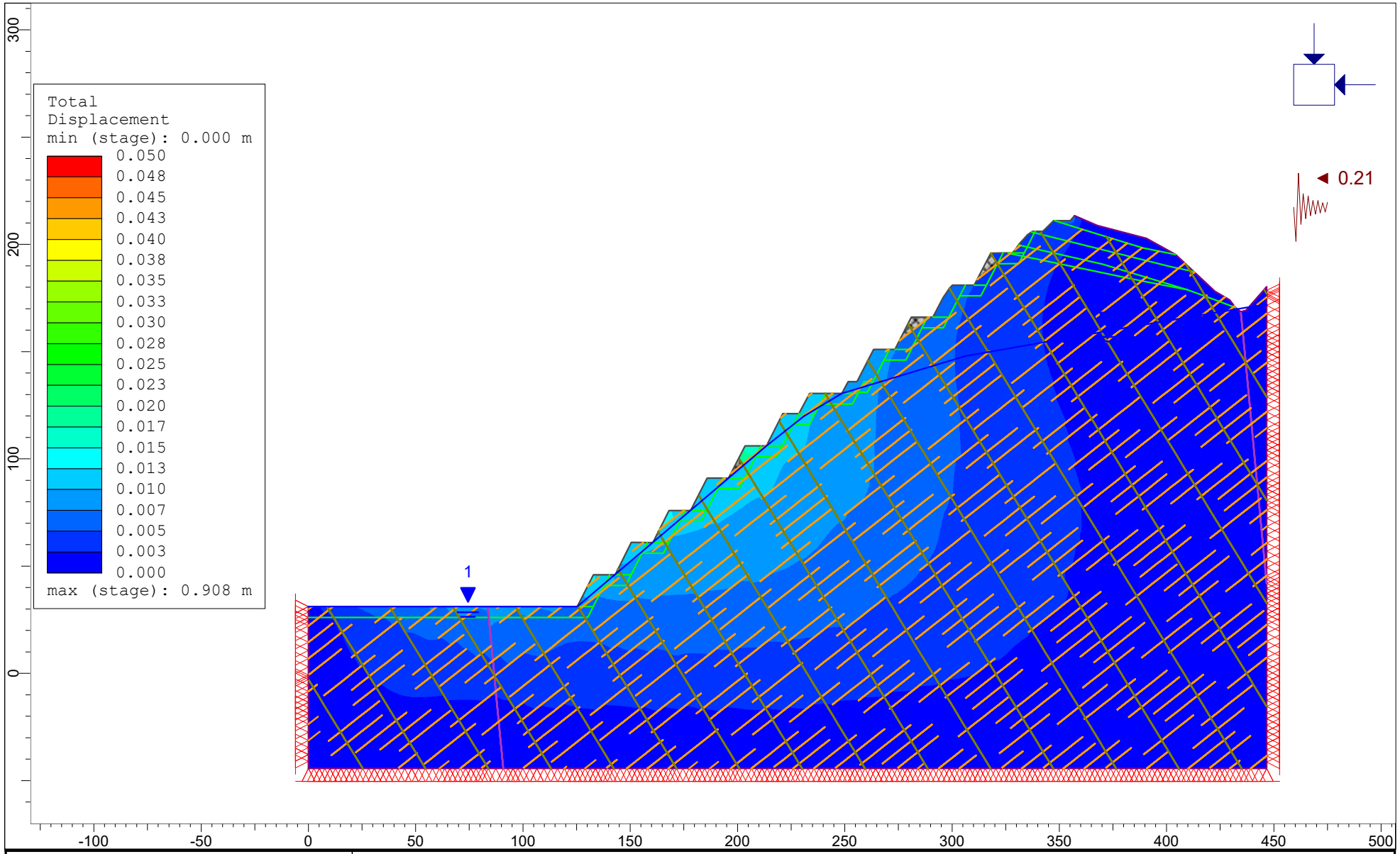
Project	BGL000206A - Clevedon Quarry Extension			
Analysis Description	South Pit Wall - Static Case [SRF: 1.70]			
Drawn By	CLi	*Scale*	1:2500	*Company* Baseline Geotechnical Limited
Date	28/09/2026			*File Name* 2026.09.28 - South Wall -V3.fez

Shear Strength Reduction
Critical SRF: 1.21 at Displacement: 0.014 m



BASELINE GEOTECHNICAL	*Project*	BGL000206A - Clevedon Quarry Extension		
	Analysis Description	South Pit Wall - Static Case [SRF vs. Displacement]		
	Drawn By	CLi	*Scale*	*Company* Baseline Geotechnical Limited
	Date	28/09/2026		*File Name* 2026.09.28 - South Wall -V3.fez

INTERPRET 11.029



BASELINE GEOTECHNICAL

INTERPRET 11.029

Project	BGL000206A - Clevedon Quarry Extension			
Analysis Description	South Pit Wall - Seismic Case (PGA = 0.21g)			
Drawn By	CLi	*Scale*	1:2500	*Company* Baseline Geotechnical Limited
Date	28/09/2026			*File Name* 2026.09.28 - South Wall -Seismic V3.fez