

Coal Transport Logistics

Road Design

June 2026

Contents

1.0	Introduction.....	6
2.0	Coal transport options analysis	11
3.0	Coal Transport Corridor Geology.....	16
3.1	Rock Types	16
3.2	Engineering Geology.....	24
3.2.1	Historical Underground Workings.....	24
3.2.1.1	Proposed Control	29
3.2.1.2	Acid Mine Drainage Potential	30
3.2.1.3	Pre-Commencement Work	30
3.2.2	Colluvium / Landslide Material	30
3.2.3	Bulk fill & removal of unsuitable materials	31
3.2.4	Bulking factors and moisture content.....	31
3.2.5	Sourcing of Road Construction Material	32
3.2.6	Slope design criteria	33
4.0	Geochemical Assessment.....	35
5.0	Road Design	35
5.1	General assumptions	35
5.2	Design Vehicle.....	37
5.2.1	Swept Paths	37
5.3	Curve radius and curve widths	37
5.4	Longitudinal road gradients.....	37
5.5	Pavement Design	38
5.5.1	Traffic Loading	38
5.5.2	Subgrade & empirical design.....	38
5.5.3	Pavement structure.....	39
5.6	Recreation and Public Access Requirements.....	41
5.7	Transpower Interaction	43
5.7.1	Conductor Clearance	43
5.7.2	Pylon Stand-offs	45
5.8	Water Management	45
5.9	Fish Passage	46
5.10	Heritage Areas	47
5.10.1	Heritage New Zealand listed area (Coalbrookdale Mine & Burnett's Face) ..	47
5.10.2	Ironbridge Mine.....	49

5.10.3	Ceaderdale Mine, (Beggs Outcrop)	49
5.10.4	Cook's Lease area	49
5.11	MFS Access	49
5.11.1	UWR crossing.....	50
5.11.2	Deep Creek Bridge	53
6.0	Road Construction	54
6.1	Whareatea Road	54
7.0	Road Construction	54
7.1	Road Construction Start and Progression	60
7.2	Road construction equipment and timing.....	71
8.0	Coal Handling Infrastructure	71
8.1	ROM Coal Loadout ESE	71
8.2	Coal Handling Stockton CHPP	74
8.3	Aerial Ropeway	75
8.4	Export Coal Rail-Port Operations & logistics	78
9.0	Closure.....	78
9.1	Closure Areas	78
APPENDIX A Double configuration & swept path		80
APPENDIX B Road alignment long sections.....		82
APPENDIX C Sediment control sumps and catchments		125
APPENDIX D Culvert Locations and Types.....		132

Figures

Figure 1: Proposed Disturbance and Consent Area for the Upper Waimangaroa Haul Road (Section 1 – Southern End)	7
Figure 2: Proposed Disturbance and Consent Area for the Upper Waimangaroa Haul Road (Section 2 – Northern End)	8
Figure 3: UWHR section naming convention.....	10
Figure 4: CAPEX comparison of Coal Haulage Alternatives.....	12
Figure 5: Pavement width and alignment impacts on UWHR CAPEX.....	14
Figure 6: Kaiata Mudstone Cutting along haul road alignment	17
Figure 7: Brunner Coal Measures cutting on haul road alignment	17

Figure 8: Road Alignment Geology - Escarpment to Cascade	19
Figure 9: Road Alignment Geology - Cascade to Burnett's	20
Figure 10: Road Alignment Geology - Burnett's to Bridge	21
Figure 11: Road Alignment Geology - Bridge to Ford	22
Figure 12: Road Alignment Geology – Ford to Cypress.....	23
Figure 13: In-situ cover in metres (m) from ground surface to underground void.....	26
Figure 14: Surface cracking above Iron Bridge historic mine. Location of image is depicted as (1) on Figure 5.	27
Figure 15: UWHR alignment & Iron Bridge Mine showing location of surface cracking and shallowest workings	28
Figure 16: Geotechnical Design Criteria for bulk fill	32
Figure 17: Typical access road section with separated public access.....	36
Figure 18: Typical access road section without separated public access	36
Figure 19: Unreinforced pavement structure and tensar reinforced pavement structure	40
Figure 20: MTB tracks, DoC Walking Tracks and 4WD tracks.....	42
Figure 21: Conductor clearance calculation components	44
Figure 22: Historic Places Trust areas and survey points of note.....	48
Figure 23: Proposed crossing location topography	51
Figure 24: X-Section of proposed crossing	51
Figure 25: 4m x 4m x 1.55m Uculvert sections, (15.91t each).....	52
Figure 26: Box Culvert Installation similar in geometry to that proposed	53
Figure 27: Deck Truss Bridge example	54
Figure 28: UWHR construction starting points and overall construction sequence.....	56
Figure 29: Cascade Start point and development to ESE	62
Figure 30: Cascade start point - Initial water management.....	64
Figure 31: Burnett's and Ironbridge start points and connecting development	66
Figure 32: Burnett's start point – Initial temporary SRP's for site establishment	67

Figure 33: Burnett’s face – final operational SRP and expanded construction footprint	68
Figure 34: Cypress start point and subsequent development	70
Figure 35: Infrastructure layout showing location of ESE ROM Coal stockpiles and loadout.....	73
Figure 36: Conceptual side tipper road train access to CHPP SP areas for loader reclaim	75
Figure 37: Post CHPP Coal Transport to Rail Loadout Facility at Nagakawau...	77

Tables

Table 1: Access road section naming convention and description.....	9
Table 2: Estimated Void Migration Heights for Typical Denniston Workings...	29
Table 3: Bulking factors and moisture content	31
Table 4: Estimated A-Drive Aggregate Available and Required for UWHR	33
Table 5: Geotechnical Design Criteria for UWHR road cuttings based upon Cypress slope design criteria	34
Table 6: UWHR Geochemistry Reports	35
Table 7: Design Vehicle Summary.....	37
Table 8: Design Vehicle Axle Load	38
Table 9: Empirical Design – Subgrade CBR 5% (Brunner Coal Measures / Mudstone)	39
Table 10: Empirical Design – Subgrade CBR 1% (Colluvium / Landslide).....	39
Table 11: Haulroad pavement design summary.....	41
Table 12: Vehicle heights used in estimating Transpower clearance requirements	44
Table 13: Disturbance Areas, Construction vs Final Operational	58

1.0 Introduction

A private haul road linking Denniston Plateau with existing wash plant and product loadout facilities at Stockton and Ngakawau is preferred to deliver ~2Mtpa of ROM coal from combined Escarpment Extension and Mount Frederick South operations, (comprising a mixture of wash plant feed and bypass coal). The anticipated operational life of the haul road is currently ~15 years, and will continue to be used beyond for monitoring, maintenance and recreational purposes.

The main haul road connecting Escarpment (ESE) and Stockton Coal Handling and Processing Plant (CHPP) is known as the Upper Waimangaroa Haul Road (UWHR). Wherever possible the selected alignment of the UWHR leverages existing access roads and previously cleared areas to minimise the disturbance footprint. Where the route follows existing 4WD tracks, these will require widening and straightening. Only 4km of the haul road alignment traverses previously undisturbed ground, comprising of 1km adjacent to the Escarpment Infrastructure and 3km connecting the haul road to Cypress mining operations in the north. The 4km of previously undisturbed area are covered in a range of native habitat, varying from pākihi wetland to native forest.

Approximately halfway along the UWHR is a spur providing access to the Mount Frederick South (MFS) mine and associated infrastructure.

The UWHR and MFS roads will perform multiple functions in addition to coal transport, providing access for personnel, equipment, supplies and materials to MFS and between Stockton Operations and the Denniston Plateau project.



The road design specification for these interconnecting mine access roads is the same.

Figure 1 and Figure 2 below show the southern and northern UWHR alignment and the MFS access corridor intersecting this approximately halfway between Escarpment and Stockton can be seen heading north from the UWHR alignment in Figure 1 below.

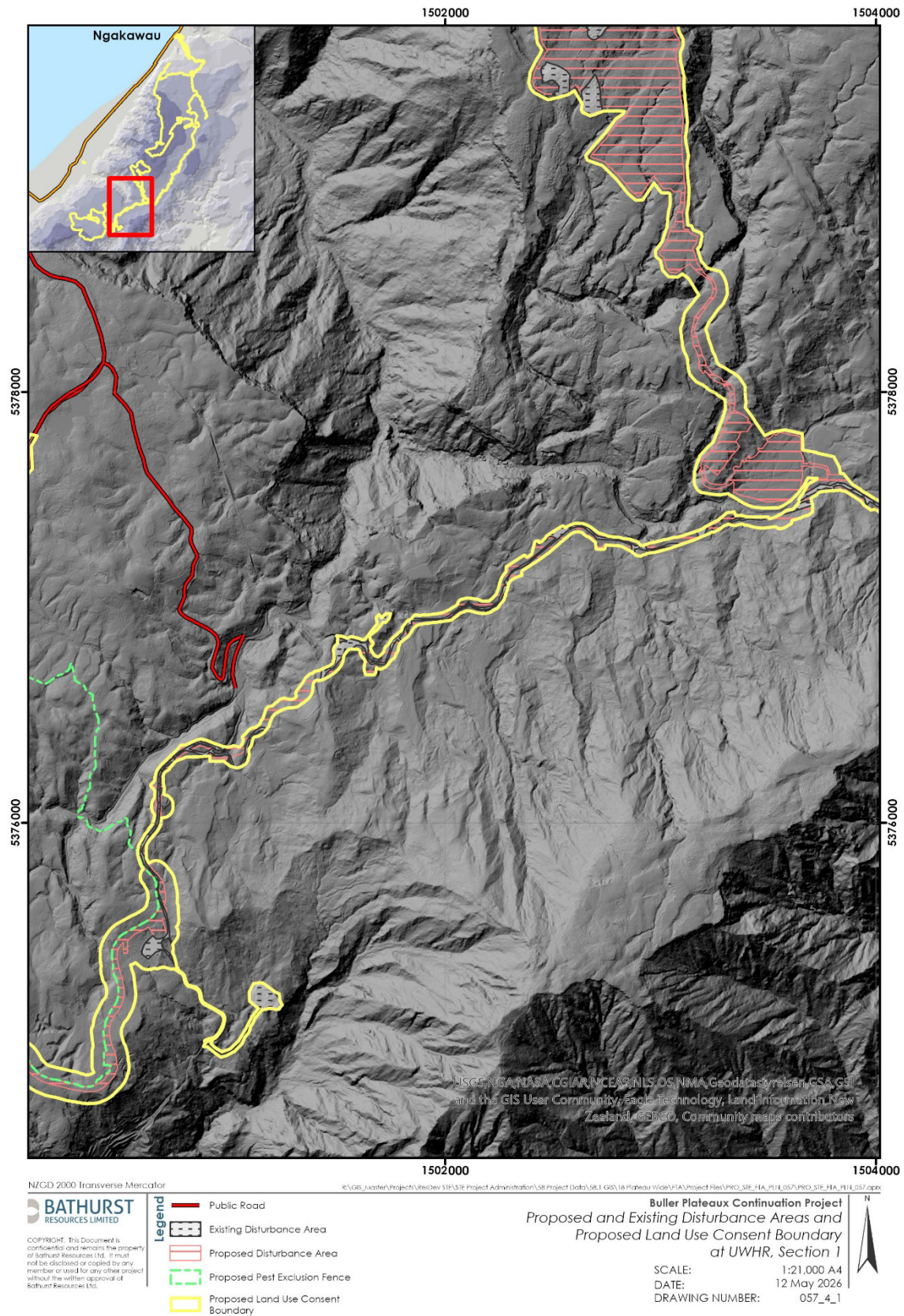


Figure 1: Proposed Disturbance and Consent Area for the Upper Waimangaroa Haul Road (Section 1 – Southern End)

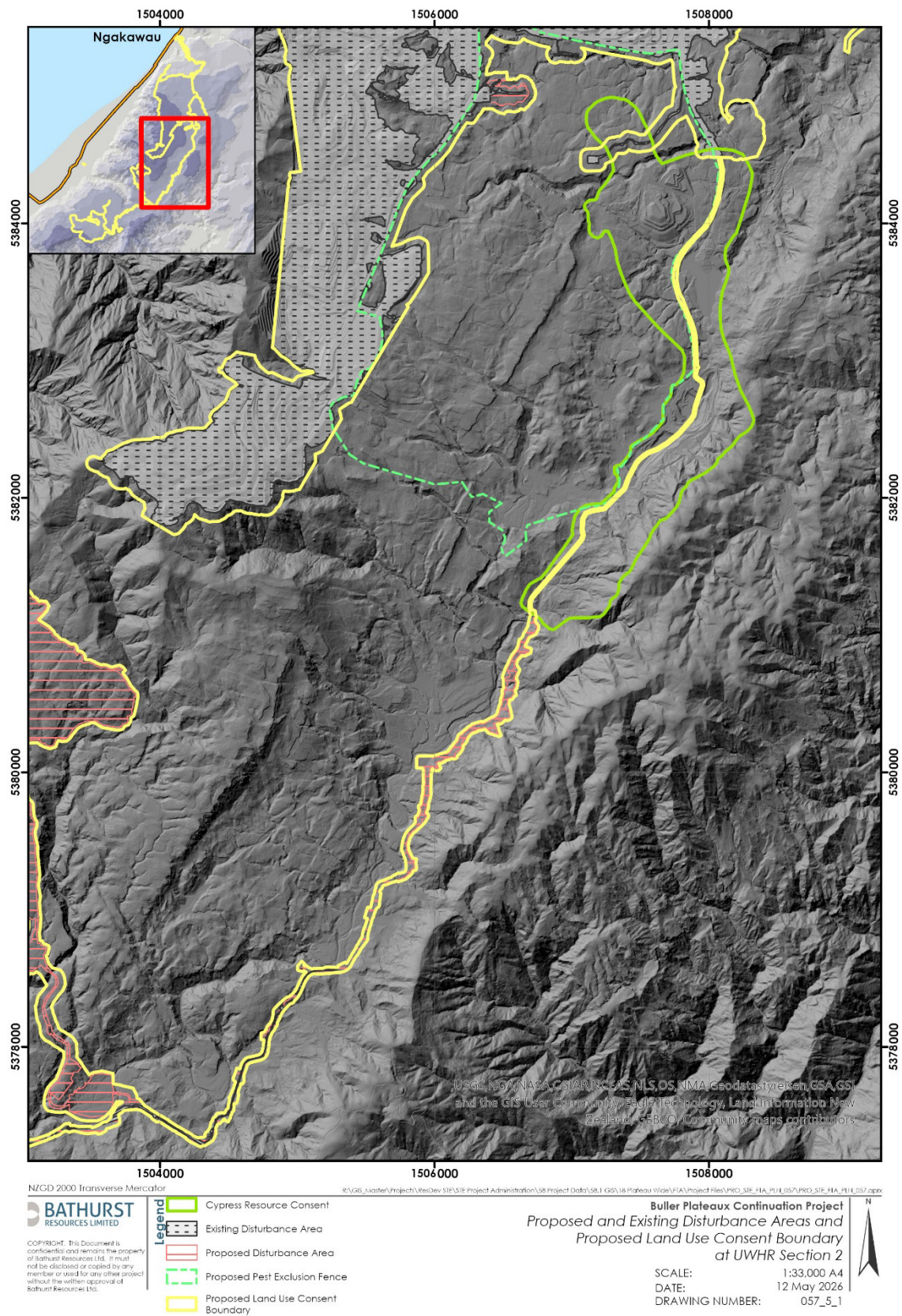


Figure 2: Proposed Disturbance and Consent Area for the Upper Waimangaroa Haul Road (Section 2 – Northern End)

Table 1 below shows the different sections of the UWHR access road with associated naming convention used in describing and summarising road design information along the 15km haul distance between Escarpment and the southern limits of Cypress Pit. Table 1 below summarises the section names and total 19km haul distance from Escarpment to Stockton CHPP.

Table 1: Access road section naming convention and description

Section shorthand	Section Name	Length (km)	Description
E2C	Escarpment to Cascade	2.1	Escarpment ROM SP to Cascade mine access road – no existing track.
C2B	Cascade to Burnett's	1.9	Cascade mine access road and bypass of Burnett's face
B2B	Burnett's to Bridge	2.9	Mackley access track through to last bridge and first point where Mackley track breaks off to Lyell
B2F	Bridge to Ford	1.8	Existing track from Bridge through to UWR ford crossing and end of TLHS 4WD track
F2C	Ford to Cypress	3.0	Ford through to southern limit of Cypress Pit with no existing track
C2S	Cypress to Stockton	7.0	Through Cypress pit and along established haul roads to CHPP
MFS	Mount Frederick South	3.9	Access from UWHR to MFS infrastructure and mine

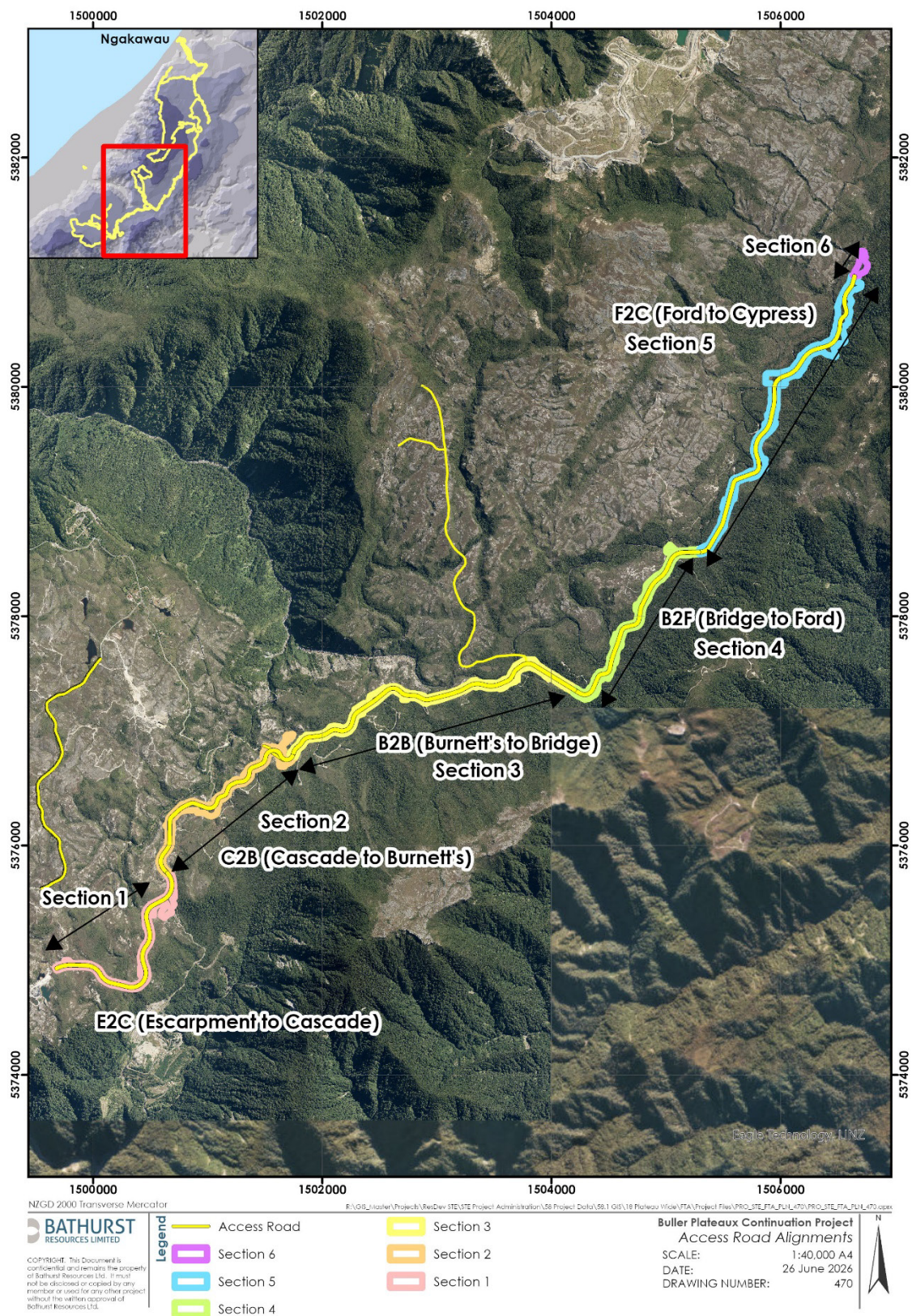


Figure 3: UWHR section naming convention

2.0 Coal transport options analysis

The UWHR has been selected as the preferred coal haulage option on the basis of an extended options assessment that has considered multiple criteria including environmental footprint, technical risk, closure requirements, permitting, capital and operating cost. Coal transport options considered have included, Aerial Ropeway, Aerial Rope Conveyor, Slurry pumping, haulage utilising public roads, haulage with mine trucks utilising a private haul road and haulage via private road utilising road trains.

Aerial ropeway vs private haul road

An Order of Magnitude (OoM) assessment of options in 2024 determined Aerial Ropeway options of primary interest in comparison to private UWHR options due to the reduced environmental impacts of the pylon footings in comparison to the road footprint.



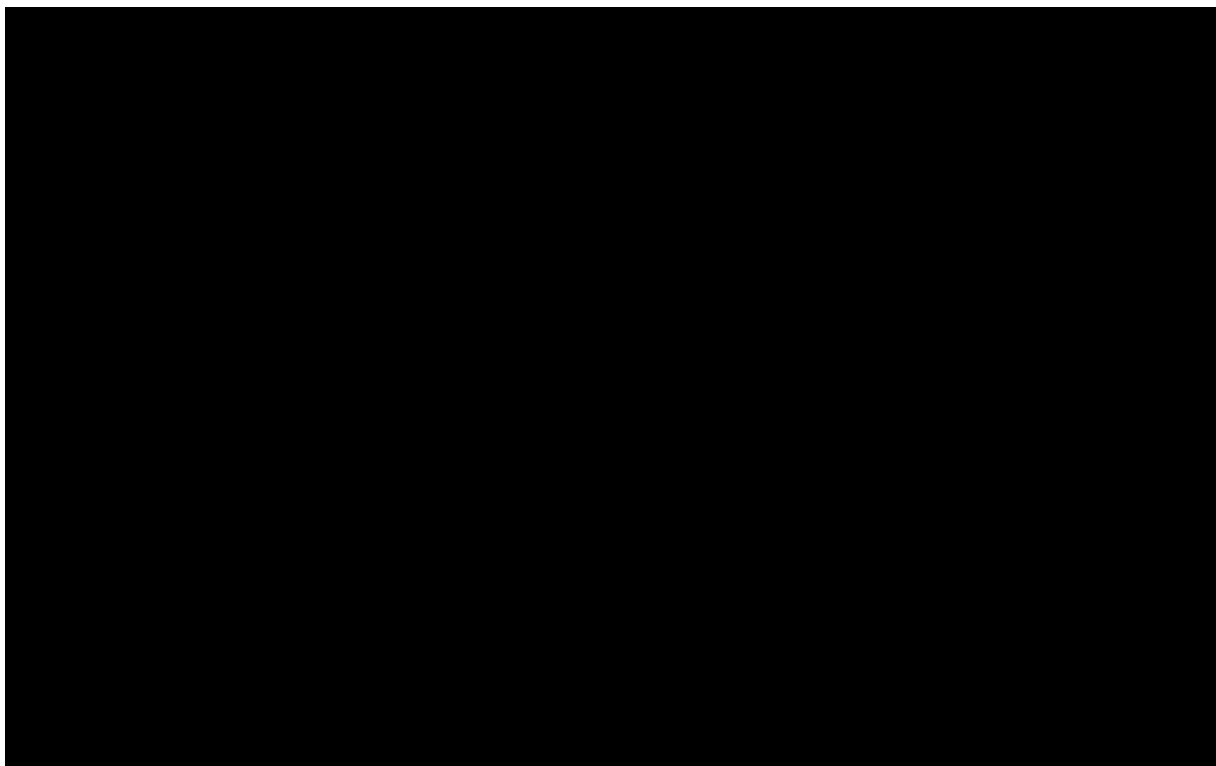
The main aerial ropeway options considered had a loading facility at Escarpment Operations with:

- a combination Bi-cable ropeway to Mt Frederick South (MFS), with mine truck haulage to Stockton Coal Handling and Processing Plant (CHPP),
 - Bi-cable Ropeway direct to existing Stockton CHPP,
- Bi-cable Ropeway to new or relocated CHPP at Fairview,
 - Mono-cable Ropeway to MFS with mine truck haulage to Stockton CHPP

The Mono-cable option (far right in Figure 4) represents a reduced capacity option that leveraged pre-processing of ROM coal feed with modular container housed x-ray sorting units to reduce quantities transported and potentially enable lower capital mono cable ropeway option. 

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Based upon this evaluation, the haulage of Denniston Plateau coal to Stockton via an UWHR is preferred.

Several alignment options have been considered previously. This has included both the true left hand (TLH) and true right hand (TRH) sides of the Waimangaroa River beyond “The Ford” and existing public access tracks. Alignment also considered options to cross the Upper Waimangaroa River to avoid Transpower Infrastructure.

The TLHS alignment that does not cross the river to avoid Transpower towers and lines has been selected as the preferred alignment on a cost and risk basis. The TLHS option eliminates the need for two significant bridges in close proximity and also avoids significant topographical relief and geotechnical / cost risk associated with the TRHS option. The TLHS also avoids significant areas of untouched natural wetlands along the upper reaches of the Upper Waimangaroa River.

The final ~1km of the northern end of the TLHS alignment has residual geotechnical risk around colluvium and landslide material making up the foundations of the road.

Haul Road Size and Alignment Options

Several haul road size and alignment options were considered to estimate cost and footprint effects associated with different vehicle types and dual usage requirements. This work showed that the estimated cost of the road was closely related to design and use assumptions, and this was used to refine the recommended specification of the road.

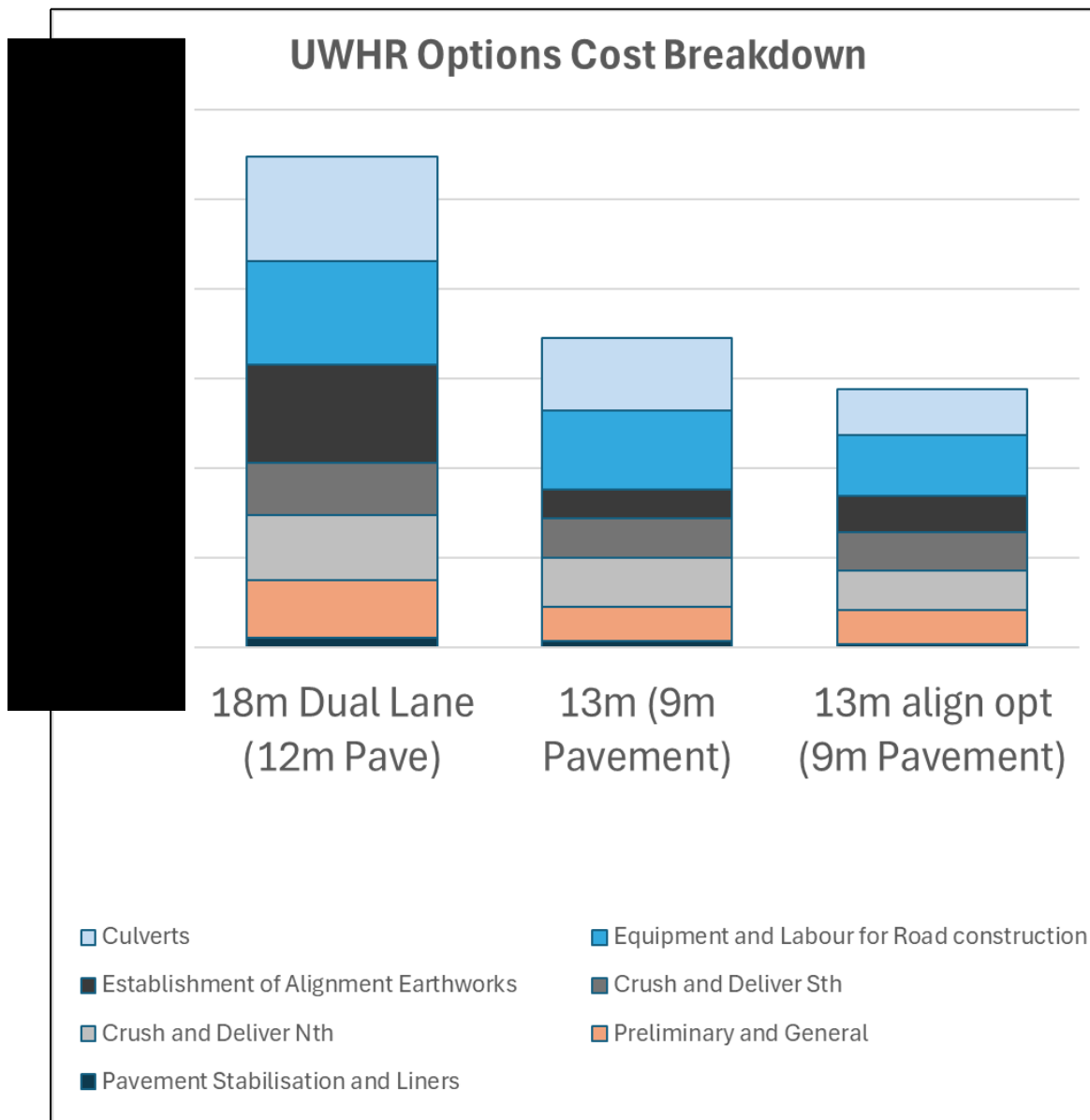
Road geometry options considered included:

- 18m pavement to accommodate mine truck haulage (3.5 x CAT777 width) between ESE and Stockton
- 12m pavement for A-Double road truck configuration (3.5 x A-Double width), with separate public LV and Transpower access
- 12m pavement for A-Double road truck configuration (3.5 x A-Double width) excluding separate access
- 8.6m pavement for A-Double road truck configuration (2.4 x A-Double width) with separate public LV and Transpower access
- 8.6m pavement for A-Double road truck configuration (2.4 x A-Double width) following existing access road more closely – minimum entry footprint

The 3.5 x operating width guidance is in line with Stockton mine road design standards. The 2.4 x operating width assumption was selected based upon the combined influence of lower traffic density and a suite of operational controls that can be used to ensure the safety of personnel and equipment on a narrower design pavement.



UWHR Options Cost Breakdown



Selected go forward haul road geometry

The proposed UWHR design has been selected on the following basis:

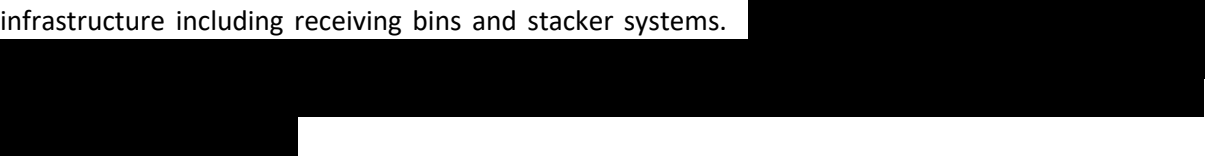
- The footprint of the haul road is materially reduced due to the smaller width of the road train units when compared with heavy mine haulage equipment.
- The capital intensity of the associated private haul road option is estimated to be approximately half the cost of aerial ropeway options with further options available to optimise and stage capital expenditure associated with the establishment of the haul road.
- The haul road option provides greater flexibility in supporting a range of production rates and mining locations

- The equivalent standard axle load of road trains is orders of magnitude less than mining trucks with an associated reduction in construction basecourse requirements and ongoing operating maintenance cost.
- Risks associated with tyre heating on long hauls using mining trucks is eliminated

A-Double Trailer Selection

Both belly dumping and side tipping trailers were considered for coal haulage.

Belly dump trailers were initially considered preferable due to their stability and efficiency in unloading bulk materials. Subsequent estimation of the cost associated with feed preparation and receiving infrastructure however showed there is significant expense associated with their use. This is in the form of feed preparation sizing (>200mm), conveyors and hoppers and unloading infrastructure including receiving bins and stacker systems.



3.0 Coal Transport Corridor Geology

3.1 Rock Types

Broadly the geology along the 15km, TLHS alignment of the haul road south of the Cypress Pit limits transitions through 3 zones. In the northern third the geology is characterised by Quaternary colluvium/landslide material overlying Tertiary Kaiata mudstones. The southern 1/3 of the road is located in the Brunner Coal Measures which are interbedded sandstones, conglomerates, mudstones and shales. The middle section of the road is a transition between these with a mixture of both Brunner Coal Measures and Kaiata Mudstones.

Topsoil / Growth Medium

In the forested areas of the northern half of the road alignment the Quaternary deposits are covered in organic rich soils of minimal thickness (typically <300mm).

The surface of the sandstone pavements of the Brunner Coal Measures in the southern half of the haul road alignment are a mixture of bare rock and the weathered sand particles of the sandstone measures. These provide very poor soil with only patches of organic materials hosting low scrub.

Colluvium / Landslide Material

A mixture of colluvium, landslide deposits and talus deposits occur along the western side of the Mt William fault and immediately beneath the northern 1.2km of the road alignment. This material comprises of boulder to gravel sized basement rock in a fine grained matrix and is typically saturated.

Drill holes located within a 100 m of the haul road alignment show there is an average of 5.5 m thickness of colluvium in the 1.2 km stretch directly south of the Cypress pit. These drilling intersections were derived from several programmes over a lengthy timeframe, where characterisation of overburden materials was not a priority. Field inspections revealed that in some of the creeks the colluvium was greater than 10 metres thick and experience in mining the Cypress pit would suggest that it can be up to 20m thick or greater when skirting large scale landslide on the flanks of Mt William and the Mt William fault zone.

Kaiata Mudstone (Fault affected and weathered)

The surface weathering profile has been found to be 15 to 20 metres in thickness, meaning the majority of Kaiata Formation mudstone intercepted during road construction will be of this type.

Where the Kaiata Formation mudstones have been subjected to additional stresses relating to faulting or surface weathering, pervasive shearing develops. This sheared material is significantly weakened which requires reducing the batter angles when compared with fresh mudstone slope design criteria to maintain stability.

This material does not require drilling and blasting for excavation.

Where Kaiata mudstone is intersected insitu and unaffected by faulting, it would appear to have a reasonable contained bearing capacity. Experience at the Cypress mine shows, however, that this

material is not that durable when continuously trafficked by mining trucks. The ground pressures of these large mining trucks are significantly higher than those of the proposed haul trucks though and some assessment of base course requirements in this material for the anticipated duty will be required.



Figure 6: Kaiata Mudstone Cutting along haul road alignment

Brunner Coal Measures

The Brunner Coal Measures are made up of conglomerates, sandstones, mudstones and coal seams. The coal measures are dominated by sandstones varying from very fine to very coarse.

The sandstone feldspars are heavily weathered, meaning the sandstones do not perform well where abrasion and crushing occur due to repeated vehicle movements and it is therefore not that suited to road surface layer construction. This material due to its well graded nature will likely form suitable bulk fill material for road construction.



Figure 7: Brunner Coal Measures cutting on haul road alignment

The intersection of these rocktypes and the associated structural geology with the road alignment are shown.

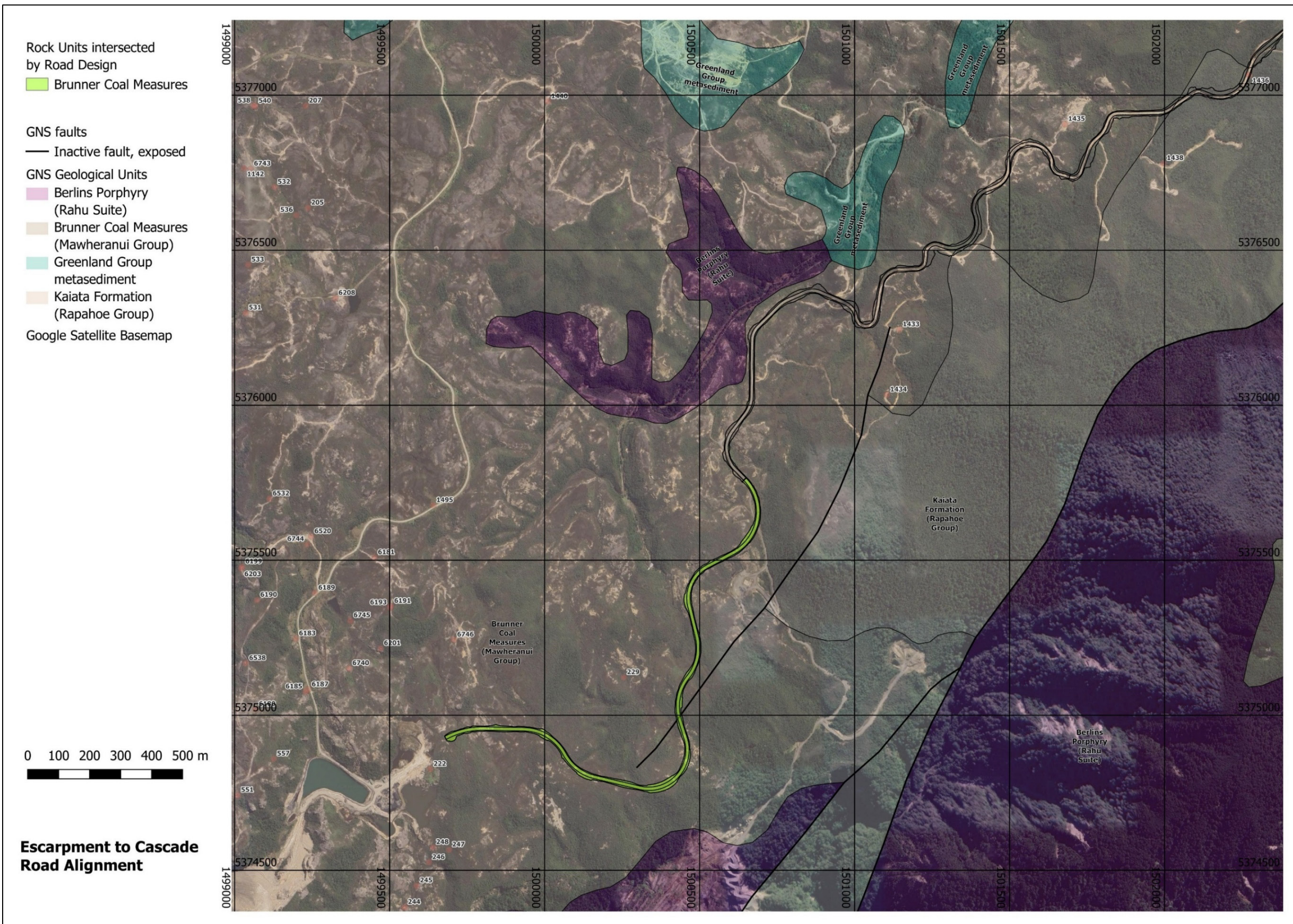


Figure 8: Road Alignment Geology - Escarpment to Cascade

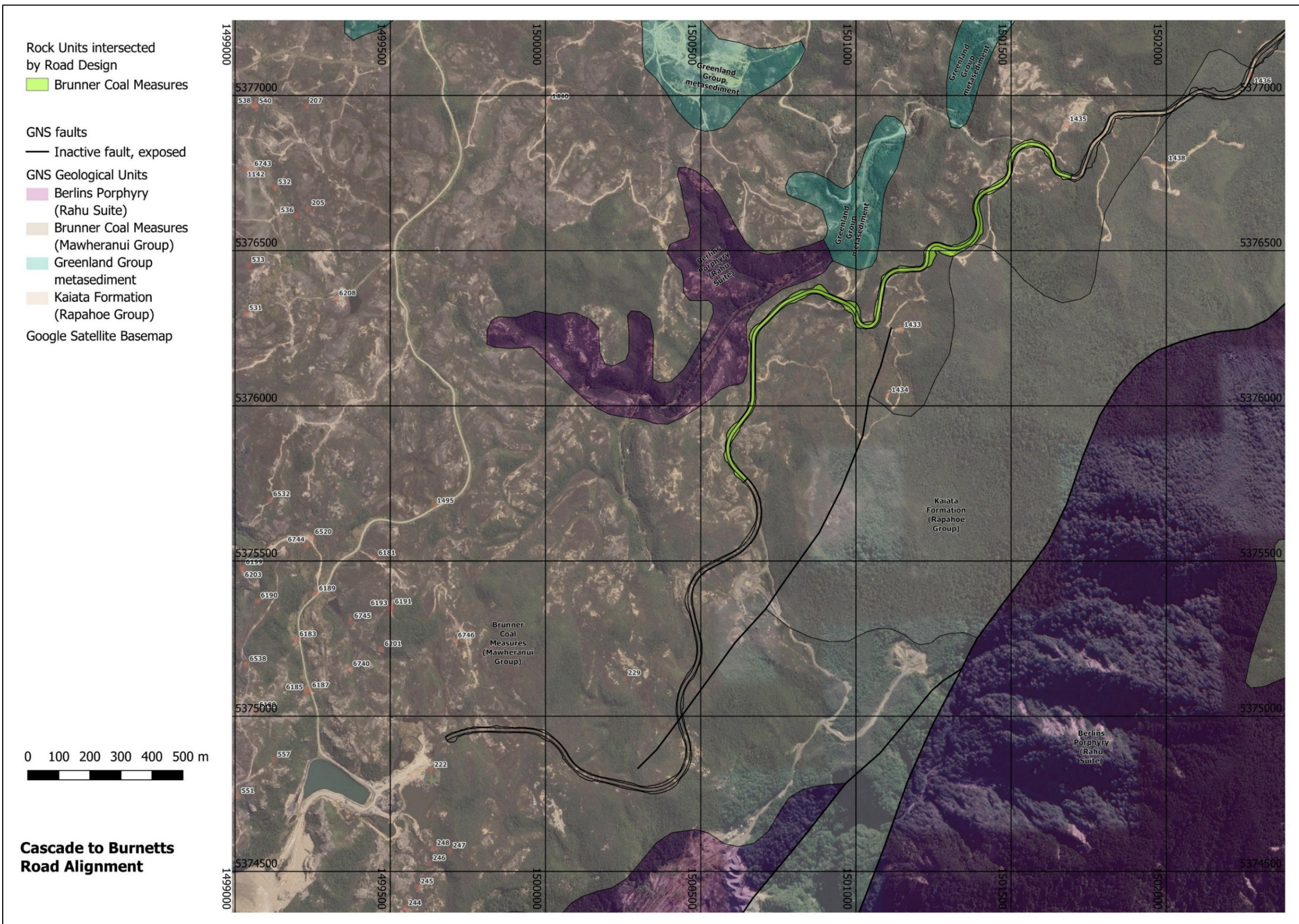


Figure 9: Road Alignment Geology - Cascade to Burnett's

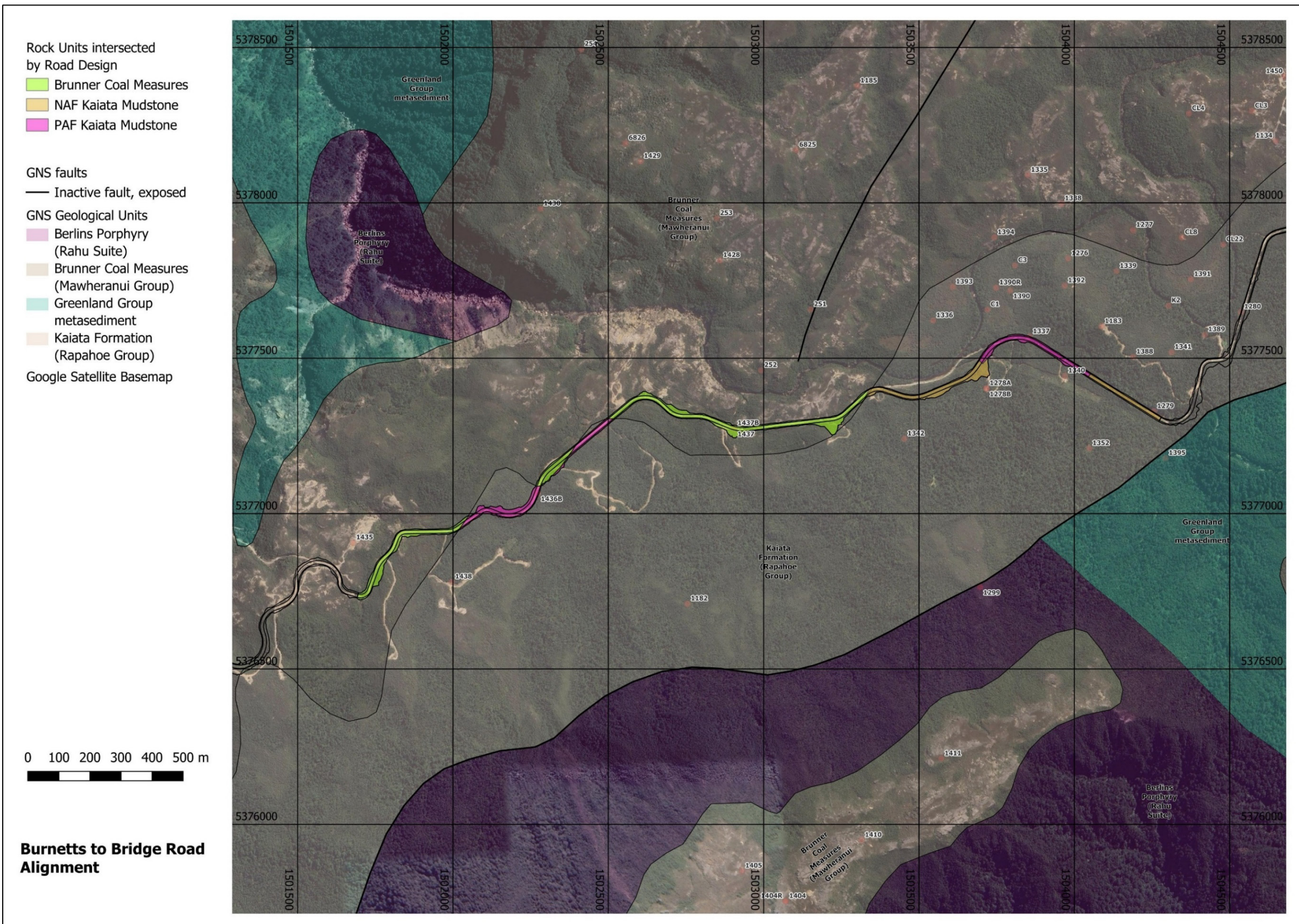


Figure 10: Road Alignment Geology - Burnett's to Bridge

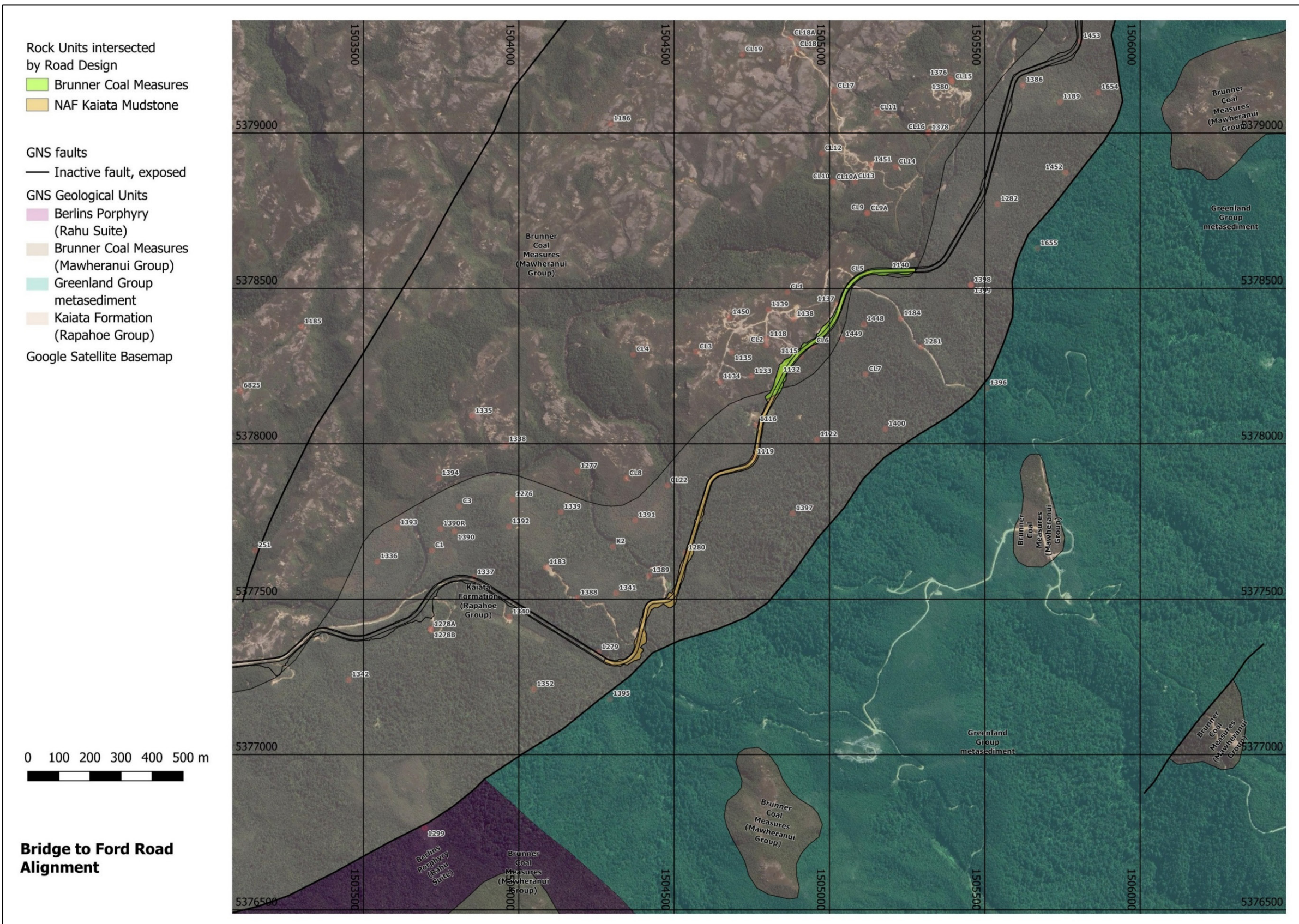


Figure 11: Road Alignment Geology - Bridge to Ford

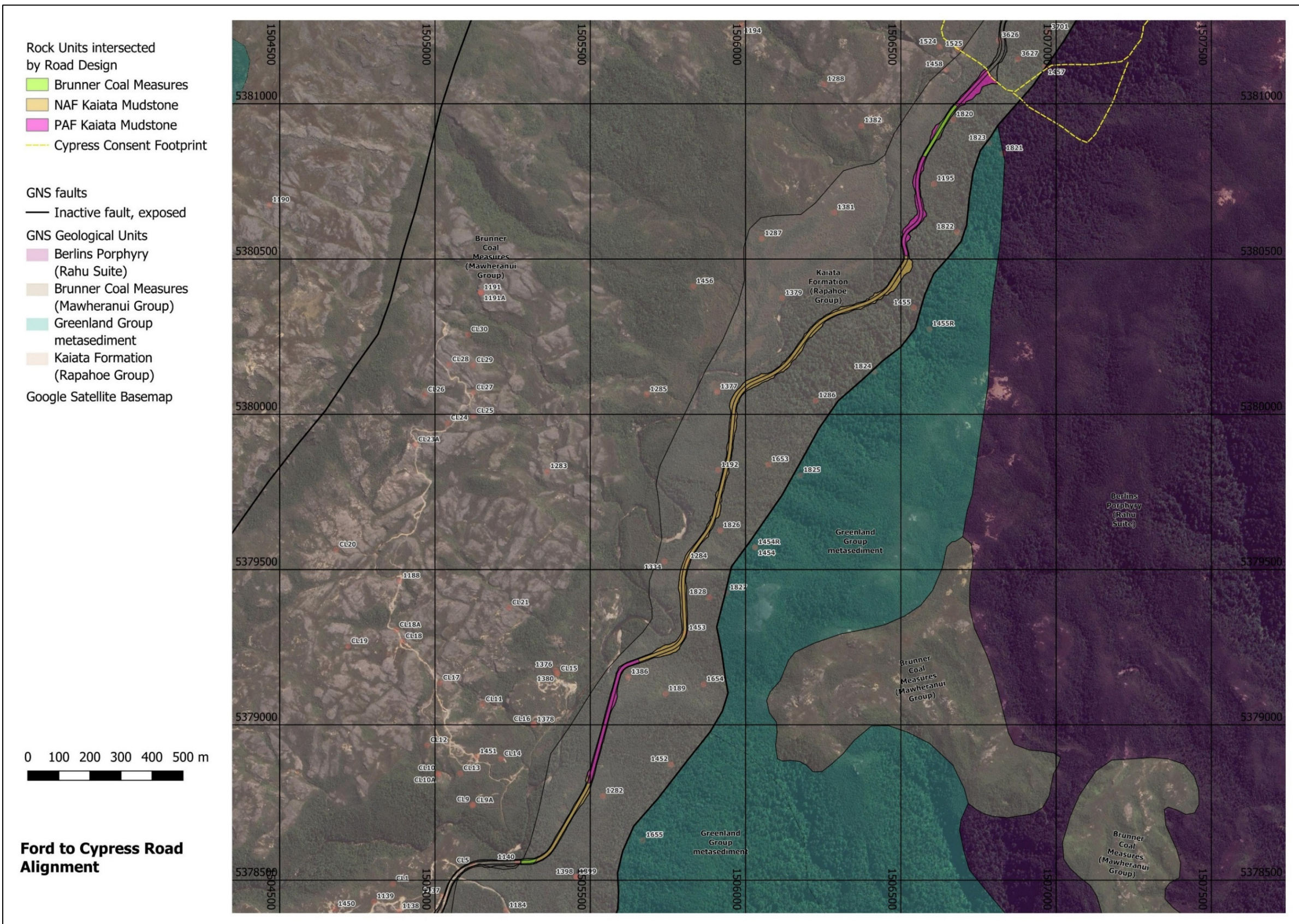


Figure 12: Road Alignment Geology – Ford to Cypress

3.2 Engineering Geology

The 15km TLHS alignment of the haul road south of the Cypress Pit limits transitions through three geological zones as defined by regional geological mapping and confirmed through coal exploration drilling and field mapping along the length of the alignment.

The road alignment in the southern third is entirely made up of the Brunner Coal Measures which provide a good solid road base as well as producing a material with suitable properties for use as bulk fill, (notwithstanding its AMD potential). Excess fill material from this section of the road will likely need to be stockpiled for use further north on the road where suitable bulk fill materials are absent.

The central part of the road alignment is a mixture of Kaiata Mudstones and Brunner Coal Measures. Road cuttings through the Kaiata Mudstones are likely to provide suitable road foundations (not base course or running courses) however the fine friable nature of the material once disturbed will make it unsuitable for construction bulk fill below the road surface layers.

The northern 1/3 of the road alignment is established in colluvium and landslide materials of variable thickness overlying a Kaiata Mudstone basement. The Colluvium will present challenges in establishing stable cuts and will not provide a suitable bulk fill material. Road foundations through this section will therefore require additional stabilisation. Cut materials produced from this section will have to be removed from the road footprint and stored in ELF storage facilities associated with the Cypress mining operations. Stockton operations have confirmed the relatively small volumes of unsuitable cut from this section of the haul road will easily be accommodated in ELFs used for mining operations.

A program of rotary cored diamond drilling was completed between November 2025 and February 2026 on the UWHR and MFS access road alignments. A summary of the drill hole locations and results of this program, including drilling and geophysical logs are provided in a summary geotechnical report¹.

3.2.1 Historical Underground Workings

The road alignments of the UWHR and MFS access road traverse historical underground workings. While some of the voids created by underground mining will have collapsed over time, some may remain open and any changes in the stress - strain regime during haul road construction may induce further collapse.

The hazards presented by the proximity of the underground workings to the proposed road are:

- Ground collapse during excavation or transit
- Uncontrolled loss of drainage water into the workings via surface cracks
- Emission of noxious gases

¹ Summary of BPCP FY26 Geotechnical Drilling Programme, 2 June 2026

A review of historic mine workings plans and the UWHR and MFS Access Road designs produced the heatmap below in Figure 13 which shows in-situ cover between the current ground surface and the roof of the coal seam that was subject to underground extraction. Green represents ≥ 20 metres of in-situ cover, Orange: 12 - 20 metres of in-situ cover and Red: ≤ 12 m of in-situ cover. While this indicates that the majority of coal extraction along the access road alignments occurred at depths greater than 20m, it does not confirm the current depth of voids associated with establishment of mine access and infrastructure or the potential for subsequent propagation of voids, which may be shallower.

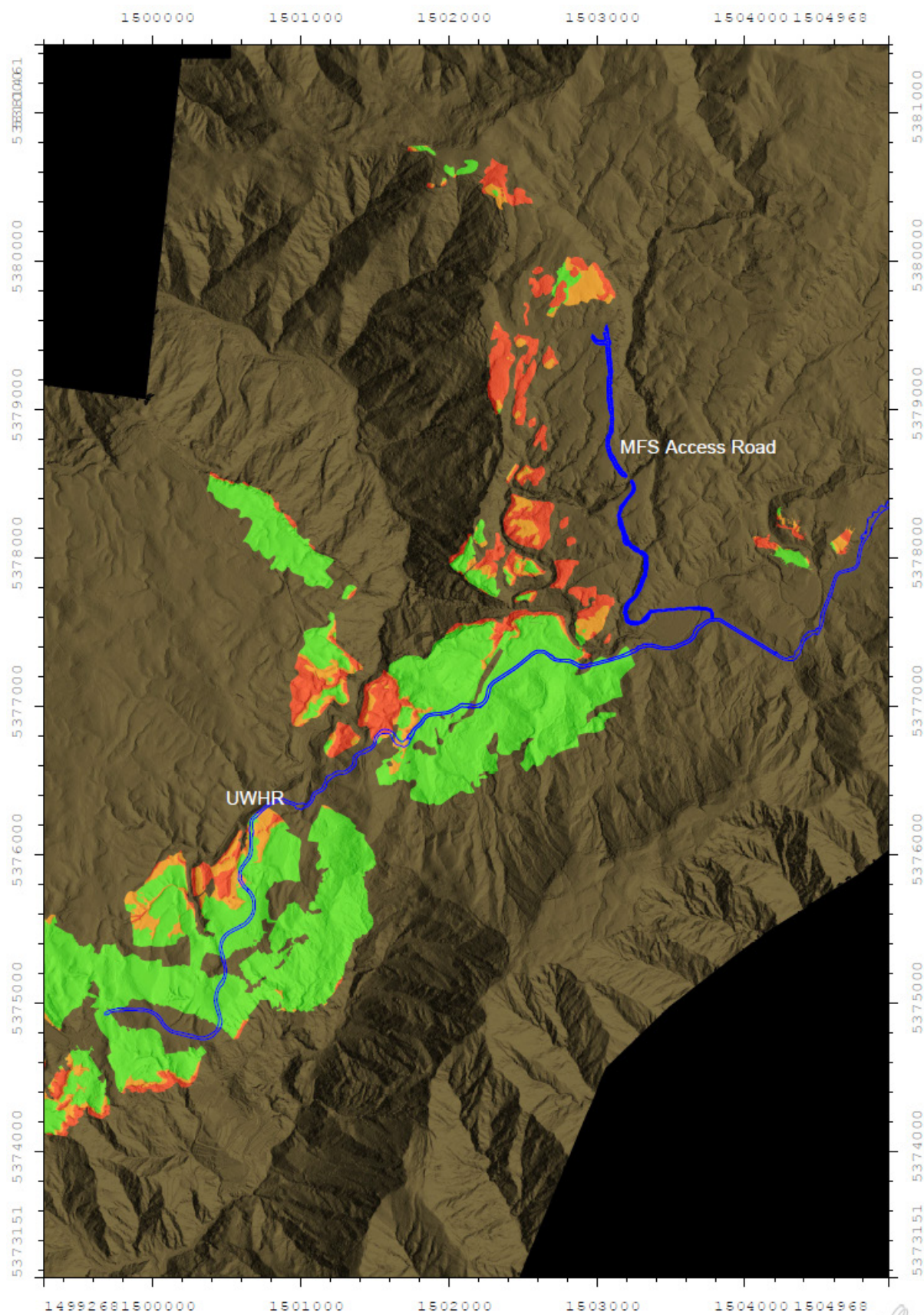


Figure 13: In-situ cover in metres (m) from ground surface to underground void.

Ground surface investigations along the proposed UWHR and MFS Access Road alignments noted only one area where collapse of historic underground workings have intersected the ground surface.

This is manifest at the ground surface above the Ironbridge mine workings (NZTM 5377300E, 1502850N), as tensile fracturing with an aperture of ~100mm and an offset of ~1.0 metres. See Figure 14 below.



Figure 14: Surface cracking above Iron Bridge historic mine. Location of image is depicted as (1) on Figure 5.

Historical records would suggest that UG workings in this location are close to a shaft and associated infrastructure which were within 10m of the surface.

The location of this surface expression relative to the UWHR alignment is shown in Figure 15: UWHR alignment & Iron Bridge Mine showing location of surface cracking and shallowest workings.

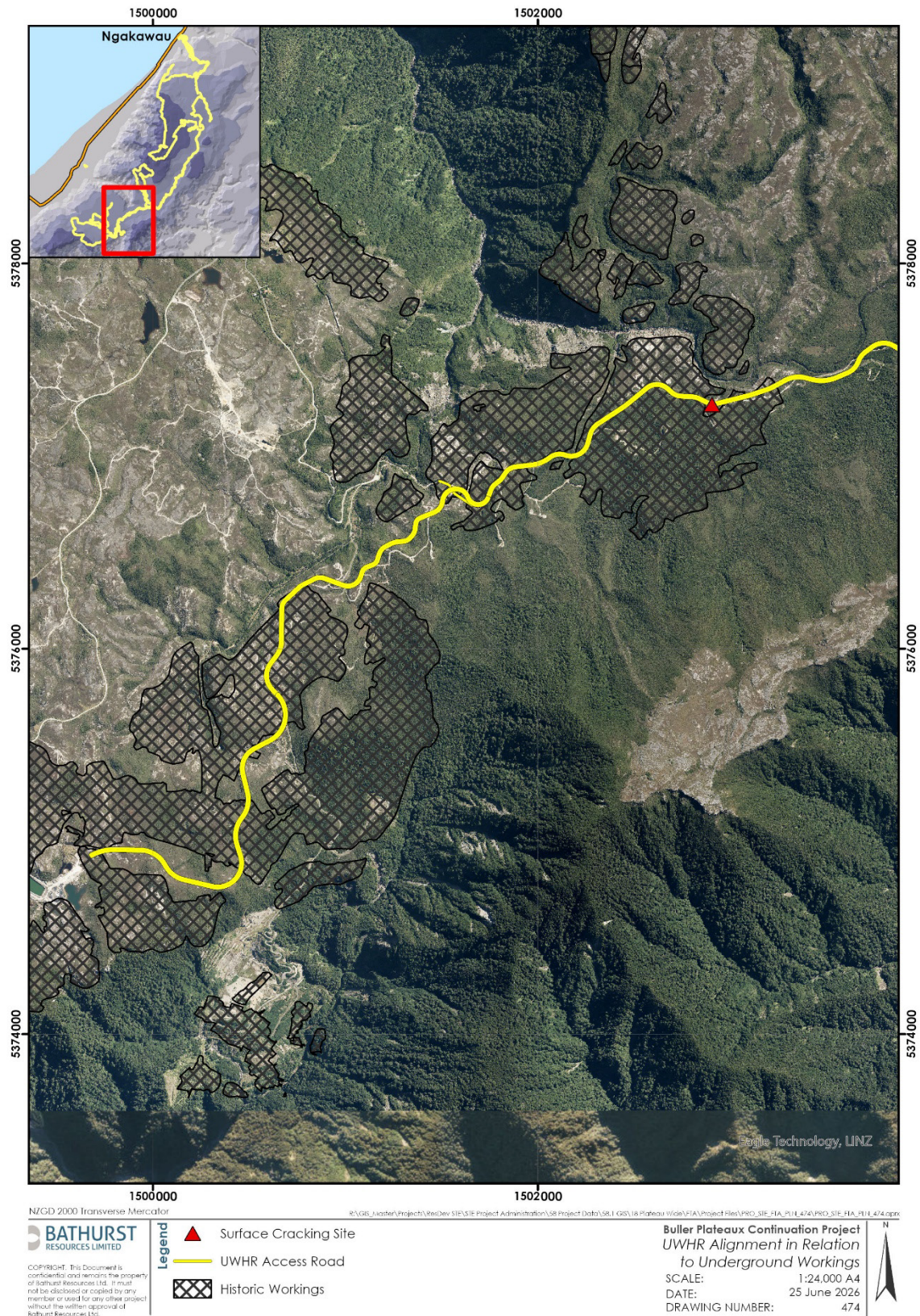


Figure 15: UWHR alignment & Iron Bridge Mine showing location of surface cracking and shallowest workings

Based on the maximum understood geometries of the underground workings ($\leq 3\text{m}$ height and $\leq 4.5\text{m}$ span), bulking limited migration heights for underground workings within the Project area typically range from 6 to 10 metres, (See Table 2: Estimated Void Migration Heights for Typical Denniston Workings). Surface breakthrough on this basis is most likely where cover depth is less than 12m which is consistent with observations in the case recorded above.

Table 2: Estimated Void Migration Heights for Typical Denniston Workings

Lithology	Extraction Height (m)	Bulking Factor (BF)	Maximum Bulking Limited Height (m) A	Maximum Arching-Limited Height (m) B
Sandstone Roof (low BF)	3.0	1.30	10.0	12.1
Sandstone Roof (moderate BF)	3.0	1.40	7.5	12.1
Sandstone Roof (high BF / blocky)	3.0	1.50	6	12.1
^A Calculated from equation: $Dc = \frac{h}{BF-1}$ ^B Calculated using maximum span of 4.5m				

In areas with 12 to 20 metres cover, although this exceeds the calculated maximum expected surface expression, breakthrough remains possible if there are additional factors affecting the overburden rock mass. Where cover exceeds 20 metres, migration is unlikely to reach the surface but broad subsidence troughs may still form above wider mined areas.

These predicted void migration heights align with actual observations of near surface void propagation within the same lithologies at the neighbouring Stockton opencast mine.

3.2.1.1 Proposed Control

Geotechnical drilling will be undertaken before any construction activities, targeting areas of suspected underground workings to confirm the depth of in-situ cover to the underlying coal seam and underground void (if any).

Where voids are in close proximity to the surface, it may be feasible to excavate them entirely to remove the void hazard, replacing the void with compacted backfill.

Where voids are identified within 12.1 metres of the ground surface, collapse blasting may be utilised as the key control for mitigating the void hazard.

Collapse blasting involves drilling a pattern of blast holes above the void to break up the overburden rock mass, resulting in collapse of the overburden into the void below. The collapsed area is then bladed smooth by a bulldozer with suitable subgrade subsequently placed for the haul road.

Before using a collapse blasting technique it will be necessary to confirm that surface water can be appropriately managed ensuring it does not run into the collapsed ground and flush through any remaining open voids outside the collapsed area as this could cause internal erosion and surface subsidence as well as potentially adding to acid mine drainage (AMD) from historical workings.

Where the haul roads are required to bridge a section of open voids an engineered fill raft roadway foundation may be implemented, negating the need for rubblisation of the overburden material using drill and blast.

3.2.1.2 Acid Mine Drainage Potential

The Iron Bridge mine currently has several drainage and access adits that intersect the Upper Waimangaroa River valley. The extent to which these openings remain connected to historical mine workings under the UWHR alignment is unclear.

As the technique of rubblising road foundation material via blasting for stability would significantly increase the effective surface area and permeability of BCM sulphides, the potential for increased water ingress and AMD discharge represents a risk to the use of this technique for ground stabilisation above the Iron Bridge mine.

Before adopting rubblisation as a method for ground stabilisation it will be necessary to understand the proximity of historical workings to surface, and also to understand the connectivity of these points to discharge locations along the Upper Waimangaroa River valley. During the Pre-Commencement Work, if the potential for AMD from rubblisation of the road alignment is identified, alternative solutions to ground stabilisation will be utilized.

3.2.1.3 Pre-Commencement Work

- Geotechnical drilling along the UWHR and MFS Access Road alignment to confirm the in-situ depth of cover to coal seams and associated underground voids (if any).
- Surface geological mapping must be undertaken along the Project alignment to confirm the exposed geology is suitable for supporting the proposed roads.
- Surface geophysical surveys (e.g. electrical resistivity tomography) will be utilised to determine the location and depth of underground voids, from which accurate maps of the void locations will be produced.
- The Proposed design approach to ground stabilisation will be assessed for its AMD potential.
- A data review and risk assessment will be completed that considers the risks that the voids and associated controls pose to both safety and the environment. Followed by the development of a Trigger Action Response Plan (TARP) for working around historic underground workings.

3.2.2 Colluvium / Landslide Material

This includes both recent soils, completely weathered rock types, and landslips. The colluvium / landslide material is a saturated mixture of clays, fines and boulders and varies between matrix and clast supported. It is considered unsuitable as a road construction material and will also likely present challenges as a road base material. It will require remediation / removal for road construction and a double thickness of road base in conjunction with geosynthetic liners for stabilisation have been specified. Experience at the Cypress mine has shown that dewatering of cuts through this material is required to stabilise slopes enough for shallow slopes to be established. This is particularly so as the basement is approached, and water is concentrated along the low permeability basement contact.

Current uncertainty around the thickness of this material represents a risk to quantity and cost estimates.

These issues are of critical importance in the 1.2km directly south of the Cypress South Pit limits where these material properties and quantities combine with increased topographical relief.

Proximity of Road Cuttings to Transpower Infrastructure

In places the UWHR road cuttings are in the proximity of power pylons that form part of the national power distribution system maintained and administered by Transpower. The UWHR road alignment has been designed not to impact on Transpower Pylons and is outside stand-offs specified by Transpower. Due to the topography and the location of Pylons on ridgelines The geotechnical stability of pylon footings will need to be ensured through monitoring during excavation of the road alignment and BRL intends to work closely with Transpower when finalising designs for construction and undertaking earthworks.

3.2.3 Bulk fill & removal of unsuitable materials

Of the rock types encountered along the road alignment, Brunner Coal Measures are the only one considered suitable for use as a bulk fill in construction. Kaiata Mudstones and Colluvium / Landslide material where encountered will be removed from the road footprint and placed in mine ELF's at either end of the haul road.

It is intended that bulk fill (Brunner Coal Measures only as other lithologies are unsuitable), will be placed following established Bathurst ELF construction guidelines to limit the potential for AMD and ensure road foundations are stable. This will involve placement of BCM in 2m lifts with it being compacted either by mining equipment and/or pad foot rollers to achieve design densities.

Where there is a suitable fill deficit for road construction, basement materials sourced from quarries at either end of the UWHR alignment will be used to source bulk fill. The granites will not require compaction for AMD purposes but will still require some post placement compaction for engineering / Stability.

3.2.4 Bulking factors and moisture content

The following bulking factors and moisture content assumptions are applicable in the conversion of insitu tonnages and volumes into haulage and construction quantities. These are based upon those used in Stockton mine planning and based upon reconciliation and testwork there.

Table 3: Bulking factors and moisture content

Material	Bulking Application	Insitu Density (t/m ³)	Moisture Content (Insitu)	Bulking Factor (%)
Colluvium / Landslide	Compacted Dump (5m lift)	1.9	+33%	0%
Brunner Sandstones	Compacted Dump (5m lift)	2.5	10%	20%
Brunner Sandstones	End tipped loose	2.5	10%	25%
Kaiata Mudstones	Compacted Dump (5m lift)	2.1	15%	2%

For PFS road design, the following typical bulk fill geometries were used.

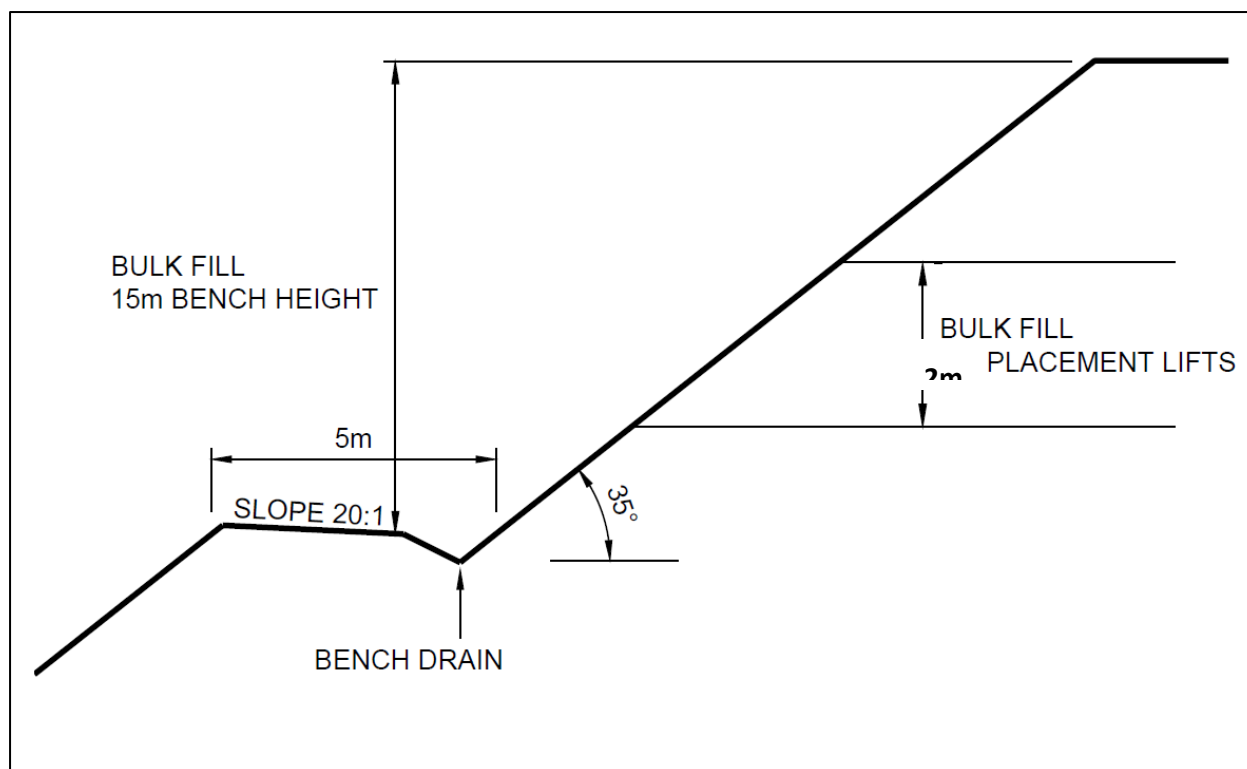


Figure 16: Geotechnical Design Criteria for bulk fill

3.2.5 Sourcing of Road Construction Material

The only material cut from the road alignment that is anticipated to be suitable for use as fill are the Brunner Coal Measures. Other road construction rock will need to be sourced from suitable local quarry locations. This quarry material will either be unweathered granite or Greenland group Hornfels/Greywacke.

An evaluation of potential sources of inert road construction material sources was undertaken with the aim of identifying locations close to the haul road alignment most likely to be consented. These sources were of interest as they would eliminate the need to source commercially crushed and screened aggregate at a cost premium from the coastal plane.

Investigations narrowed the options down to four local highs / surface expressions of Berlin Quartz Porphyry close to the haul road alignment.

Two of these sites within consent boundaries, an Escarpment option and Cypress option were identified through review of exploration drillhole records as most likely to meet requirements however these have been discounted for further consideration due to land use constraints and the availability of material from expansion of the A-Drive quarry that sits within the current Stockton Mining operations.

A Drive Quarry

Expansion of the existing A Drive Quarry within the existing Stockton mining licence area is preferred as the initial source of engineering aggregates for construction of both the northern parts of the UWHR and the middle sections once access is established from the north connecting Stockton to the remainder of the UWHR. The A Drive Quarry may not provide the combined requirements of Stockton operations and ESE operations over the life of the Project and it is anticipated that an alternative source, potentially subject to additional consents may be confirmed closer to that time.

Table 4 below summarises the total estimated material balance for A-Drive quarry. Excess material at A-Drive quarry will be used for ongoing Stockton operations and closure works.

Table 4: Estimated A-Drive Aggregate Available and Required for UWHR

Aggregate type	Available (BCM)	Required for UWHR (BCM)
Weathered Granite (bulk fill)	140,000	60,000
Good Granite (Engineered Agg)	360,000	212,000

3.2.6 Slope design criteria

Cypress mine rock mass characteristics and geotechnical modelling outcomes were considered a suitable analogy for road design, with the design criteria applied based upon the mapped geology along the UWHR alignment.

Specifically the design batters for Cypress mine rock types were applied to the UWHR cuttings on a rocktype basis with berm widths modified to reflect overall slope angles defined for these rock types.

Bench height was set at 5m based upon the anticipated size of earthmoving equipment to be used in construction of the road (ensuring operator safely when undercutting a working face).

With a 5m bench height and Cypress rock type batter angles, safety berm width was back calculated as 2.5m.

Slope heights in road construction will be significantly less than the Cypress mine pit walls upon which the design criteria are based.

Existing access road cuttings in the BCM units of the southern sections of the road also provide a useful calibration for proposed slope design criteria. Current cuttings of up to 10m high are stable over very long timeframes (~100yrs) at batter angles of 50° to 70° which is in the range of applied Cypress mine slope design criteria.

Table 5: Geotechnical Design Criteria for UWHR road cuttings based upon Cypress slope design criteria

Rocktype		Colluvium / Landslide Material	Kaiata Mudstone	Kaiata Mudstone	Brunner Coal Measures
			Unweathered	Fault affected / Weathered	
Density (insitu)	(t/m ³)	1.9	2.1	2.1	2.5
UCS	(Mpa)	NA	NA	NA	16
Bench Height	(m)	5	5	5	5
Batter Angle	(°)	20	50	30	63
Safety Berm Width	(m)	2.5	2.5	2.5	2.5
Overall Slope	(°)	17.1	36.9	24.1	44.7

4.0 Geochemical Assessment

The following reports have been prepared on UWHR geochemistry.

Table 6: UWHR Geochemistry Reports

REPORT NAME	REPORT NUMBER	REFERENCE	APPENDIX
Prediction			
Upper Waimangaroa Haul Road Site Visit	J-NZ0453-001-M-FINAL	(MWM, 2026b)	A
UWHR Geochemistry ABA Summary	J-NZ0532-003-M-FINAL	(MWM, 2026f)	B
Annual Overburden Schedule: MFS, ESE, UWHR	J-NZ0453-011-N-FINAL	(MWM, 2026y)	C
Assessment of Potential Effects			
Construction Phase Report	J-NZ0453-007-R-FINAL	(MWM, 2026t)	D

5.0 Road Design

5.1 General assumptions

Coal Haulage will be undertaken on a 24/7 basis by a 4 shift panel arrangement working 12 hour day and 12 hour night shifts. 4 to 6 A-Double truck and trailer units of approximately 70-90t payload, (~115t Gross vehicle weight, 14 axles, 36m long and 3.1m wide) will be used for haulage on a ~70 minute return cycle time per load. Intensity of traffic movements for coal haulage will be 25-30k return trips per annum, (80-100 return trips per day).

The haul road pavement will be 8.6m wide with a 7.3m wide running surface for dual lane haulage operations and have an allowance for surface drainage and earth side barriers to arrest vehicles that may lose control. Where public access currently exists through to the Mackley Track, separated pedestrian / cycle access will be provided for as shown in Figure 17 below. Where there is currently no public access along design road alignments there will be no provision for separate access as shown in Figure 18 below.

Road pavement width has been selected to support the intermittent transfer of Heavy Earth Moving Equipment between sites. These movements will require closure of the road to other traffic due to their operating widths.

The road surface will largely be unsealed although pavement construction will support sealing as required on steep gradients where maintenance of the unsealed surface may become difficult and costly.

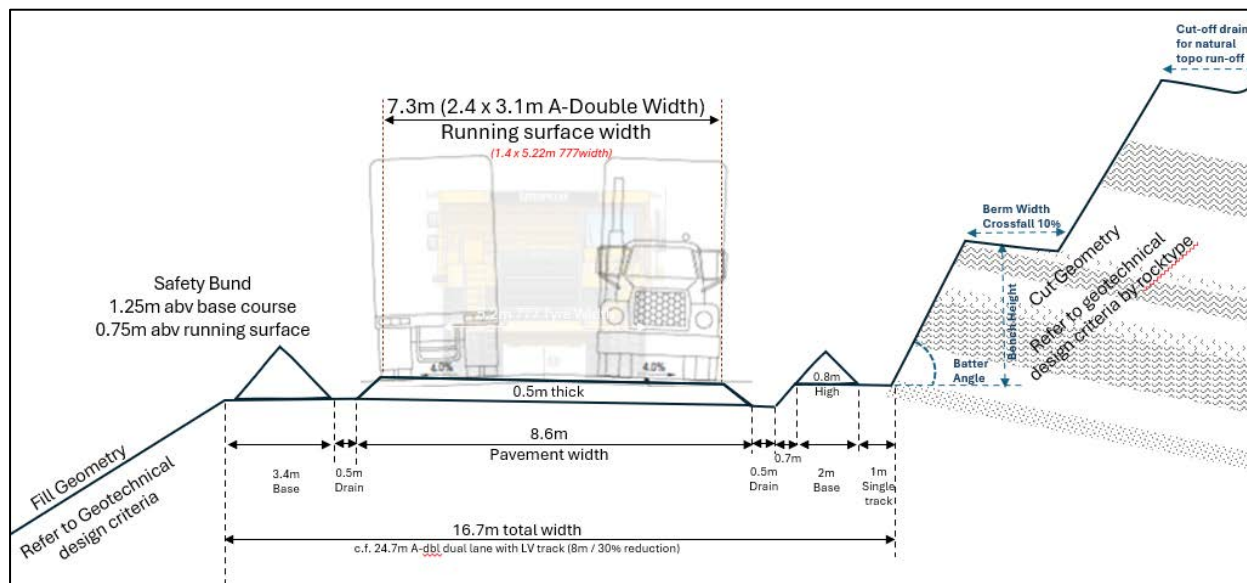


Figure 17: Typical access road section with separated public access

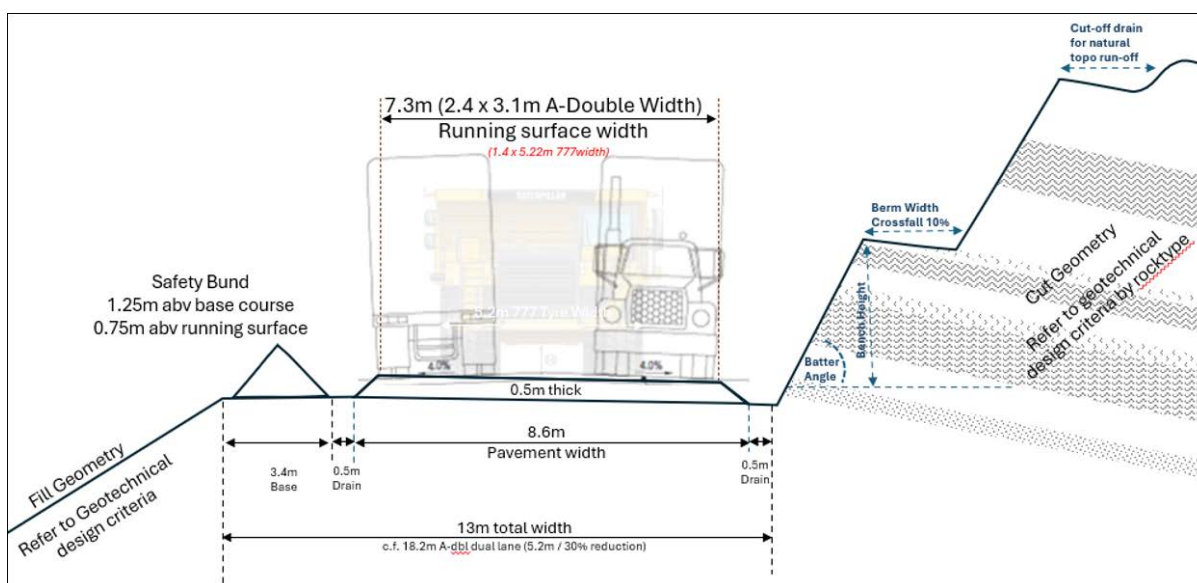


Figure 18: Typical access road section without separated public access

Speed on the road will be limited to less than 50kmph and on average will be much lower than this due to the meandering nature of the road and associated sightlines and stopping distances.

Dust will be suppressed by water spray delivered by water trucks, the frequency of which will be determined by weather conditions and ongoing monitoring of dust levels.

The road is split into design sections to assist in summarising quantity and cost estimation elements as shown in the introduction.

5.2 Design Vehicle

An A-Double Side Tipper trailer unit with the required capacity has been designed by Boomerang Trailers for ROM Coal haulage and is 36.6m long with a gross weight of ~115t. A prime mover specification similar to the Kenworth C509 (600Hp) will be required.

Table 7: Design Vehicle Summary

		<u>Side Tipper (Kenworth C509 prime mover)</u>
Body Volume (with allowance for fill factor)	(m3)	70
Bulk Density	(t/m3 loaded)	1.05
Payload assumption used for calculations	(t)	73
<u>Operating</u>		
Operating Vehicle Weight	(t)	42
Target Gross Machine Weight	(t)	115
Length	(m)	36.6
Width	(m)	2.5
Height	(m)	4.2

5.2.1 Swept Paths

The swept path defined for the A-Double configuration is 32m (15-30kph) without any additional clearances. Refer to drawings in APPENDIX A Double configuration & swept path for further details. An additional clearance of a minimum 1m was added to the swept path for road design but will be more depending on assumed vehicle velocity and operator sight lines.

5.3 Curve radius and curve widths

Haul road truck specifications were modelled using specialist software, (Autoturn).

The Autoturn swept path was simulated in both directions along the entire proposed haul road alignment. A first iteration of this simulation identified curves that did not allow for the design vehicle to complete the turn or showed a significant cross over with a design vehicle travelling in the opposite direction. These curve locations were modified with localised road widening which is reflected in the design model alignment.

Localised widenings on all other curves may be required to maintain the lateral clearance between vehicles that is equal to the clearance available on straight sections of road. This level of detail and consideration of superelevation on curves has not been applied to the modelled alignment and requires refinement in the planned Feasibility Study design stage.

5.4 Longitudinal road gradients

A maximum longitudinal grade of 10% was specified. A maximum downhill gradient of 8% was applied where downhill loaded haulage is anticipated and this has been applied to the design alignment.

The haul road alignment long sections plots are included in APPENDIX B Road alignment long sections.

No allowance for any run-off gravel pits for arresting runaway vehicles was allowed for at this stage of design, this is dependent on the braking and performance capabilities of the design vehicle.

The design vehicle manufacturer will need to confirm the longitudinal grades and operational conditions are compatible with the performance capabilities of the selected design vehicles.

5.5 Pavement Design

5.5.1 Traffic Loading

The expected traffic loading is 25 to 30k return trips per annum of the design vehicle. The design vehicle was used to calculate the design equivalent standard axles (DESA) as per Austroads Part 2 Table 8 below.

Table 8: Design Vehicle Axle Load

Vehicle	Daily Trips	Axle Group (Nhvag)	ESA/HV	ESA/HVAG	Design Life (yrs)	NDT	DESA
Loaded	37	5	15.98	3.20	15	1.01E+06	3.24E+06
Unloaded	37	5	1.91	0.38	15	1.01E+06	3.87E+05
							3.62E+06

5.5.2 Subgrade & empirical design

An assumption on subgrade California Bearing Ratio (CBR) has been made based on the geological mapping and the material characteristics, however these may be subject to change as a result of further pavement investigation that will be conducted along the length of the road alignment to determine actual CBR values. The investigation will also provide additional information on material characteristics to assist with the pavement design.

The Brunner coal measures and mudstone can be expected to provide a reasonable foundation for the haul road. Due to the limited information and potential variance in ground conditions a subgrade CBR of 5% has been adopted in these geology types.

A CBR of 1% has been used for the northern section of haul road, through colluvium and landslip material, to reflect the higher design risk associated with this weaker soil. The pavement investigation will also need to establish the moisture sensitivity of the soil to determine if any drainage measures are required to prevent water egress to the pavement and subgrade.

Table 9 and Table 10 below show the pavement thickness required for estimated subgrade CBRs using the AGPT02 empirical design method. Figure 8.4 from AGPT02 has been used due to the high vehicle loading, with the Austroads guide for unsealed roads limited to lower volume roads.

CBR Input		NOTE	
5		Brunner CM/Mudst-Assume average bearing capacity	
Value Description	Value	Comments	
Annual Growth Rate		OTHER SHEETS	
Design Period		LOADED AND UNLOADED	
CGF	0.00		
AADT	74	LOADED/UNLOADED SHEETS	
Design Life	15		
DF (Directional Factor)	0.5	LOADED/UNLOADED SHEETS	
%HCV	100		
LDF (Lane Distribution Factor)	1		
CGF	15		
NHVAG	5.00	Belly Dumper 5x axle groups	
ESA/HVAG	3.2 & 0.38	See DESA tab	
NDT	2,025,750	2.03E+06	LOADED + UNLOADED
DESA (Design ESA)	3,624,277	3.62E+06	LOADED + UNLOADED
		0.00E+00	
t_GranularMaterial_Design_yr	447	mm	
t_Designyr_min_base	152	mm	

Table 9: Empirical Design – Subgrade CBR 5% (Brunner Coal Measures / Mudstone)

CBR Input		NOTE	
1		Colluvium unknown bearing capacity - Include Ggrid	
Value Description	Value	Comments	
Annual Growth Rate		OTHER SHEETS	
Design Period		LOADED AND UNLOADED	
CGF	0.00		
AADT	74	LOADED/UNLOADED SHEETS	
Design Life	15		
DF (Directional Factor)	0.5	LOADED/UNLOADED SHEETS	
%HCV	100		
LDF (Lane Distribution Factor)	1		
CGF	15		
NHVAG	5.00	Belly Dumper 5x axle groups	
ESA/HVAG	3.2 & 0.38	See DESA tab	
NDT	2,025,750	2.03E+06	LOADED + UNLOADED
DESA (Design ESA)	3,624,277	3.62E+06	LOADED + UNLOADED
		0.00E+00	
t_GranularMaterial_Design_yr	981	mm	
t_Designyr_min_base	152	mm	

Table 10: Empirical Design – Subgrade CBR 1% (Colluvium / Landslide)

5.5.3 Pavement structure

The pavement design for Brunner coal measures and mudstone areas is based on the empirical design shown in Table 11, with the pavement structure rounded up to 500mm total thickness. This specification is applicable to both the UWHR and the MFS access road with only a small, 2km section at the northern limit of the UWHR having a different specification as it traverses colluvium and landslide material on the approaches to the Cypress Pit.

The northern most section of the UWHR alignment (ROAD05 F2CT) runs through an area of unconsolidated colluvium material as described in the geology section above. This material may be prone to both settlement and lateral movement where the road alignment is traversing sloping geography. To address potential settlement the design philosophy is to construct a floating pavement incorporating geosynthetic layers to lock the lower pavement structure together.

Tensar+ software has been used to assess the benefit of including geogrid over an assumed low strength subgrade (CBR 1%). The images below show the 1.0m unreinforced pavement structure can be greatly reduced by including two geogrid layers. Allowance however needs to be made for a sacrificial sub-subbase to provide an anvil that allows compaction of the lower pavement over unstable ground, and cutting in bench footings where the risk of lateral movement is identified in fill areas. As such the potential reductions in thickness from the inclusion of geogrid layers has not been included in the pavement structure.



Figure 19: Unreinforced pavement structure and tensar reinforced pavement structure

The pavement structures summarised in Table 11 below were adopted for project quantity and cost estimates associated with UWHR and MFS access road construction.

Table 11: Haulroad pavement design summary

Road Section	Geology	Assumed CBR	Estimated pavement depth	Estimated pavement details
01 E2C 02 C2B 03 F2CT 04 B2F	Brunner coal measures and Kaiata mudstone (weathered)	5	500mm	150mm – basecourse 350mm – sub-base
05 F2CT	Brunner coal measures and Kaiata mudstone (weathered) Colluvium/landslide	1	1000mm, with two layers of geogrid	150mm basecourse 200mm subbase InterAx or similar geogrid 450mm subbase InterAx or similar geogrid 200mm sub-subbase

5.6 Recreation and Public Access Requirements

Vehicle monitoring shows that the majority of people visiting the Denniston Plateau do not go beyond the DOC visitor area at the Denniston Brake head. There remains however a number of groups and individuals accessing the area beyond this for recreational purposes via existing tracks. This includes a mixture of recreational users, infrastructure maintenance, heritage and conservation requirements.

The main utility of the existing tracks beyond the Denniston brake head is in connecting Denniston to the Mackley Road and the Buller Gorge beyond. As the coal haulage road alignment follows existing access tracks it will impact on the current unrestricted public access through this area.

To ensure the safety of company vehicles / personnel and the public is maintained, it will not be possible for the haul road to accommodate dual use. During coal haulage operations the road will be closed to the public and used solely for company operations with permitting processes in place for other access.

For the purposes of maintaining recreational access for walkers and mountain bikers along the haul road alignment, a single track of approximately 1m width will be built into the shoulder of the haul road with an earth bundwall separating the haul road from the track. Refer to Figure 17 above. Where 4WD, Motorcycle and other organised groups require access, this will be granted by permit and scheduled for non-operating times with company escorts. Signage will be erected to this effect.

As the proposed haul road alignment follows existing tracks where they exist, ad hoc access for other activities such as shooting, wood cutting or collecting coal from outcrops will not be possible.

Figure 20, below shows how the UWHR alignment overlays the current public access roads and tracks.

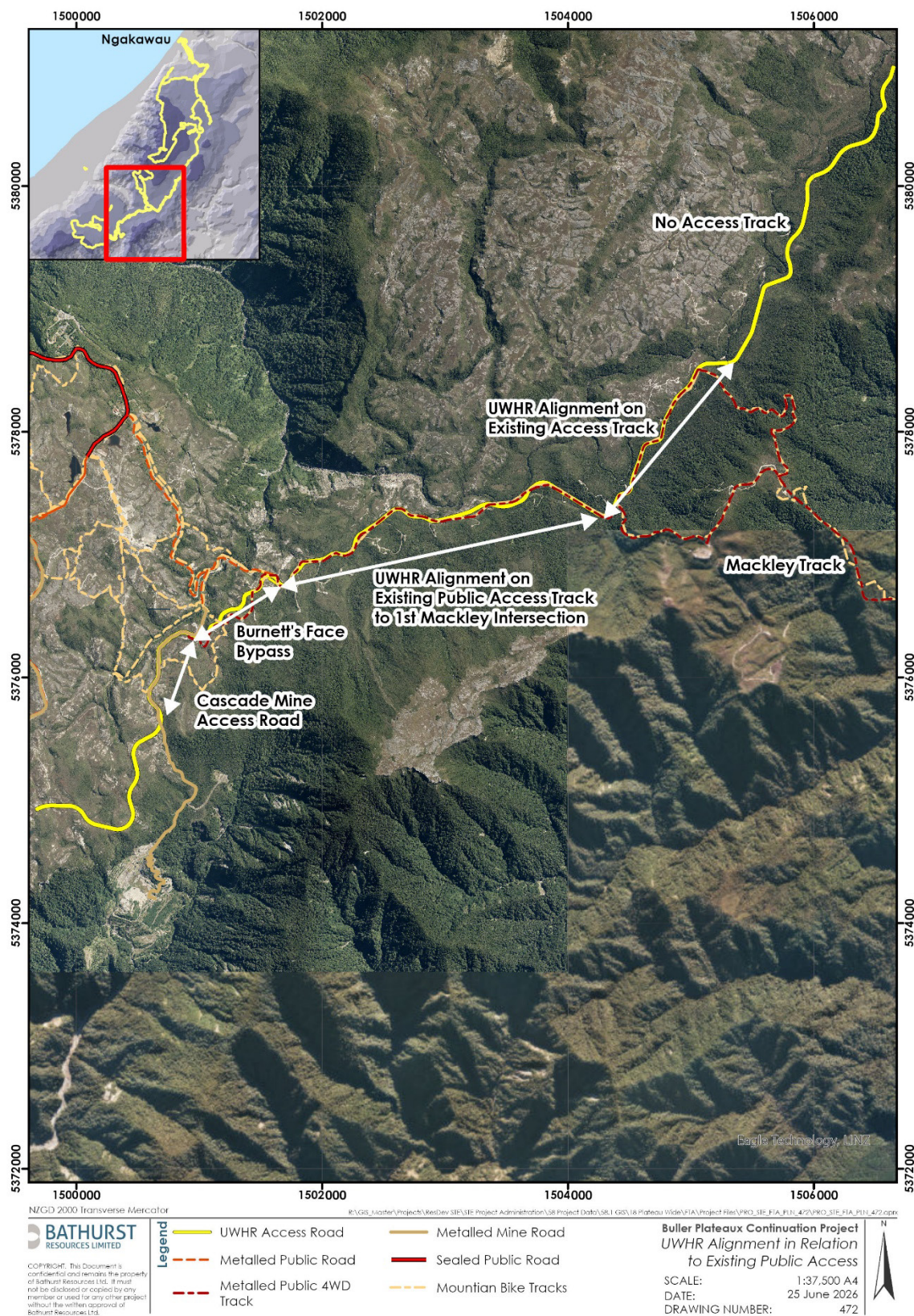


Figure 20: MTB tracks, DoC Walking Tracks and 4WD tracks

5.7 Transpower Interaction

The haul road alignment crosses under Transpower 110kV power lines in 3 places. All statutory stand-off requirements will be adhered to in construction and operation of the haul road around this infrastructure. Transpower will also maintain the right to access their adjacent infrastructure via the haul road at any time, although this will require BRL clearance and possibly escort to ensure operational safety.

5.7.1 Conductor Clearance

The defined height of vehicles operating on the haul road alignment and the design elevation of the road are the key variables in determining whether there are clearance violations for existing overhead conductors and this is different between construction activities and normal operations.

Transpower's maintenance requirements and designation of the road type also affect required clearances.

A Transpower clearance requirement for reconductoring ($C_{RD} = 1.5\text{m}$) to allow for potential line work, can be set to zero if the road is assumed to be closed during any reconductoring. This is the assumption used for UWHR design and alignment.

The 110kV minimum approach distance MAD, (D_{RD}) for a "High Importance Road" such as a national highway is 2.5m. Transpower have indicated that the UWHR does not meet this classification however and that a reduced MAD of 1.5m will likely be appropriate for Mobile plant. This has therefore been used as the basis of clearance calculations.

This appears appropriate given that everyday coal haulage activities on the UWHR will utilise equipment that is 2-3m lower than the large mining equipment that will intermittently utilise the road for transfer between mining sites.

The clearances for temporary construction activities and maintenance where excavator boom extensions and truck tray lifting are required will be manageable with appropriate vehicle approach and operating controls and have not been used in the assessment of required operating stand-offs for the road alignment and levels. In places a bulldozer will likely be required to push material from under the lines prior to loading into trucks for removal. Control of equipment access under the conductors during construction and maintenance can likely be achieved with active JHA's (Job Hazard Analysis) and the placement of height restriction barriers on the approaches to the risk areas.

In determining the operating clearance for road alignment, the height of mining equipment that will be transported between sites via the road is the controlling factor.

Table 12 lists the range of equipment heights that might be expected to traverse the UWHR and the design height used as the basis for determining the required road surface level passing under 110kV conductors.

The 7m design height adds additional contingency to the 3.6m height of side tipper trailer units preferred for coal haulage and the main vehicle type trafficking the road.

Table 12: Vehicle heights used in estimating Transpower clearance requirements

Vehicle Type	Vehicle Height (m)
Kenworth C509 haul truck exhaust	= 4.3m
Low Loader with Bulldozer (D10)	Top of ROPS (4.4m) + low loader deck (1.5m) = 5.9m
CAT 777 Haul Truck	Vehicle (5.17m) + allowance for payload (1m) = 6.2m
Low Loader with 100t excavator	100t excavator (5m) + low loader deck (1.5m) = 6.5m
Low Loader with 200t excavator	200t excavator (7m) + low loader deck (1.5m) = 8.5m
CAT 789 Haul Truck	Vehicle (6.7m) no payload = 6.7m
Cat 740 Articulated Truck with tray up	6.7m during construction
Max vertical reach of 100t excavator	13m during construction
Operational Clearance for Design	Design Height = 7m

As can be seen above a 7m design height does not cover the height of a 200t excavator on low loader, however the 1.5m difference for this rare occurrence is covered by contingency applied. Other options also remain for achieving transit of this larger equipment if required.

Clearance calculations based on NZECP 34 according to the depiction below.

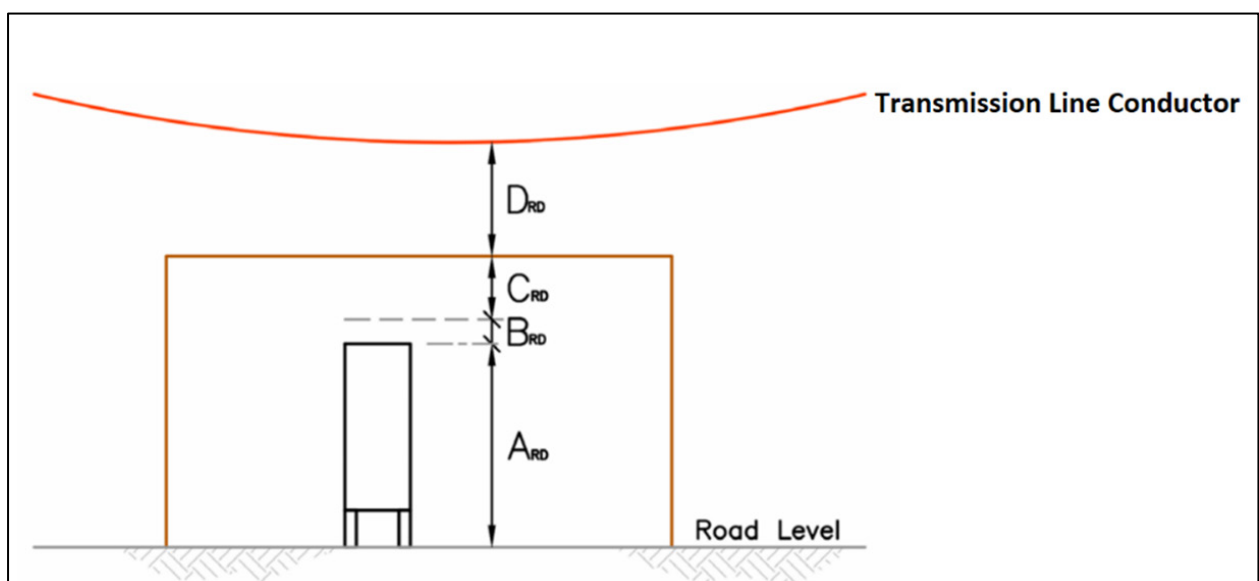


Figure 21: Conductor clearance calculation components

A_{RD} = Equipment height: 7m

B_{RD} = Vehicle error buffer (0.5m)

C_{RD} = 0 m Can be zero if road closed for reconductoring otherwise an additional 1.5m clearance required for hurdling.

D_{RD} = 1.5m (110 kV line – not designated “High Importance”) + 0.5m (line survey buffer)

Contingency = Inconsistencies in road survey conversion approximately 0.5 m.

Min clearance from road surface to 110kV conductor for a 7m high design vehicle:

$$= A_{RD} + B_{RD} + C_{RD} + D_{RD} + \text{road survey contingency}$$

$$= 7 + 0.5 + 0 + 1.5 + 0.5 + 0.5 \text{ (m)}$$

$$= 10\text{m}$$

(incl 1.5m contingency).

N.B. Application of this Transpower provided method results in a theoretical 3m clearance (1.5m clearance + 1.5m contingency) which is different from Stockton mine standards which require a 6m clearance distance. As a result the more conservative procedures for approaches to overhead power lines will be applied and will not contravene Transpower requirements.

5.7.2 Pylon Stand-offs

A stand-off of 12m is required by Transpower from the base of any pylon for undertaking construction activities. Although the excavation of the road alignment does not directly violate this requirement, the potential for the stability of pylons to be impacted by earthworks nearby remains, due to the steep topography around pylon foundations in some places. This risk will require specific geotechnical evaluation as part of detailed design and construction activities.

5.8 Water Management

Road surface run-off will be captured in sediment retention ponds (SRP's) while natural surface run-off will be diverted along and under the road via culverts, maintaining the natural water flow and quality feeding into the Upper Waimangaroa River. Sump locations and road surface catchment zones are shown in APPENDIX A .

The fundamental principle of minimising disturbance forms the basis of the UWHR design and there have been several design iterations to achieve this. (Road level, alignment and pavement width have been optimised to minimise footprint for the preferred design).

Details of the water management design basis and construction and management processes are included in the Erosion and Sediment Control Plan for Land-Disturbance Activities²

The risk of AMD seepage from Brunner Coal Measures used in bulk fill for road construction will be mitigated through the placement of geosynthetic clay liners over bulk fill areas and under the road base, where the volume of fill is deemed great enough for there to be the potential for downstream effects from seepage water. The geosynthetic clay liners will be installed with the aim of restricting the flow of seepage water to extremely low background levels.

Treatment of seepage water using collection ponds was considered as an alternative to geosynthetic clay liners, however the large footprint and ongoing access requirements for these ponds was

² BPCP-ENV-PLN-022, Erosion and Sediment Control Plan for Land-Disturbance Activities, Buller Plateaux Continuation Project

challenging given the steep natural terrain. With the OoM cost of geosynthetic clay liners being similar to the pond options and the associated smaller footprint, reduced ongoing maintenance and elimination of issues around practicality of access, the geosynthetic clay liner option is preferred and forms the basis of the UWHR design.

Highwall Clean Water Drains

Highwall clean water drains will be an important feature for reducing the catchment reporting to the sediment retention ponds (and therefore reducing the pond sizing). Placement will be at the toe of the highwall where no ongoing disturbance will occur.

Energy Dissipators

Channels will be individually assessed where there is risk of erosion/damage to the channel, or water may escape the bounds of the channel walls, due to excessive channel slope/water velocity or sudden changes in water direction.

Typically, where the channel slope is close to 1%, there is expected to be little risk of damage through changes in water direction, however, as the slope steepens to 5% and greater the channels will require assessment. At greater than 15% and where there is a sudden change of slope, energy dissipators will be assessed for the risk of hydraulic jumps and design requirements.

5.9 Fish Passage



Native fauna

Due to the relatively low number of vehicle movements and the low average and top speeds of vehicles using the road, the impact of the haul road construction and operational activities on mobile terrestrial native fauna is anticipated to be low. Sedentary and poorly mobile terrestrial species such as snails and reptiles will be relocated, in accordance with the requirements of the Wildlife Authority, prior to construction activities commencing.

Application of the New Zealand fish passage guidelines in design of culverts passing clean water under the UWHR are anticipated to result in installations that will provide no greater impediment to the passage of kōura than are present in adjacent reaches of natural habitat.

³ BRL_Buller Plateaux_FTA_Koura_Passage_Culvert_Characterisation_260616

5.10 Heritage Areas

The UWHR has been designed to avoid impacting on all surveyed heritage features and archaeological sites within the Heritage NZ Listed Area and TTPP scheduled – Denniston Historic Area, including the extensive and significant early settlement and coal mining remains at Burnetts Face and Coalbrookdale and the main surface remains of the Iron Bridge Mine (L29/98).

There remains the possibility that the selected alignment will still impact on historical underground mine workings, (subsurface archaeological remains), and some remnants of historical surface mine infrastructure. Three main locations of heritage interest identified through surveys in the proximity of access road alignments are Iron Bridge Mine (L29/98), Beggs Outcrop (L29/99) and Cooks Lease Area (L29/102). Additionally, the UWHR alignment crosses the New Zealand Historic Places Category 1 heritage corridor associated with the Coalbrookdale mine in transiting from Escarpment to Cascade at the southern end of the alignment. Although passing through this heritage area the UWHR design alignment does not impact on any noted sites within the area. Figure 22 below shows these main features noted in the Historic Management Plan.

Further information on these areas of heritage and archaeological significance associated with past mining activity on the Denniston Plateau, (including sites of special interest) are discussed in more detail in the Historic Heritage Management Plan⁴.

5.10.1 Heritage New Zealand listed area (Coalbrookdale Mine & Burnett's Face)

The UWHR alignment crosses the heritage area at its southern extent in moving from the western side to the eastern side of the heritage area. This cannot be avoided due to the topography of the area. In doing so, no surveyed points of historical significance are approached. From this point the UWHR alignment runs beside the Category 1 heritage area to where the Coalbrookdale historical rail loadout meets the public access road. Beyond this the UWHR alignment has been selected so as not to traverse through the Burnett's face Heritage area.

⁴ Historic Heritage Management Plan, Buller Plateaux Continuation Project, March 2026, BUL-ENV-PLN-XXX v0.1

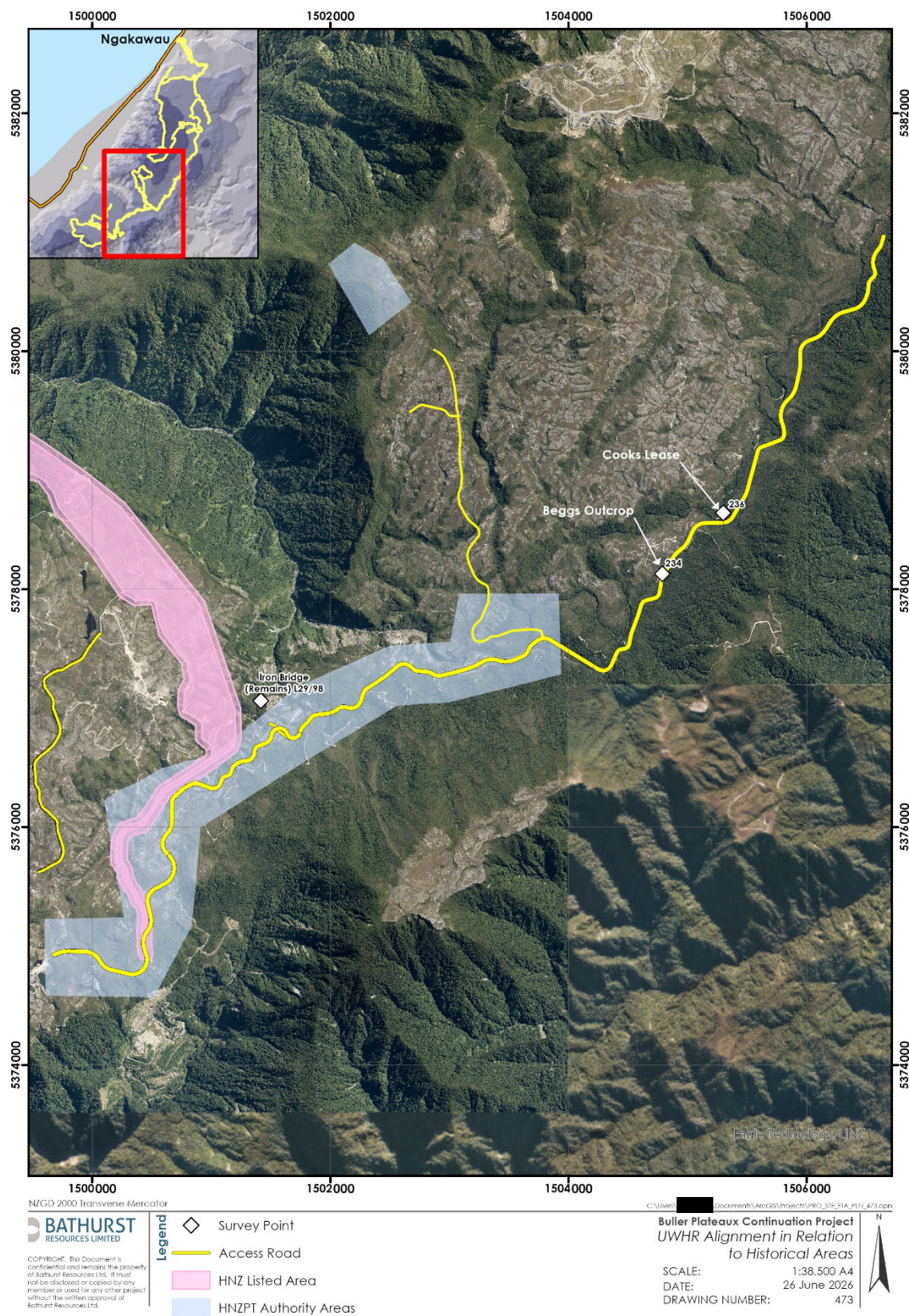


Figure 22: Historic Places Trust areas and survey points of note

5.10.2 Ironbridge Mine

Although there are points of historical note associated with the surface infrastructure of the Ironbridge mine the UWHR alignment does not pass near these. The only point of potential interaction with the UWHR alignment is in historical UG mine workings beneath the road alignment.

5.10.3 Ceaderdale Mine, (Beggs Outcrop)

Beggs Outcrop consists of three old mine entrances, the foundation of the concrete power house, the former site of the administration block, and the concrete foundations of two adjoining coal bins. Two exposed coal seams are located north of the site's structural remains that were bulldozed clear in the bank behind the building sites.

Beggs Outcrop is an example of a small mid-20th Century state-owned coal mine of short duration. The site has limited historic value but has moderate contextual value, with the site deriving its greatest importance from the wider historic context/historic landscape of the Denniston Plateau⁵.

Open and disturbed areas around this site present some opportunity to stage equipment and materials in construction of the UWHR while minimising the disturbance footprint. The road design alignment itself does not interfere with any surveyed heritage remains. Without consents to utilise cleared areas adjacent to heritage listed remains additional native habitat may need to be cleared.

5.10.4 Cook's Lease area

Cooks lease is an area that was mined for coal in 1952 and is near but not impacted by the UWHR alignment. It is noted in the Historic Heritage Management Plan as being of limited historical value⁶.

5.11 MFS Access

Several alignment options were considered for accessing the Mt Frederick Mine, within two different overarching access concepts. One option being through existing Stockton Mining operations and down to Mt Frederick mine from the north. The other being from the Waimangaroa River Valley in the south up to Mt Frederick.

The northern access options from the top of Mt Frederick South are characterised by steep topography with higher earth moving requirements and greater geotechnical and water management risk associated with high and narrow road cuttings.

The southern access options have significantly less earth moving requirements and less road cutting slope risk but require two significant river crossings. One being Deep Creek and the other being the Upper Waimangaroa River (UWR). The narrow, vertical and deep nature of Deep Creek supports a bridge crossing while the flat and low approaches to the UWHR mean that it can be crossed most cost effectively utilising large box culverts. (ensuring durability to withstand potential overflow during the most extreme rainfall events).

⁵ Historic Heritage Management Plan, Buller Plateaux Continuation Project, BUL-ENV-PLN-020

⁶ Historic Heritage Management Plan, Buller Plateaux Continuation Project, BUL-ENV-PLN-020

Although the estimated direct costs excluding contingency for either north or south access options are similar, the preferred access option for MFS is from the south based upon the reduced risk profile of the route when compared with the high and narrow mining cuts required for the northern access option.

5.11.1 UWR crossing

Access across the Upper Waimangaroa River to MFS will be achieved through the installation of large box culverts (5 barrels of ~4m High x ~4m wide). The culverts will completely fill the available width of the existing riverbed eliminating the need for filling and partial intermittent damming of the river associated with high rainfall and smaller / lower placed culvert options.

The use of large box culverts rather than a bridge is preferred for several reasons:

- Large culverts will provide an estimated annual exceedance probability of ~10% (~10% chance of overtopped in any given year - on average 1 in 10 years), effectively providing safe and continuous access for people, equipment and materials to MFS in most anticipated weather events.
- large culverts and associated flow capacity will minimise the potential for partial damming of the river in high rainfall events with associated flooding of adjacent areas upstream of the crossing.
- Entry and exit levels for the road to the crossing will be close to current topography and eliminate the need to cut road approaches down into the riverbank, with associated reduced footprint and run-off control requirements.
- The use of culverts is materially less costly than bridge options to span the river.

Figure 23 below shows the proposed location of the UWR crossing and tie in with the UWHR. Figure 24 below shows a x-section of the conceptual 5 x 4x4 box culverts estimated to establish the UWR crossing.

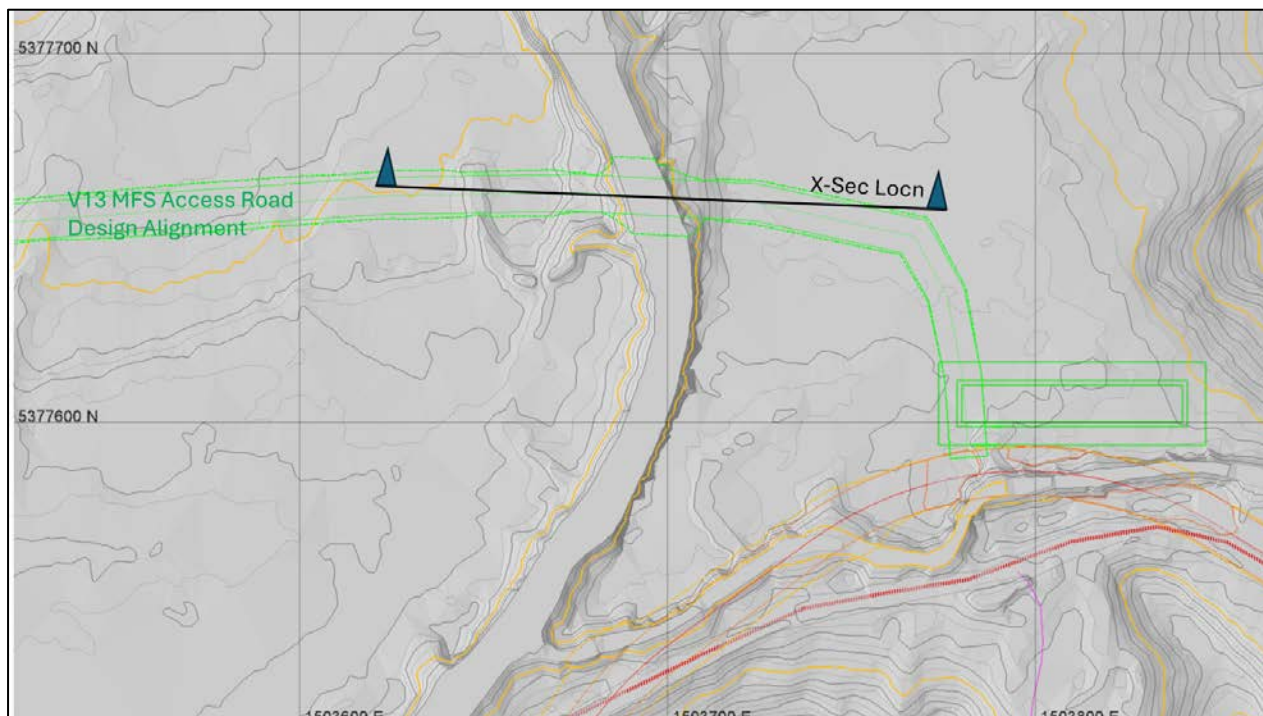


Figure 23: Proposed crossing location topography

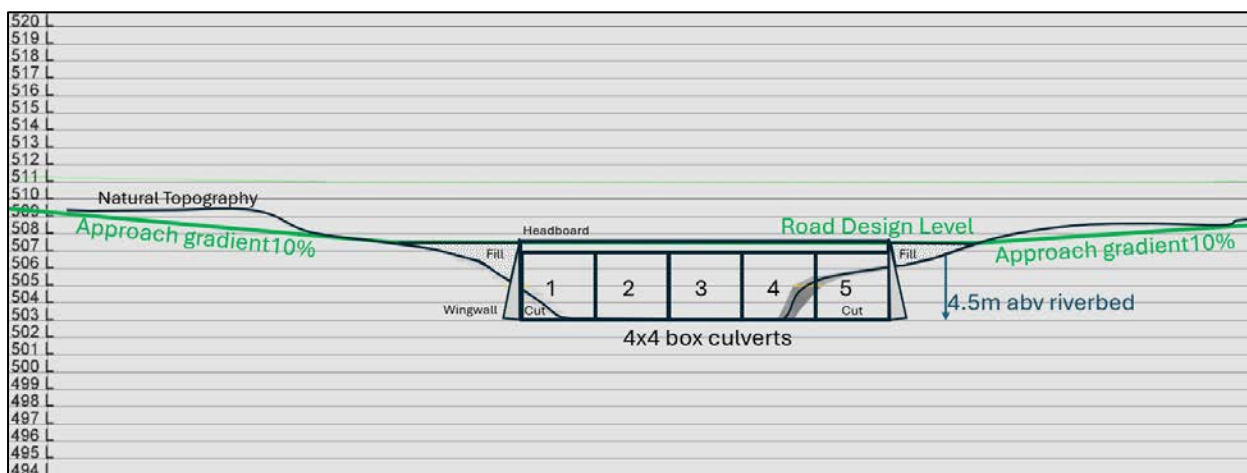


Figure 24: X-Section of proposed crossing

Wing walls will be used where the crossing meets the riverbanks to stop backfill around the culverts spilling into the river course. Standard (5m long – 0.6m high) headwall beams will be used to hold ~0.5m thickness of running course placed on top of the culverts. This running course will buffer the concrete structure of the culverts from the stresses of heavy loaded vehicles traversing the crossing.

Each barrel of the crossing will require 7 culvert sections at 1.55m each to establish the required 10m wide running surface for coal haul trucks and other anticipated mining and supplies delivery equipment. A total of 35 box culvert sections for 5 barrels as shown in Figure 24 below will be required.

Installation of the crossing will be undertaken in two parts with a low section of the eastern embankment excavated and an initial culvert barrel installed (#5 and/or #4 Figure 24) beside the existing riverbed. For stage 2 this section may subsequently be used as a river diversion channel to facilitate the installation of the remaining culvert barrels (#1 to #3) across the remainder of the river.

A typical long section of the proposed culvert installation is shown in Figure 25 with culvert dimensions and specifications.

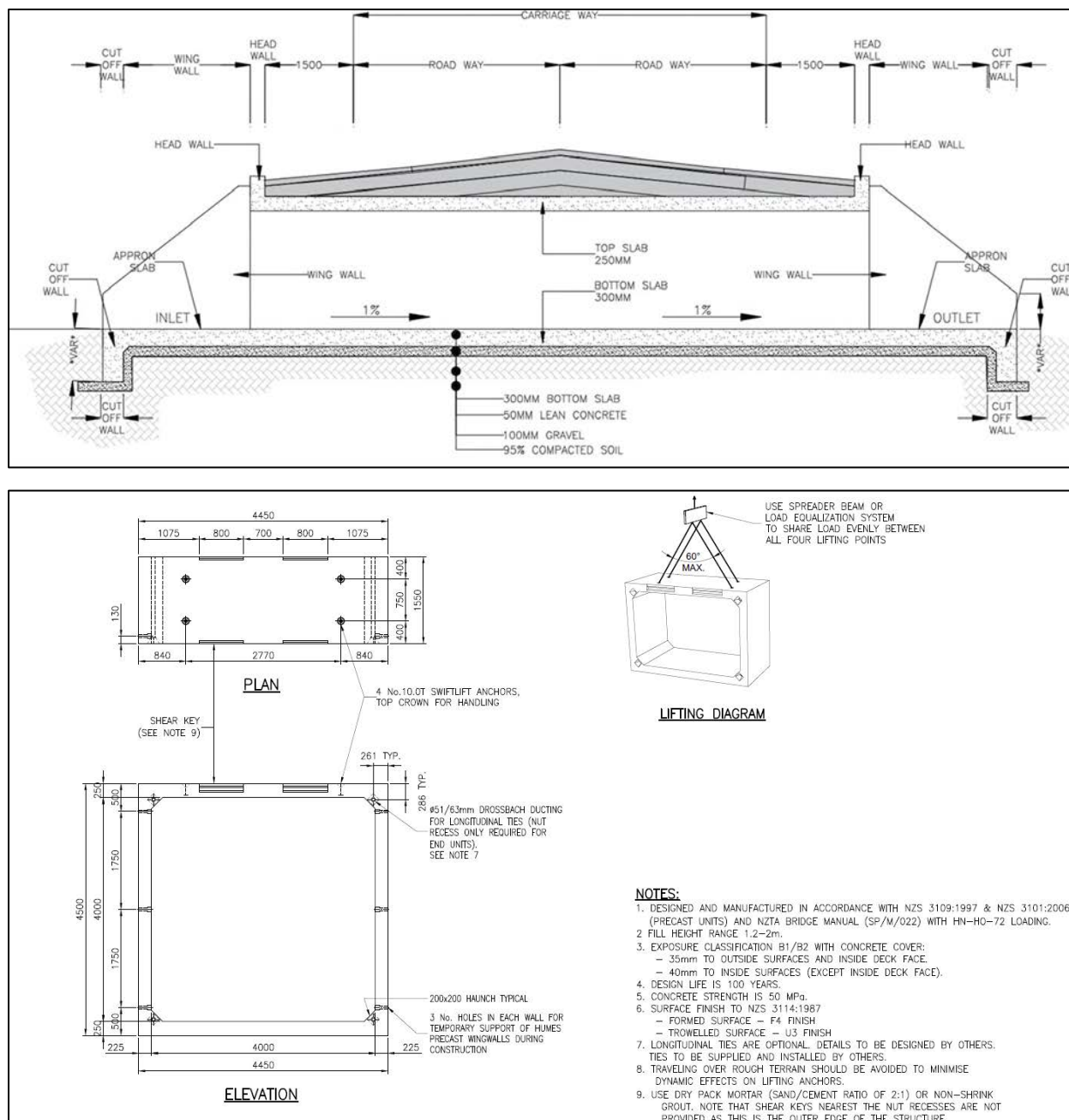


Figure 25: 4m x 4m x 1.55m Uniculvert sections, (15.91t each).

Figure 26 below shows a typical instalment of 4 large box culverts across a river channel. This is similar to that proposed for crossing the UWR.



Figure 26: Box Culvert Installation similar in geometry to that proposed

5.11.2 Deep Creek Bridge

Access to MFS across Deep Creek Gorge from the south is planned via a bridge. This is preferred to an access road down into the gorge or over Mount Frederick South due to the significant reduction in earthmoving quantities, disturbance footprint and reduction in continuity of access risks associated with rainfall, topography and geotechnical conditions.

Spanning the Deep Creek Gorge at its narrowest point, will be via a 48m Truss bridge, subject to detailed design and foundation drilling. To accommodate the largest anticipated mine vehicles a design capacity of 110t and 5.6m single lane running width for Volvo A60 ADT or similar has been specified. The deck may be either concrete or steel and run either on top of, or through, the truss structure. The top mounted deck is preferred as it eliminates any geometry restrictions for loads.

The walls either side of the gorge at the preferred crossing location are situated in strong sandstone pavement which is anticipated to provide good buttressing strength for the bridge foundations with minimal disturbance and reinforcing requirements.

The bridge is estimated to take 12-18mths to design construct and install. Given the deep and vertical nature of the Deep Creek gorge and limited access to the opposite side, the bridge would be difficult to construct in place. As a result, either the fully assembled steel superstructure will be launched into

final position from the south wall towards the north or the steel superstructure partially constructed and lifted into final position. Neither of these options will require access to the valley floor for installation.

Fully assembled installation would require attachment of a lightweight nose to the bridge superstructure and the use of bulldozers and winches to drag the bridge into place across the span.

As there is currently no terrestrial access to the north of the Deep Creek Gorge, the foundations on the northern side will be constructed by teams and equipment delivered by helicopter. This type of construction access is the same as that commonly used for installations in mountainous back country regions of New Zealand for skiing access.

The following figure shows the deck truss bridge solution proposed for the deep creek crossing in another location with similar span.



Figure 27: Deck Truss Bridge example

6.0 Road Construction

6.1 Whareatea Road

Whareatea Road alignment will be widened to accommodate higher traffic volumes associated with the Project. The typical section and pavement design specification described above for other access roads will also be adopted for the Whareatea Road upgrade.

6.2 During Construction

During construction, disturbance will be limited to areas necessary for immediate construction activities therefore minimising exposed catchments and the scale of required sediment control. Clean water diversions will be preferred wherever possible to divert water past the disturbance footprint, minimising volumes of water requiring management.

The primary driver of construction sequencing and road alignment selection are existing access points and disturbance areas associated with Transpower access tracks, recreational 4WD tracks and areas previously cleared through past activity in the area. Starting points for construction have been selected where final road alignment and sediment retention ponds overlay existing access and disturbance. These points are:

1. Cascade mine laydown and SP area with established sediment retention ponds and access
2. Intersection of Burnett's Face Sth to cascade mine road with transpower access track
3. Ironbridge at the intersection of Burnett's Face Nth with Transpower access track
4. Cypress South Mine – operational open pit with established water management systems

These starting points and the subsequent overall construction sequence are shown in Figure 28 below.

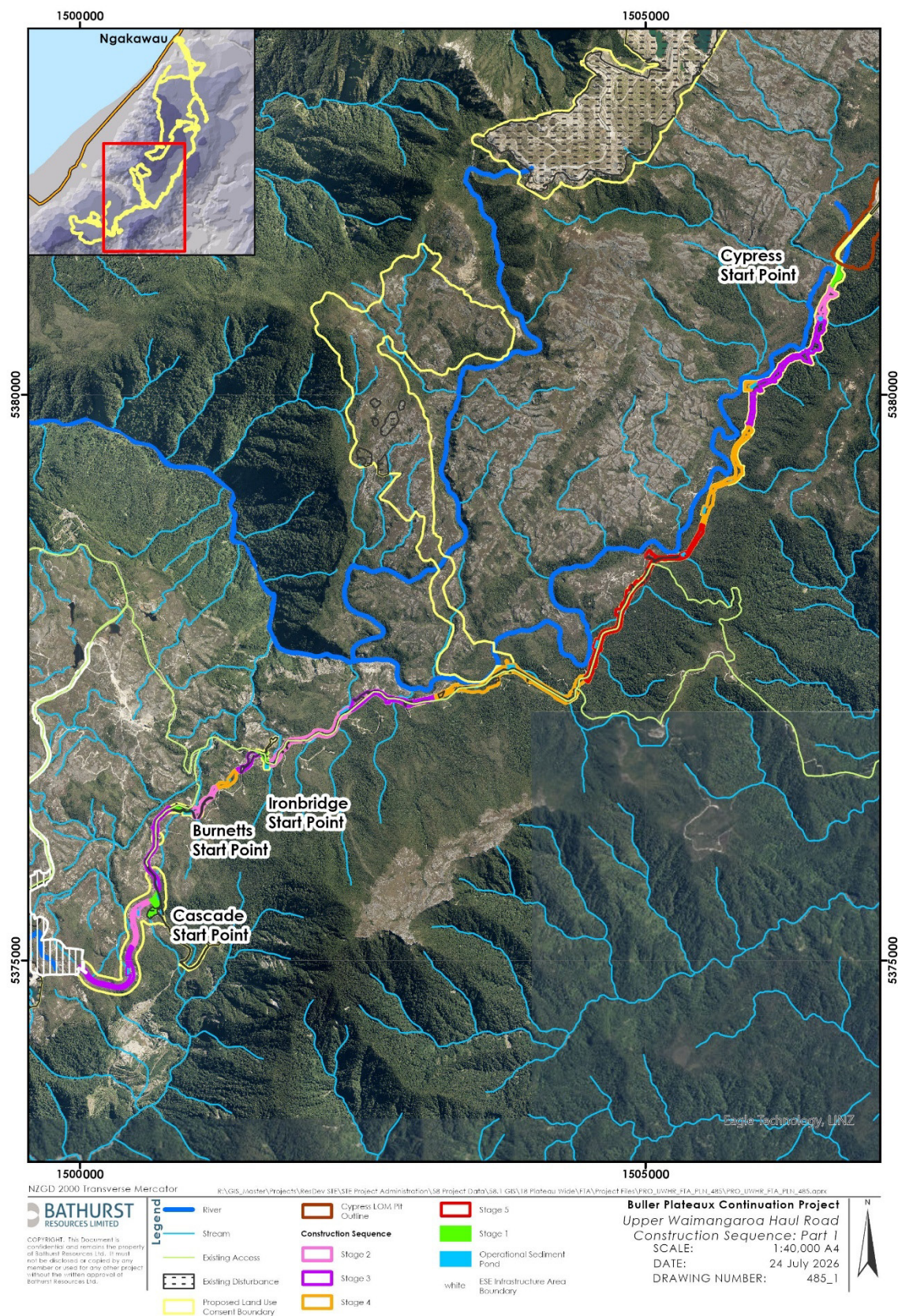


Figure 28: UWHR construction starting points and overall construction sequence

The table on the next page compares the construction disturbance areas requiring sediment control measures for each stage of the construction with the areas that each permanent SRP has been designed for. Broadly the final design areas that SRP's are designed to manage are greater than the incremental construction disturbance areas. This indicates the suitability of permanent SRP's in their final locations for road operations to meet construction requirements. In the case of 2 SRP's the final design capacity is materially less than that required for construction activities. These two locations are Ironbridge Stage 2 - SRP 8 and Cypress South stage 3 - SRP 15, (shaded grey in Table 13: Disturbance Areas, Construction vs Final Operational, below). To manage discharge water quality in these two cases SRP area/volume will need to be greater than that which will remain post construction. This will be achieved through a combination of additional temporary sediment control sumps on the road footprint and limitation of active construction working areas at any particular time. Where there is any shortfall in sediment cleaning capacity the fallback position will be to pump water further back along the established road alignment to other established SRP's.

Table 13: Disturbance Areas, Construction vs Final Operational

		Laydown Area / initial dist	Max potential dist footprint	% of max potential open	Sediment Retention Pond (SRP)	Construction dist area open to control	Final surface area reporting to SRP	temp surface area greater than final (+) temp less than (-)
		(Ha)	(Ha)	(%)	(#)	(Ha)	(Ha)	(Ha)
Construction Stage 1	Cascade	1.1	1.8	59%	4	1.0	0.8	0.2
	Burnetts	0.1	1.1	100%	5	1.0	1.7	- 0.7
	Iron Bridge	0.3	0.9	100%	7	0.7	0.8	- 0.1
	Cypress Sth	0.0	0.9	100%	pit	0.9		
Construction Stage 2	Cascade		1.5	50%	3	0.6	0.7	- 0.0
	Burnetts		1.4	50%	5	0.7	1.7	- 1.0
	Iron Bridge		3.8	50%	8	1.9	0.8	1.1
	Cypress Sth		1.4	50%	16	0.7	0.8	- 0.1
Construction Stage 3	Cascade		2.5	50%	2	1.2	1.3	- 0.1
	Burnetts		1.1	50%	7	0.5	0.8	- 0.3
	Iron Bridge	0.7	3.3	25%	9	0.8	1.3	- 0.5
	Cypress Sth	0.4	5.9	50%	15	3.0	2.0	1.0
Construction Stage 4	Burnetts		0.9	50%	6	0.5	0.4	0.1
	Bridge	0.3	7.2	25%	10	1.8	2.5	- 0.7
	Bridge				11			
	Cypress Sth		3.7	25%	14	0.9	1.7	- 0.8
Construction Stage 5	Mid Connect	0.4	2.4	20%	12	0.5	3.0	- 2.5
	Mid Connect				13			

7km of the southern part of the UWHR alignment is readily accessible via existing tracks. This existing access will be leveraged in the construction sequence to install culverts that will bypass clean water under the road construction footprint and final road alignment ahead of bulk fill, road widening and road pavement establishment.

Sediment retention ponds (SRP's)

Over the course of road construction 3 types of sediment retention pond are anticipated in response to ground disturbance. These are:

1. Sump – localised collection point cut into the ground with water collected and pumped to established sediment control ponds elsewhere. These installations will be associated with the land clearing and earthworks of remote pioneering work that establishes initial access to the road alignment for increased earthworks activity of full road construction.
2. Sediment retention pond – more substantial established pond that is sized for a specific larger construction disturbance area but is not located in its final position and will have to be subsequently removed. These ponds will be located on the road footprint where pumping or disturbance area constraints require more settling volume than that proved by SRP's in their final operational location.
3. Operational sediment retention pond – Final location for access road operations post construction and sized for operational catchments associated with road. This will mainly be the road surfaces but may include other disturbance areas not immediately stabilised as required. Stabilisation of the road running surface through sealing or other measures may be considered to reduce the required size of operational sediment retention ponds or eliminate the need for them all together.

Existing access roads will be utilised to construct both permanent and temporary SRP's in advance of subsequent road development activities on the disturbance footprint. (87% of UWHR SRP's in their final locations are accessible prior to the commencement of construction via existing roads and tracks). SRP's in their final locations and sizes are also generally suitable to manage the quantities of construction associated water management expected. This will minimise the distances and volumes of sediment affected water that is pumped from temporary sumps back to established and permanent operations SRP's.

Operational SRP's along the road alignments are generally sympathetic with local topography and located in naturally occurring low points and gullies. As a result, many of these ponds in their final operational locations can be established by local cut and fill without the need to haul unsuitable material away or bring material in. This will keep the construction footprint tight and eliminate the need for extensive sediment control measures along lengthy haul routes. Where sump and SRP establishment result in small amounts of excess materials these will be stored on localised laydown areas along the road alignment. Larger amounts of excess or unsuitable material will ultimately be hauled to the larger footprints of the mining operations at either end of the road alignment but this may be delayed until the access road construction fronts and associated water management become connected. The quantities of this unsuitable engineering material will be easily incorporated into planned mining operations due to the relatively minor amounts. Prior to entering and disturbing a

work area, erosion and sediment control plans will be in place, identifying all infrastructure required, risks involved, and existing waterways and sensitive environments.

Progressive stabilisation will be undertaken as part of minimising the disturbance footprint and protecting surfaces from erosion. Topsoil and vegetation will be removed from construction areas and locally stored with sediment and erosion controls in accordance with the Erosion and Sediment Control Plan for Land Disturbance Activities⁷. This material will be used in stabilisation and progressive rehabilitation of road cuttings and bulk fill areas during construction of the road. This approach to the use of topsoil will ensure its viability and ability to support native plants and maintain run-off water quality in the longer term.

Brunner Coal Measures traversed in construction of the road will be used as local fill and the potential for AMD associated with large fill areas controlled through the use of Geosynthetic Clay Liners (GCL) as required (stopping percolation of meteoric water). Smaller volumes of BCM fill will not require sealing or water treatment. The need for GCLs will be determined through estimation of water quality based upon construction fill material characteristics, construction methodology and resultant percolation rates.

Inert and durable road construction material is available from A-Drive borrow pits at Stockton mining operations. This will be supplemented with commercially sourced engineering aggregate delivered to the ESE/southern end of the UWHR for use in establishment of sediment control sumps and road pavements in their final locations where existing access allows. Sumps and SRP's may also be lined as required.

During operations, ongoing evaluation of the effectiveness of designs in minimising barriers to koura will be made and modifications implemented to ensure the original intent of design is maintained⁸.

6.3 Road Construction Start and Progression

Road construction will commence in locations along the road alignment where there is existing access and disturbance associated with past mining operations and Transpower access. The initial activities undertaken in these locations will be the establishment of sediment controls to support subsequent land disturbance in association with construction activities. Once established, road construction will continue away from these established water management locations initially uphill utilising gravity to direct sediment impacted water back to established SRP's. In instances where water does not drain naturally towards SRP's, sumps will be cut into localised lows from which water will be pumped back to sediment control collection channels and SRP's.

The figures below show these concepts with four start locations at Cascade, Burnetts, Ironbridge and Cypress with their subsequent development directions for the road alignment construction which will leapfrog from one operational SRP in its final location to the next.

The development concept for the road from Cascade towards the south to connect with ESE infrastructure is shown in Figure 29 below. This development from cascade to ESE is generally uphill

⁷ BPCP-ENV-PLN-022, Erosion and Sediment Control Plan for Land-Disturbance Activities, Buller Plateaux Continuation Project

⁸ Aquatic Ecology Management Plan, BCPC-ENV-PLN-006.

and is an example of the construction approach that will minimise the requirement to pump sediment impacted waters from temporary sumps in the road construction footprint back to established SRP's.



In all cases, culverts will be installed in their final locations to support the complete road footprint prior to bulk fill placement and road base construction. These culvert installations, due to their locations in natural depressions will require localised water control and likely pumping of sediment impacted waters on the footprint from temporary sumps back to established SRP's. Details of these culvert installation arrangements are covered in more detail in the Erosion and Sediment Control Plan⁹.

Figure 30 below shows the concept behind initial land disturbance for commencement of road construction and establishment of water management at the Cascade start point. This will start with the removal and stockpiling of topsoil from the areas immediately under and adjacent to the first SRP and culverts. This topsoil will be used in subsequent stabilisation and rehabilitation of the disturbance areas very close to where it was harvested, with the aim of reducing sediment run-off. Once SRP's and adjacent culverts are in place to support expansion of the construction footprint then the work on the road alignment will commence.

⁹ BPCP-ENV-PLN-022, Erosion and Sediment Control Plan for Land-Disturbance Activities, Buller Plateaux Continuation Project

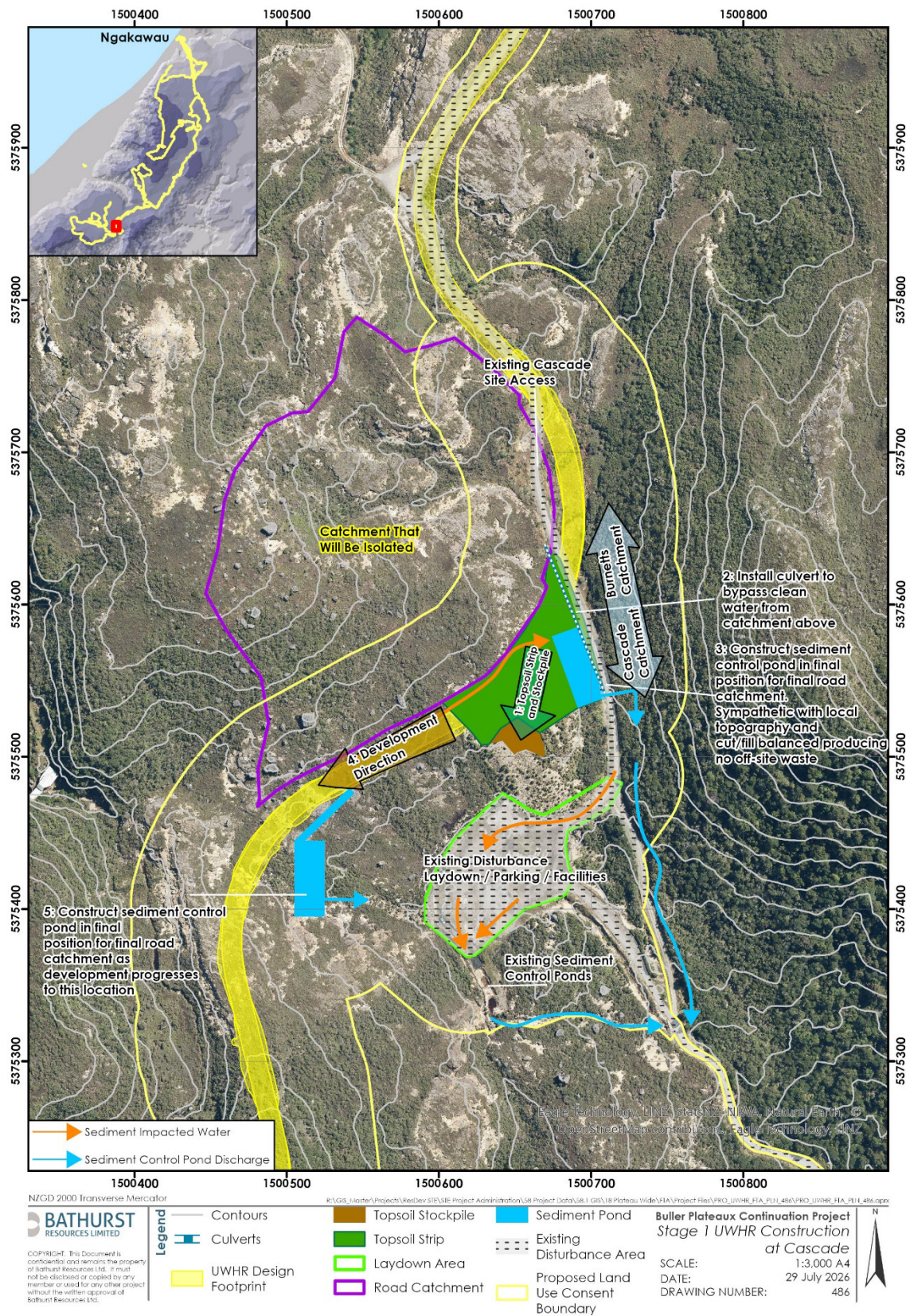


Figure 30: Cascade start point - Initial water management

Figure 31 below shows the two starting points on the southern and northern sides of Burnett's Face that will be used to launch construction of the Burnett's Face bypass section of the UWHR. Road construction will progress uphill away from established SRP's at either end to connect halfway between these start points.

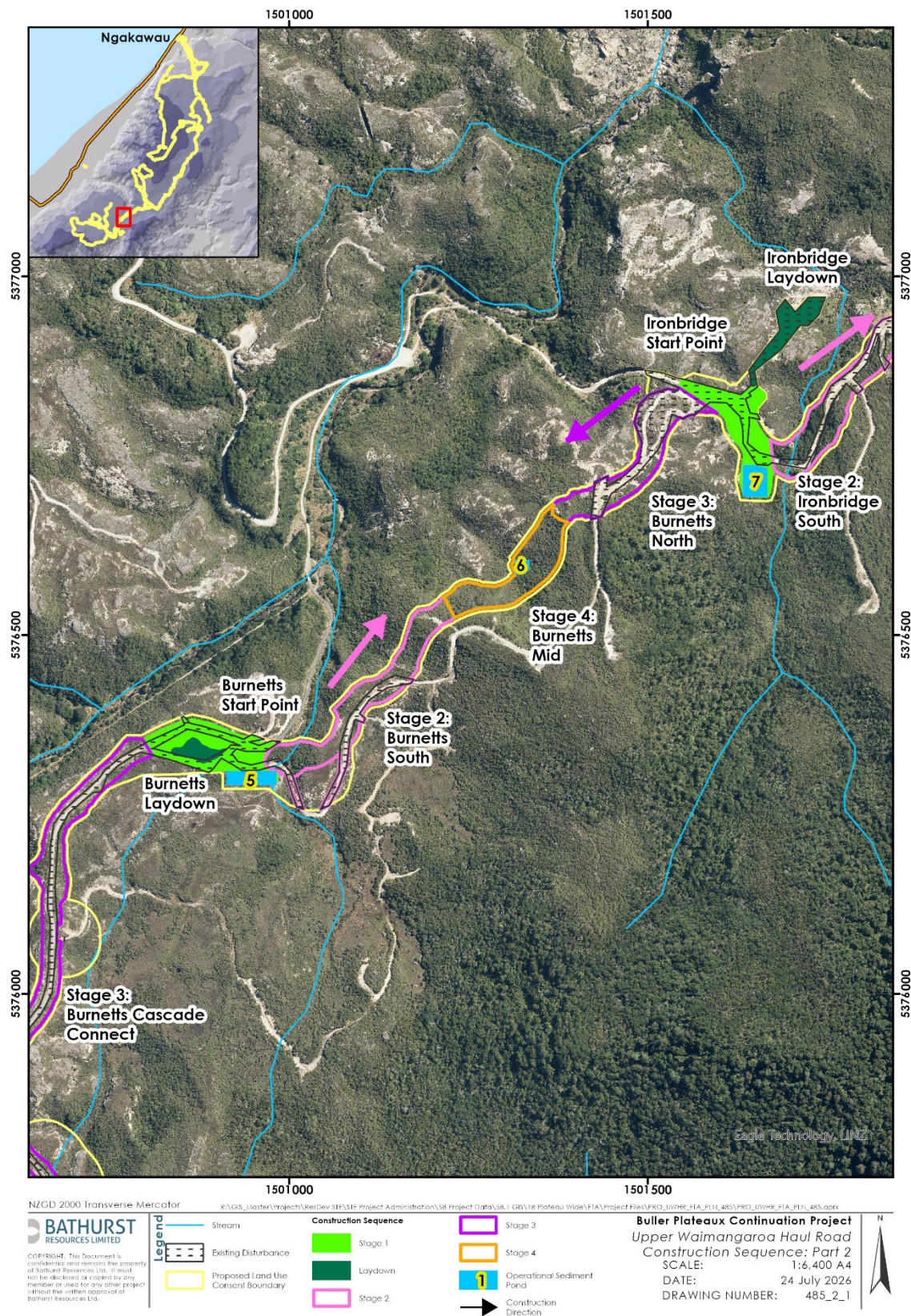


Figure 31: Burnett's and Ironbridge start points and connecting development

Figure 32 and Figure 33 below show the conceptual staged approach to break-in activities at Burnett's Face required to establish water management prior to commencement of road alignment earthworks. In this way adequate sediment control is in place as the road construction footprint is then progressed towards the next planned SRP location.

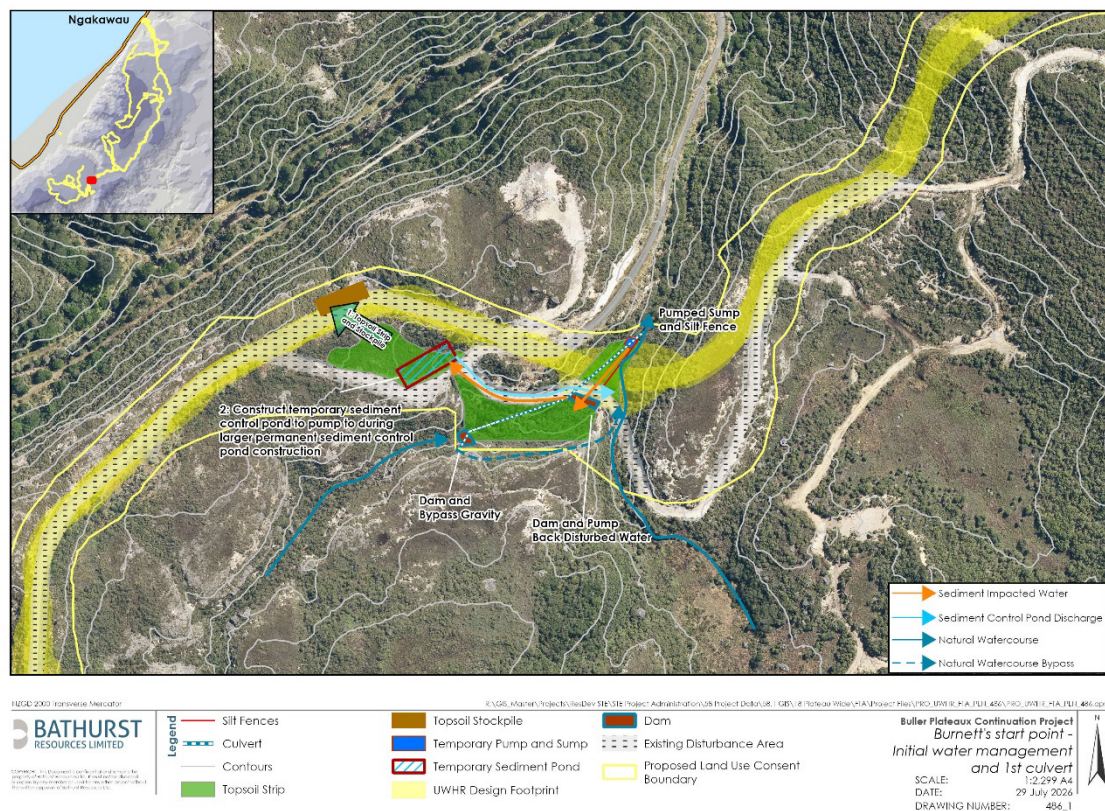


Figure 32: Burnett's start point – Initial temporary SRP's for site establishment

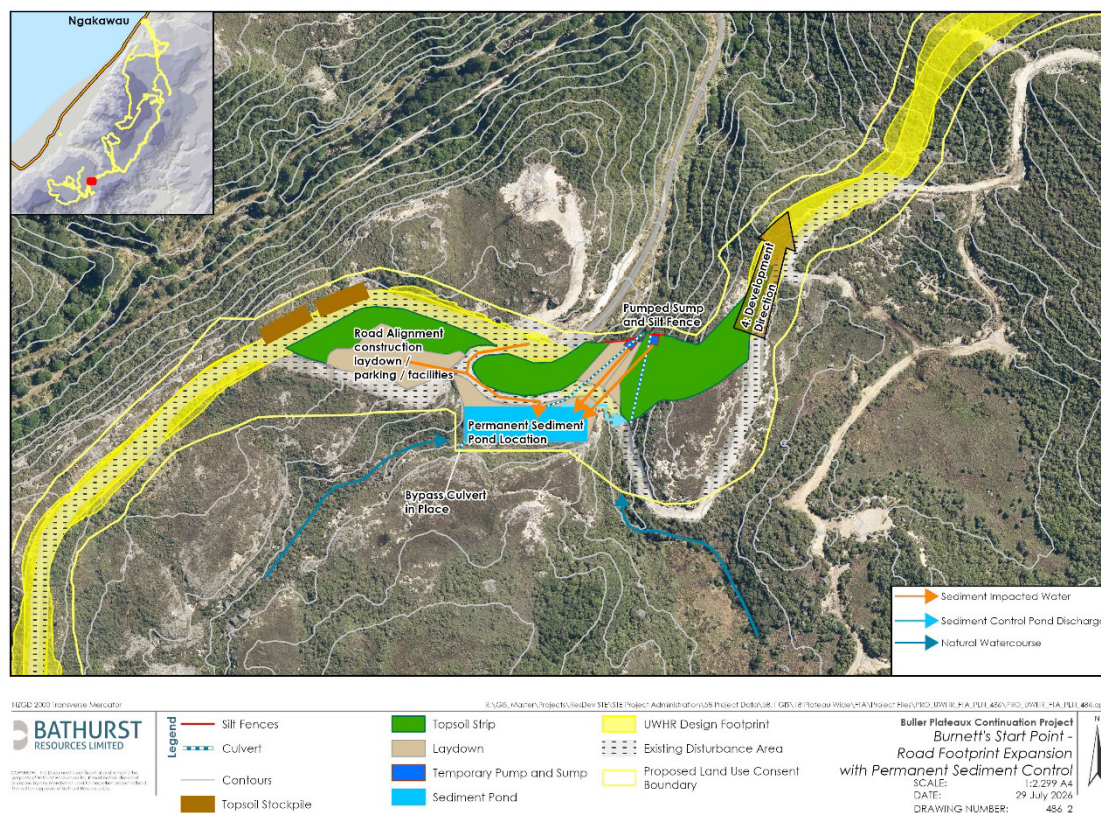


Figure 33: Burnett's face – final operational SRP and expanded construction footprint

At the northern end of the UWHR alignment, road construction will start at the southern boundary of the cypress open pit mine. Established water management for the large open pit mining operation will be leveraged for the management of water on the footprint of the UWHR as it is developed southward. Initially the road will rise away from the pit crest and enable water to naturally drain back to the open pit from the road development footprint.

The first operational SRP on the northern UWHR alignment is located approximately 500m south of the open pit. Water management during development of the road footprint south will be achieved in the same way that it is currently in clearing the open pit disturbance footprint, with water returned to the mine operations footprint using temporary sumps and pumps.

Fill material used in the construction of SRP's along the sections immediately south of cypress pit will be inert granite material sourced from A-Drive Quarry. This will be necessary due to the road foundation material in this area comprising of landslide material off the flanks of Mount William which is unsuitable for use as engineered fill.

Once the first operational SRP is established on the UWHR alignment south of Cypress Pit, development will continue south with water pumping infrastructure moving with the development heading and pumping sediment affected water back to the nearest SRP or in the case where the SRP's cannot cope with the total construction disturbance volume, back to the Cypress open pit.

Figure 34 below shows the planned progression of development from Cypress Pit towards the south and the location of permanent SRP's that will receive sediment affected water from pumped temporary sumps in active construction areas.

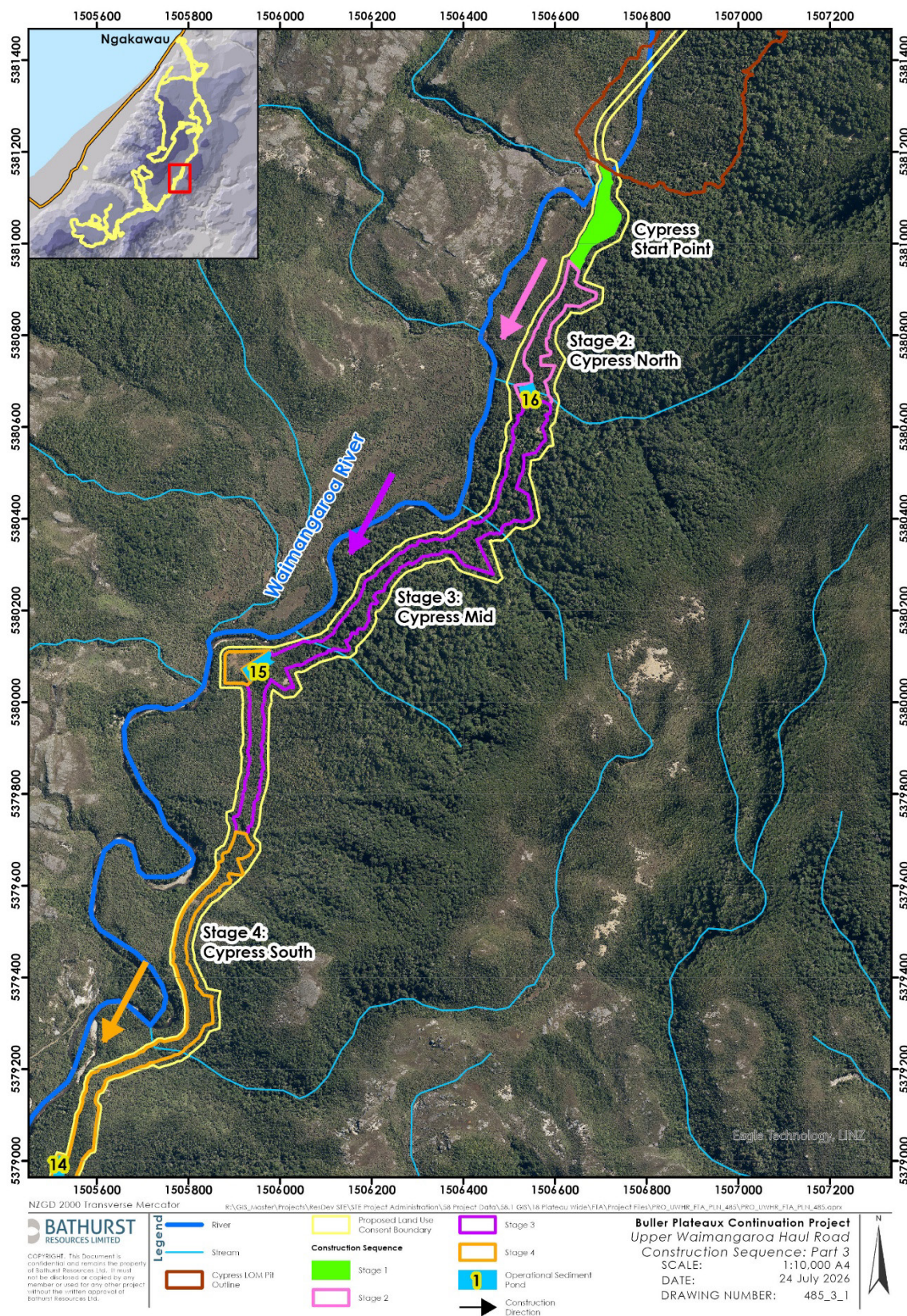


Figure 34: Cypress start point and subsequent development

6.4 Road construction equipment and timing

It is anticipated that road construction bulk cut and fill activities will be undertaken with ~100t class diggers (Hitachi EX-1200 or similar) matched with 40-50t capacity articulated 6WD trucks, (CAT-740 or Volvo-A60H) allowing for 4-5 pass loading to maintain reasonable productivity. A range of other specialist cranes and support equipment will also be employed in construction activities.

The road is anticipated to take 12-18 months to construct on multiple fronts provided by existing tracks and roads that provide multiple access points to the UWHR alignment. This will ensure access is established in time to support Escarpment production.

7.0 Coal Handling Infrastructure

7.1 ROM Coal Loadout ESE

A flat 12ha pad for storage, blending and campaigning of coal production from ESE along with coal haul truck servicing and operations facilities will be established to the southeast of the central infrastructure area where the UWHR falls in with the ESE infrastructure. The stockpiling area will be some 6ha (200m x 300m), in area and capable of storing approximately 125k m3 of coal, (4m high).

Coal will be carted ex mine pits generally by either rigid body (Cat 777) or articulated dump trucks (ADTs) at rates of up to 600tph to the coal stockpiling area. Coal will be either clean coal which will require sizing at Stockton, or wash coal which will require washing and sizing at Stockton and will be placed on designated stockpiles according to coal quality. Coal will be paddock tipped by the trucks, and if necessary, pushed up by wheel loader of CAT988 / CAT992 scale. If additional height is required, this will be achieved by an excavator, working off the coal stockpiles.

Mine operations will be 24/7, 52 weeks of the year and coal production will occur intermittently at any time. A-Double truck trailer configuration with a 60-90t payload will be loaded at an average rate of 330tph by Cat 988 to Cat 992 sized wheel loader.

Separate access to the stockpiles for coal haul trucks carting to Stockton (UWHR trucks) is required to ensure trafficability for road trains is maintained, to provide suitable turning circles for the double side tipper truck trailer configuration and to maintain separation of road trains from mine production equipment.

The coal loadout area will have permanent flood lighting for truck loading areas and where required mobile lighting towers may be used to improve lighting and ensure safe operation at night.

The coal storage area will also include a park up area or GO LINE for up to 8 UWHR trucks, a truck wash facility to clean trucks as required, a combined truck workshop and office facility and Light Vehicle parking area for servicing and repair of the UWHR trucks. A stand-alone 60, 000 litre double skinned fuel tank for refuelling the UWHR trucks and LV's will be located adjacent to the loadout area.

Electrical power will be provided by diesel generator located in the vicinity of the workshop.

Dust associated with vehicle traffic will be managed by the site water carts applying water spray to active roads as required. It is not expected that coal stockpiles will require wetting to minimise dust generation, but if required sprinkler systems could be installed should it prove necessary.

Figure 35, below shows the relative location of the ROM coal loadout facilities relative to the overall ESE infrastructure layout.

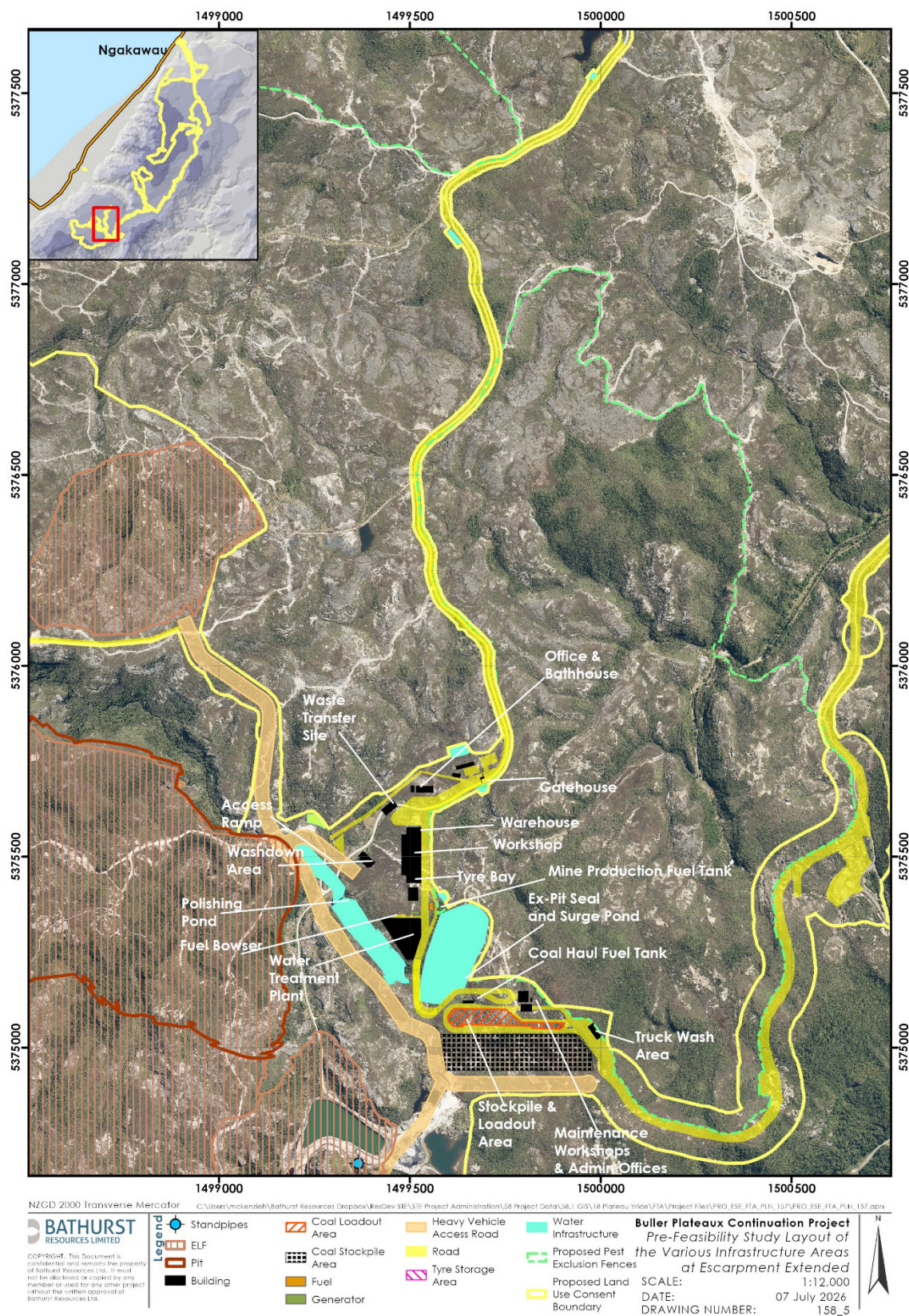


Figure 35: Infrastructure layout showing location of ESE ROM Coal stockpiles and loadout

7.2 Coal Handling Stockton CHPP

Numerous options were considered for unloading ESE ROM and Bypass coal at the Stockton CHPP.

Options Considered for unloading of ESE coal at the Stockton CHPP:

- Belly Dumper trailer units tipping to conveyor / stackers in CHPP SP area
- Side tipper trailer units tipping to conveyor / stackers in CHPP SP area
- Side tipper trailer units tipping to ground at CHPP SP area with Loader rehandle to CHPP crushers
- Side tippers short tip to ground outside CHPP and Infrastructure areas with mine truck reclaim to crushers

Evaluation and selection of a preferred option considered:

- Maintaining use and location of existing CHPP ROM and Bypass feed prep
- Maintaining existing access, topography and location of current maintenance infrastructure
- Traffic management for operation of Stockton mine equipment and ESE coal haulage trucks in Stockton CHPP area and approaches
- Stockton mine production haulage from operating pits during transition
- ESE coal haulage truck operating requirements
- ESE Coal haulage side tipper vs belly dumper trailer implications
- Potential for direct feed of ESE production utilising radial telestacker conveyor systems
- The current location of Stockton tyre storage areas
- Capital and Operating costs of alternative options

The following conclusions were drawn from evaluation of the above options.

Conveyor / stacker direct feed options are capital intensive due to the requirement for feed preparation (steel/timber/stone removal and product sizing, ~\$12M) prior to haulage. In needing feed preparation prior to haulage, existing feed prep infrastructure at Stockton CHPP becomes redundant. For the same reasons, the use of Belly Dumper trailer units is also capital intensive, (feed preparation at loading required). At the Stockton end unloaders, conveyors and stackers add further cost (~\$12M) to the overall capital, making these options ~\$20M more expensive than comparable tip to ground options utilising side tipper trailers.

Additional constraints on the conveyor/stacker and belly dumper off-loading infrastructure options are in the restricted area, elevation differences and traffic interactions of the current Stockton CHPP feed areas, which make it difficult to position this infrastructure adjacent to current crusher locations.

Options that tip to ground in the existing CHPP SP areas using side tipper trucks are preferred, due to the lower capital intensity and operational flexibility offered. These options will still require significant earthworks around the existing CHPP SP and feed areas to account for the larger turning circles of the

proposed road trains. If surge capacity is required where side tippers are discharging their loads, a ramp and platform above the SP area will also need to be established. This will likely take the form of some concrete retaining wall and concrete pads for both truck and loader operations. A conceptual access arrangement providing on SP manoeuvring areas for road trains while maintaining access for mine trucks is shown in Figure 36 below. Note, this will require further refinement based upon timing, the potential for dual haulage use and surge capacities required.

Due to anticipated disruptions required in establishing access for ESE coal haul trucks to the Stockton CHPP area a temporary short tip stockpiling area is recommended for coal coming from ESE during the transition of operations from Stockton Coal to ESE Coal sources. From this location coal would be rehandled into mine trucks that can seamlessly utilise existing feed infrastructure, layout and traffic management in place around Stockton CHPP.

Although reducing the haul distance that road trains must travel from ESE to Stockton, this initial remote reclaim option incurs a higher annual OPEX of ~\$3.5Mpa associated with loader reclaim and mine truck haulage for the final approaches to Stockton. At these levels of operating cost it is anticipated that it would be preferable to move ESE coal unloading to the CHPP SP areas as soon as practicable.

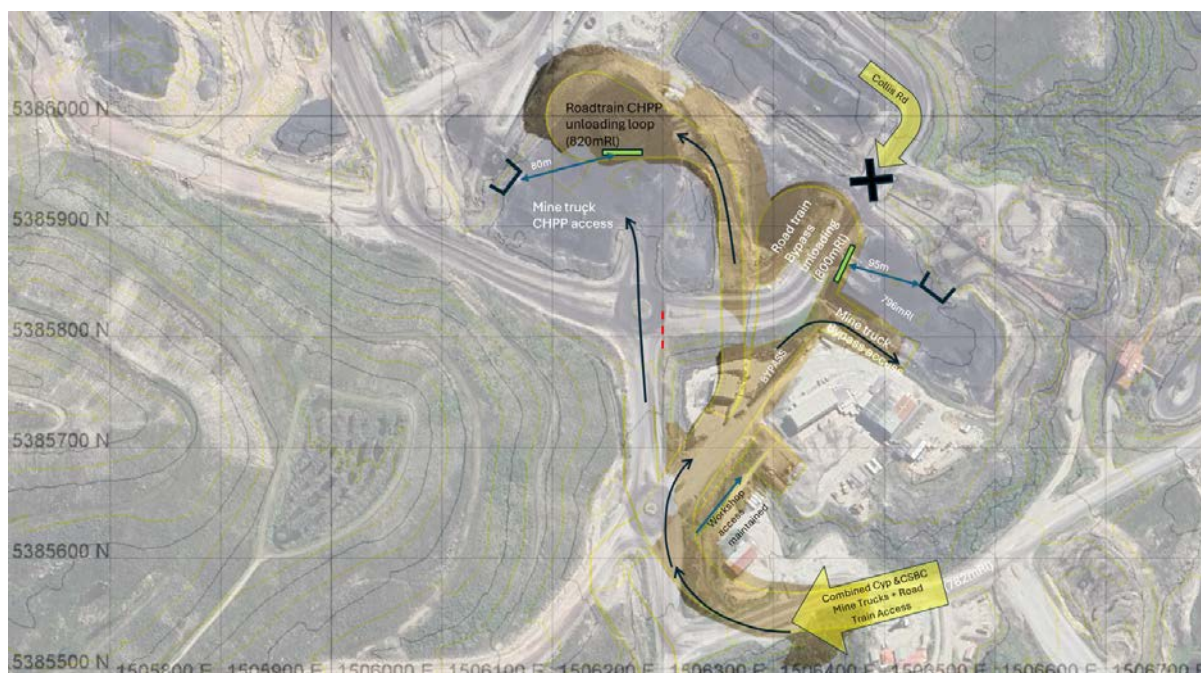


Figure 36: Conceptual side tipper road train access to CHPP SP areas for loader reclaim

7.3 Aerial Ropeway

The current Stockton haulage post CHPP will continue to be utilised for the duration of the Project. Figure 37 highlights the post processing transport network. Following coal processing at the CHPP or the Infeed, coal is transported by Heavy Mining Equipment (HME) along a 7.4 km haul road (which replaced stations 2 to 5 of the Stockton Aerial Ropeway) and then is loaded onto the Aerial Ropeway, which begins near the Stockton mine gate (Station 5). The Aerial Ropeway is approximately 2.3 km long and ends at the Ngakawau Rail Loadout (Station 7). The Aerial Ropeway has a maximum capacity

of 2.3 M tonnes per annum. The ropeway, due to the elevation change from the escarpment at Station 5, ~500 m above sea level, to Station 7 at sea level, enables the ropeway to generate its own power, a unique advantage of the system.

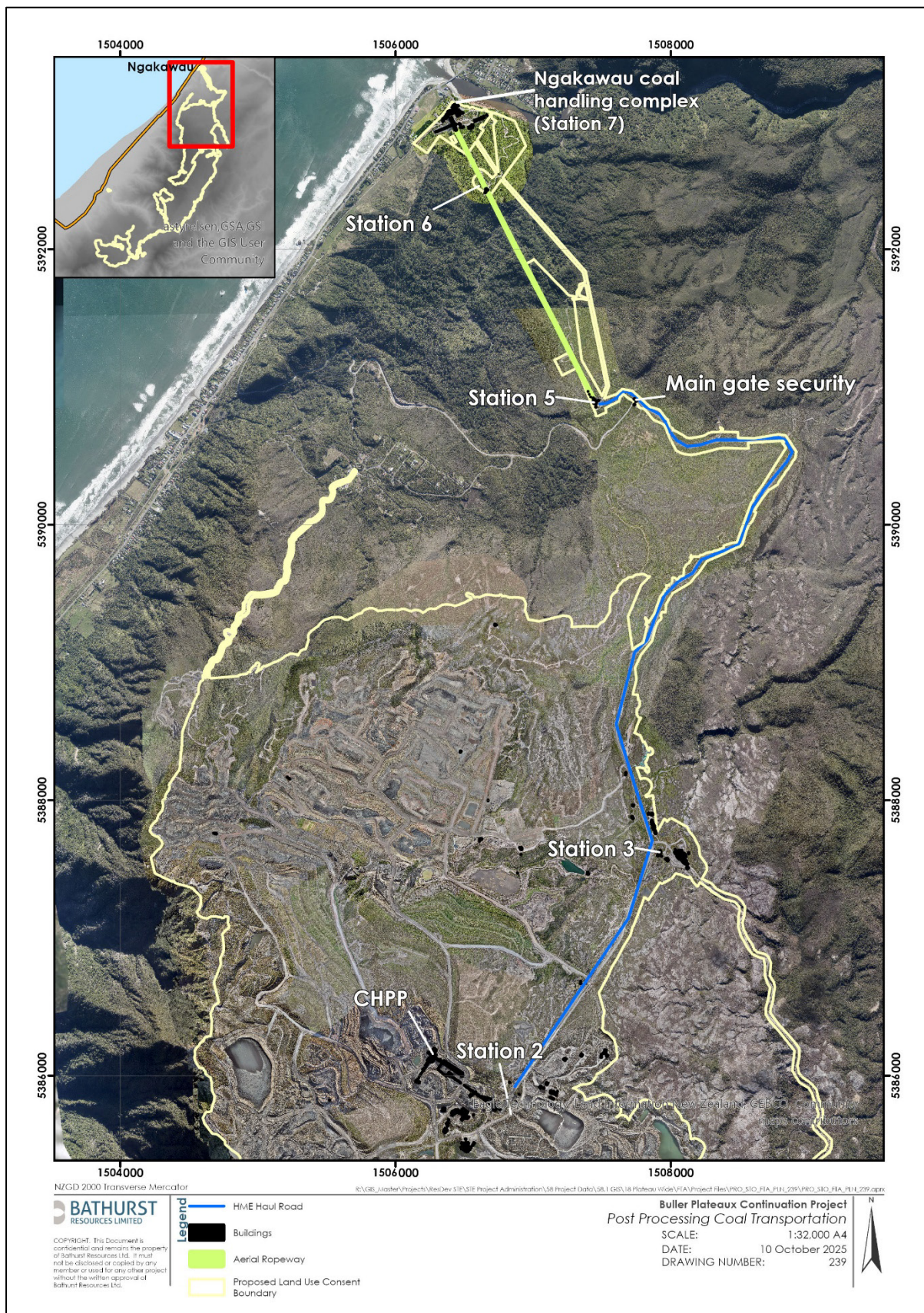


Figure 37: Post CHPP Coal Transport to Rail Loadout Facility at Nagakawau

7.4 Export Coal Rail-Port Operations & logistics

The Ngakawau Rail Loadout plays a key role in the mine operations as it is a product stockpile area and rail loadout facility. Under normal operating conditions, all coal from the facility is loaded onto rail, and railed to the export ship loading facilities at Lyttleton Port near Christchurch.

Bathurst holds existing contracts with KiwiRail and the Lyttleton Port Company (LPC).

8.0 Closure

The currently preferred closure option for the UWHR is to maintain access along the length of the road for public recreation post operations. This will require water management features to be left in place even though the road pavement may be reduced in width as part of the closure plan.

This long term closure objective will require channel and culvert sizing for the road to be based upon a 1% AEP (1 in 100 year annual exceedance probability) return period. This design basis will significantly derisk the potential for negative impacts associated with overtopping or failure of water management infrastructure during operations and post closure.

At cessation of coal haulage operations, dependent on landowner preferences, it is proposed the road revert to a combination of recreational access along with ongoing Transpower access through to the point where the Mackley Track diverges.

As Transpower will require intermittent and ongoing access to their adjacent infrastructure with heavier vehicles, it is proposed that the road from Burnett's Face through to the point where the Mackley Access Track diverges be maintained in its full constructed geometry. That is 8.6m dual lane pavement with side bunding and water run-off management.

The remaining sections in the North beyond the Mackley Track, and in the south between Escarpment and Burnett's Face will not require ongoing access for heavy machinery and the established road geometry will no longer be required. These road sections present an opportunity for public recreational amenity and provide the basis for valuable loop circuits accessing remote back country.

Some reduction in the road footprint will be preferable when heavy vehicle access is no longer required. For these areas, the pavement width will be reduced to a single lane light vehicle track or biking track, with the road shoulders reprofiled and planted in appropriate indigenous vegetation.

Ponds and drainage structures established for the control of run-off will remain in place to service the requirements of any remaining track / road profile.

Public amenity may range from bicycle and pedestrian access though to 4WD. The desired or targeted end use however is yet to be finalised through stakeholder consultation and can be easily accommodated by the proposed approach to repurposing of the road profile.

8.1 Closure Areas

The "closure area" is a measure of the reduction in surface area of the UWHR disturbance through proposed closure activities.

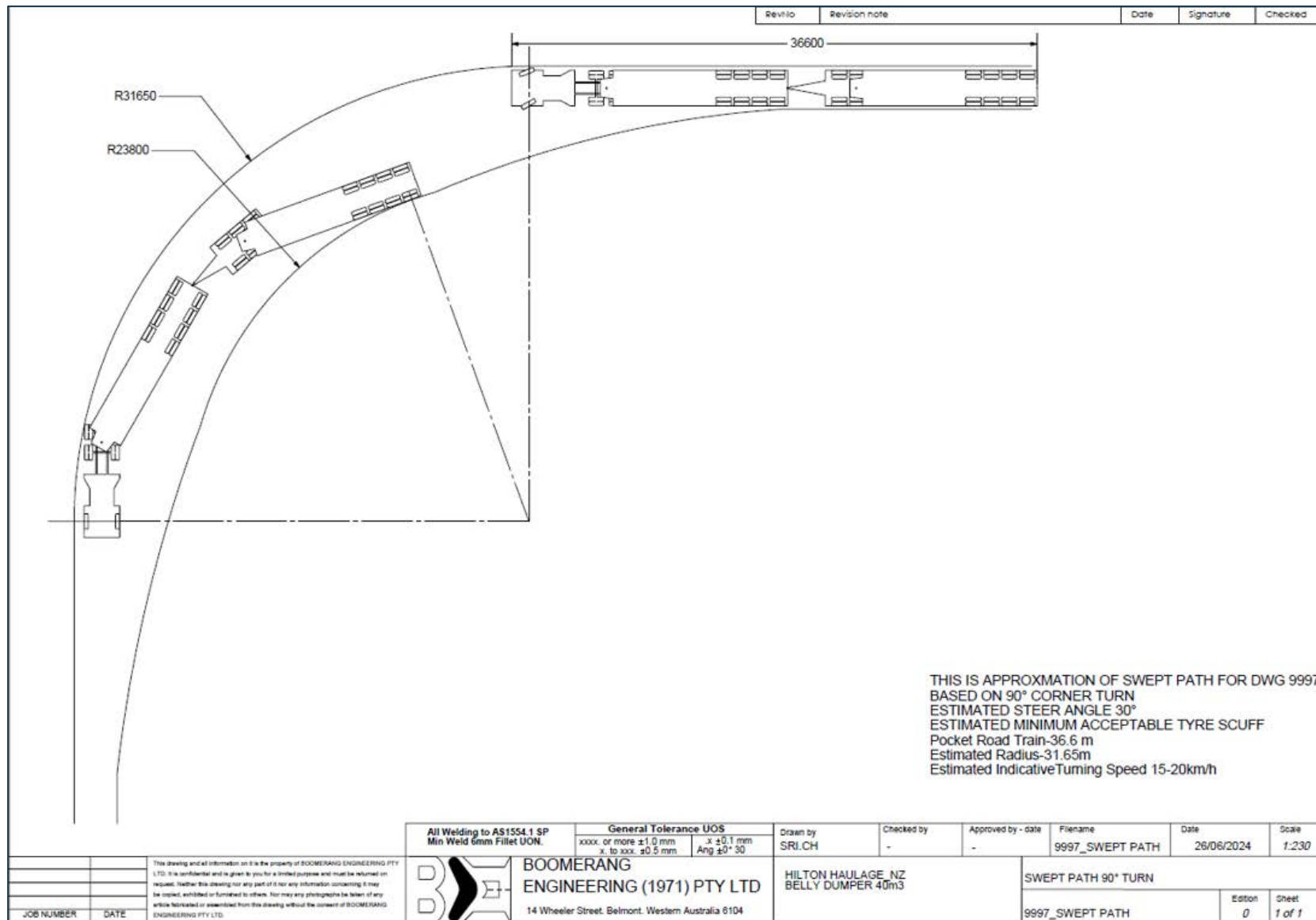
Road surface rehabilitation (Ripping/topsoil cover & native planting) is estimated to be a reduction in pavement width by approximately half, equivalent to ~5Ha.

Laydown areas adjacent to and along the length of the road that are used for equipment and materials staging during construction add up to a further ~3.4Ha that can be rehabilitated.

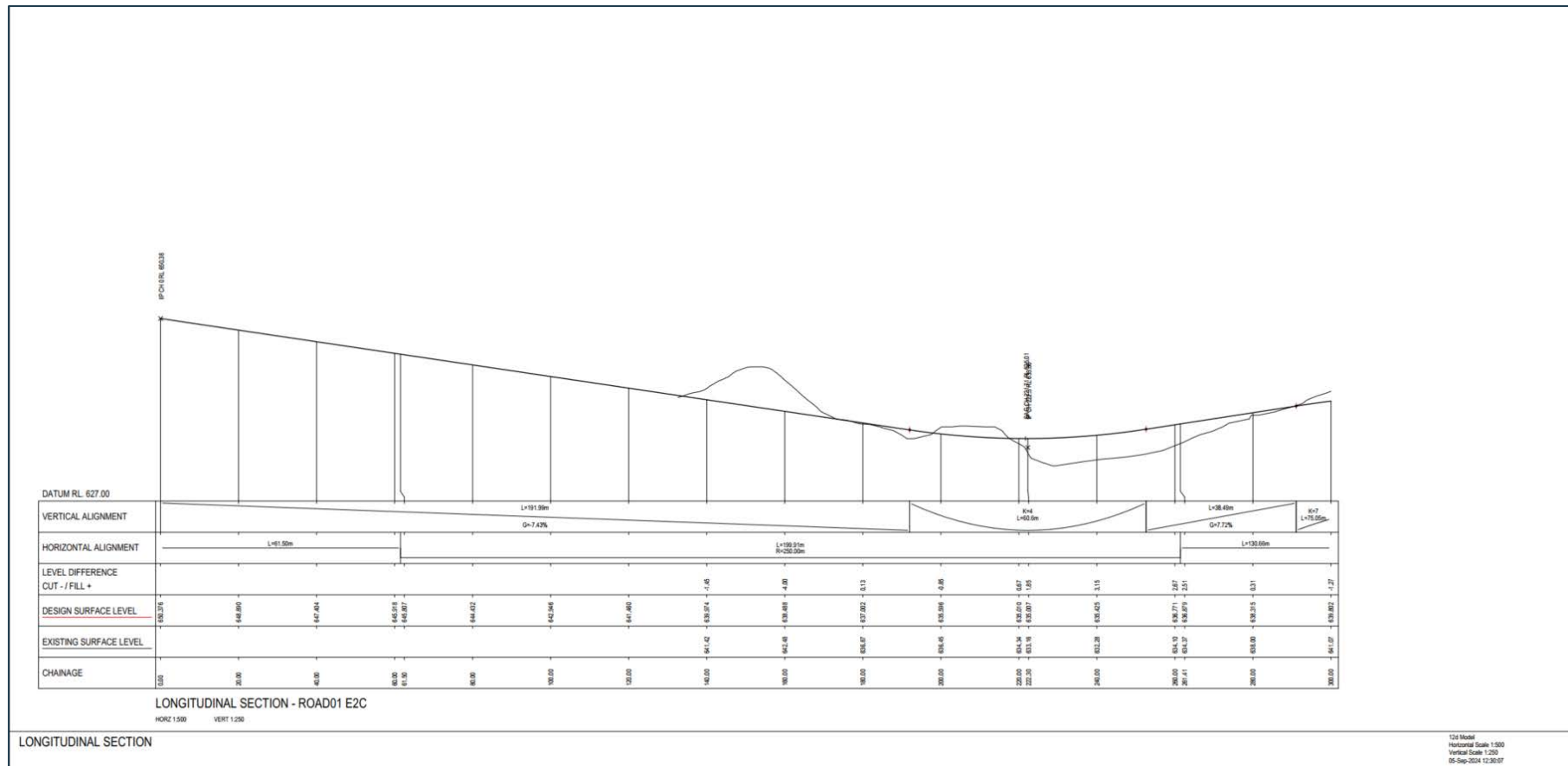
The total area of rehabilitation is therefore ~9Ha along the length of the UWHR.

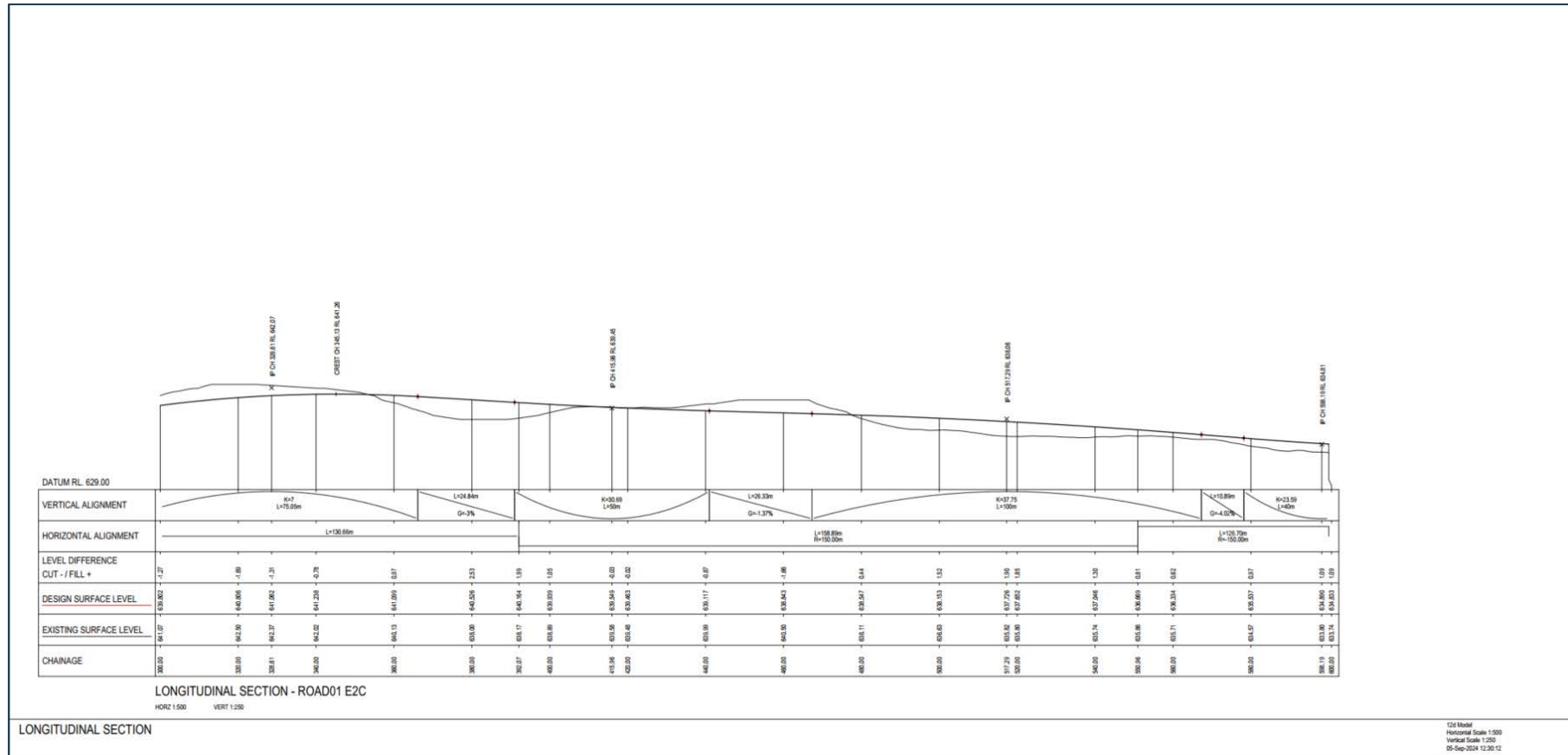
This rehabilitation area excludes cut and fill faces that will have been progressively rehabilitated during construction and operation of the road. It also excludes SRP's, culverts and drainage that will remain in place to service the road alignment remaining post closure.

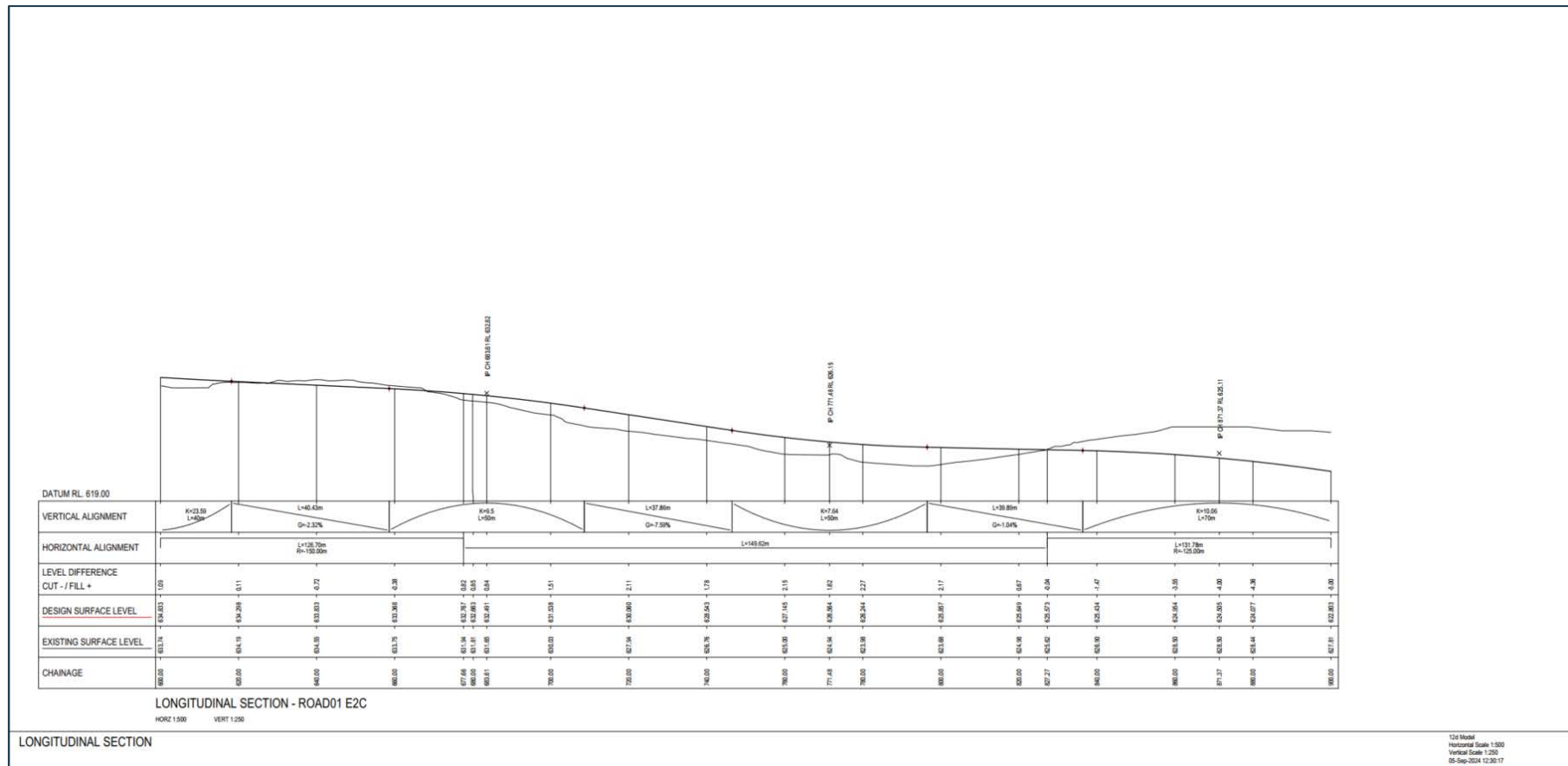
APPENDIX A Double configuration & swept path

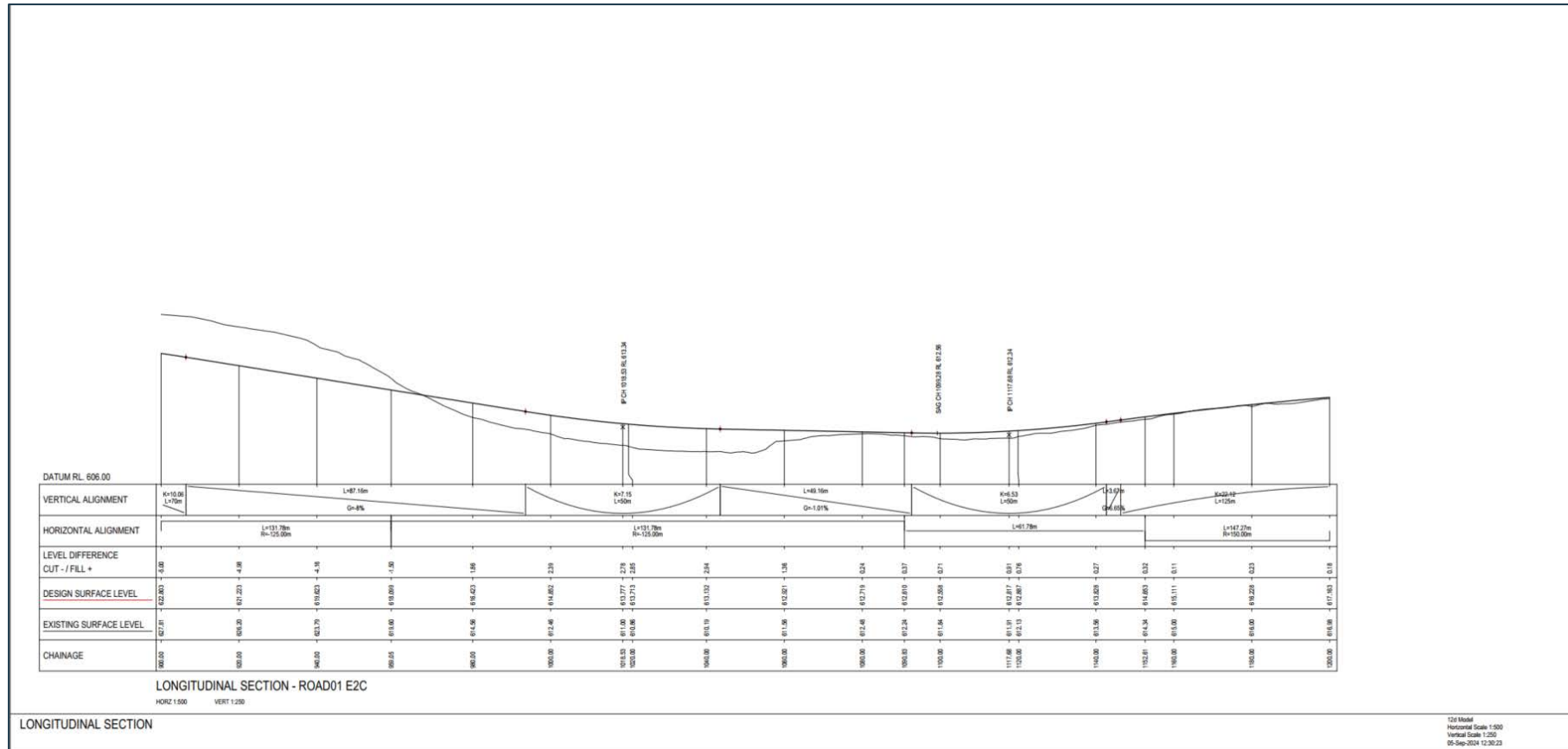


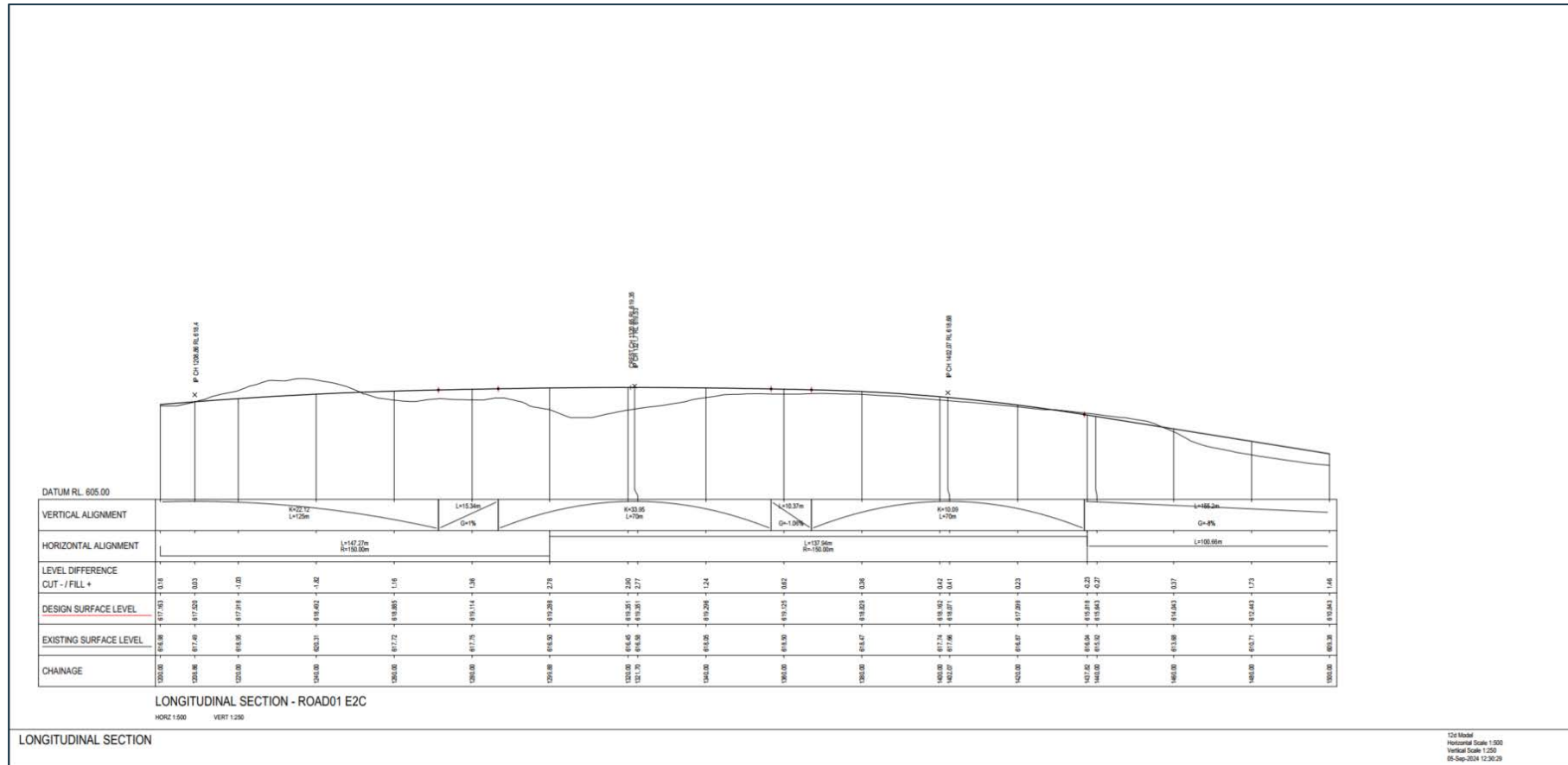
APPENDIX B Road alignment long sections

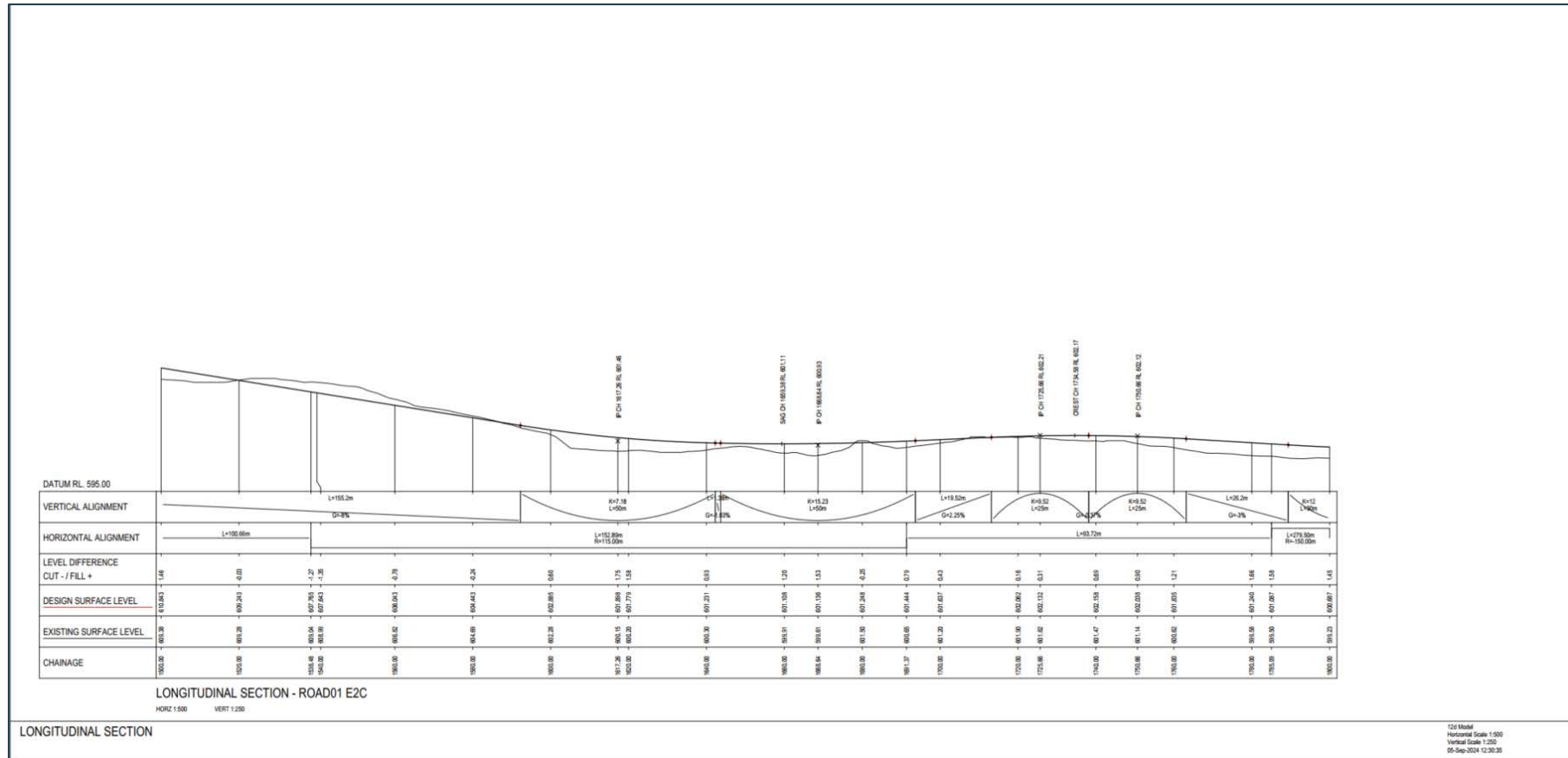


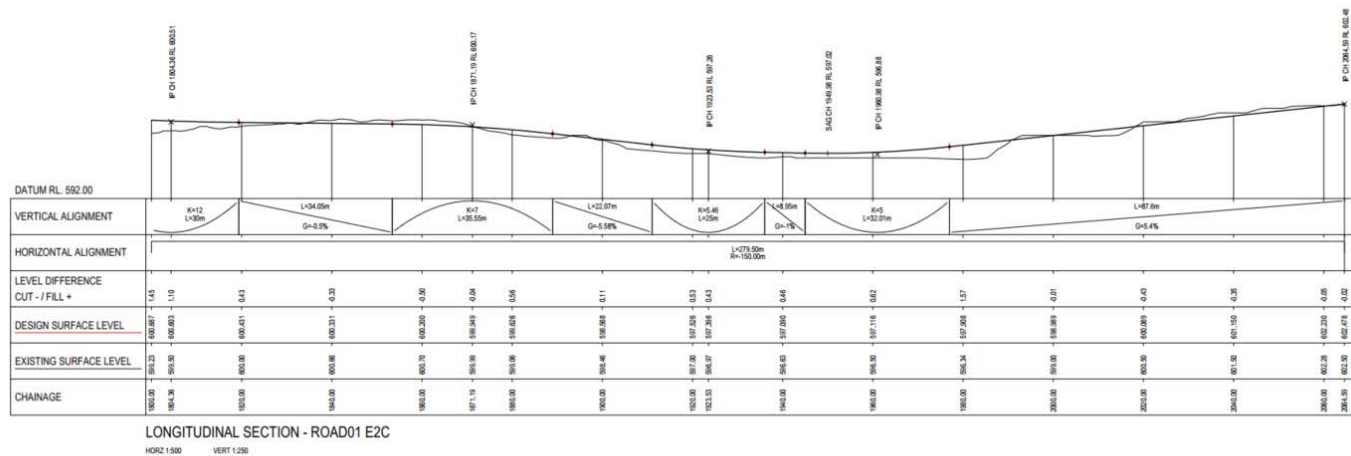




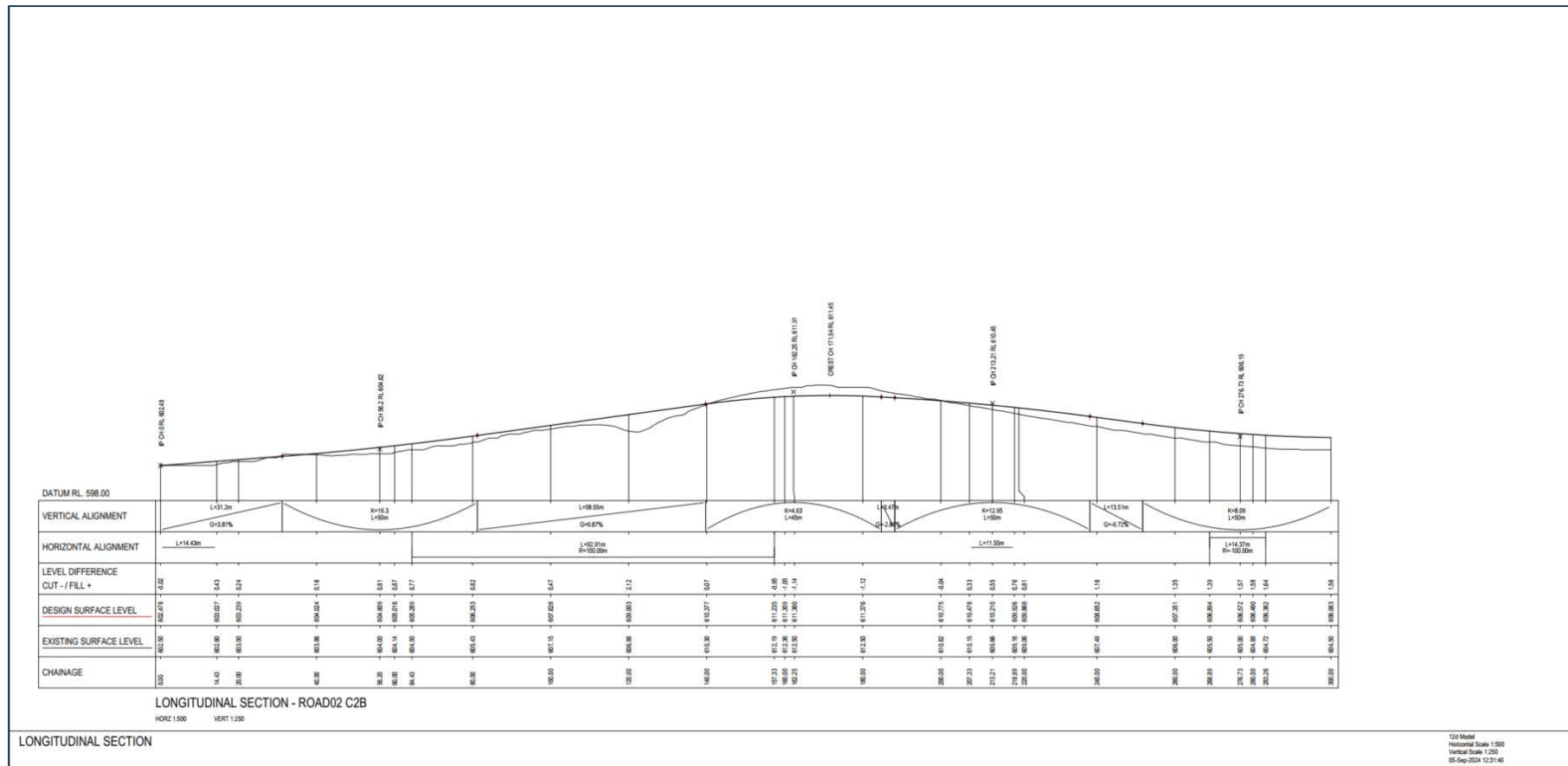


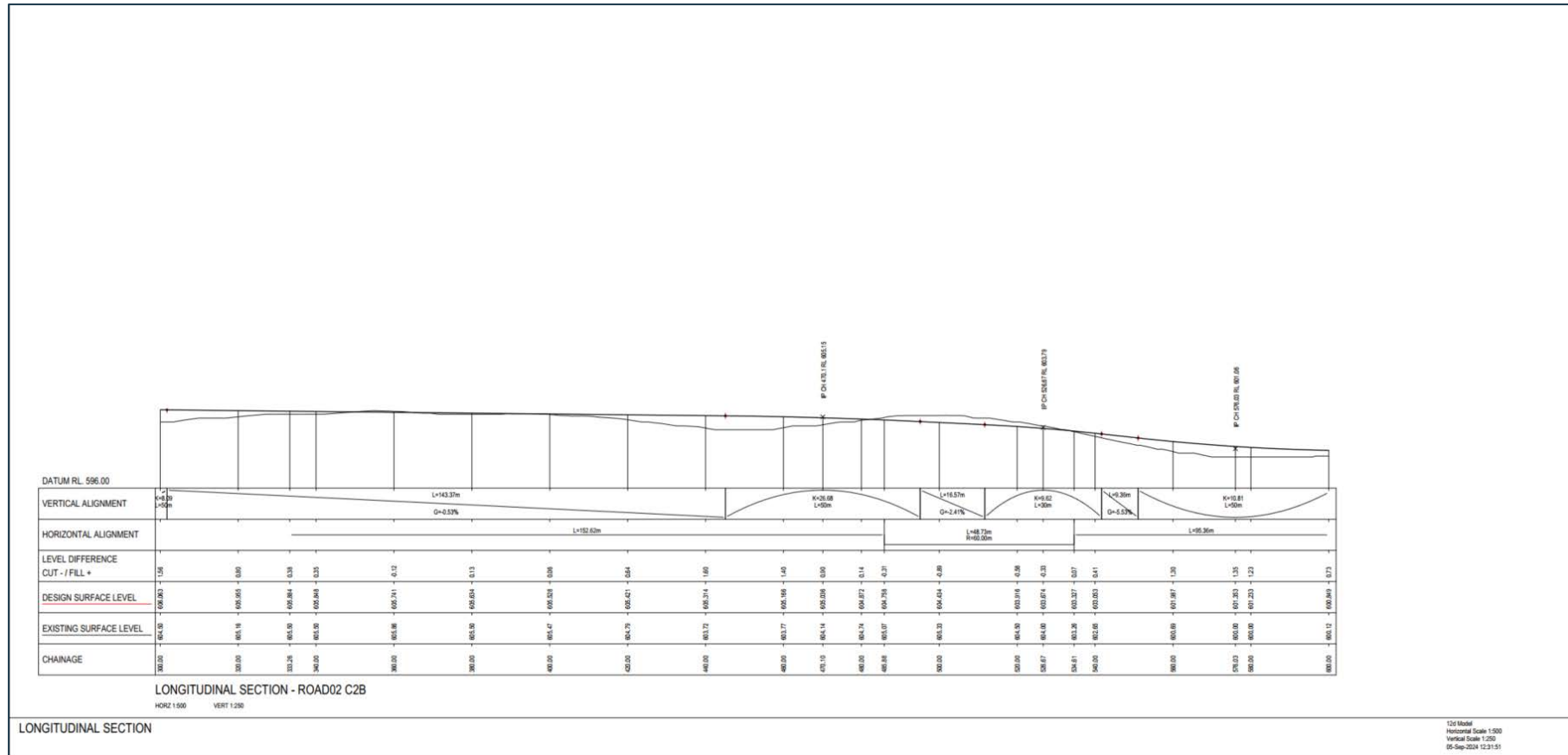


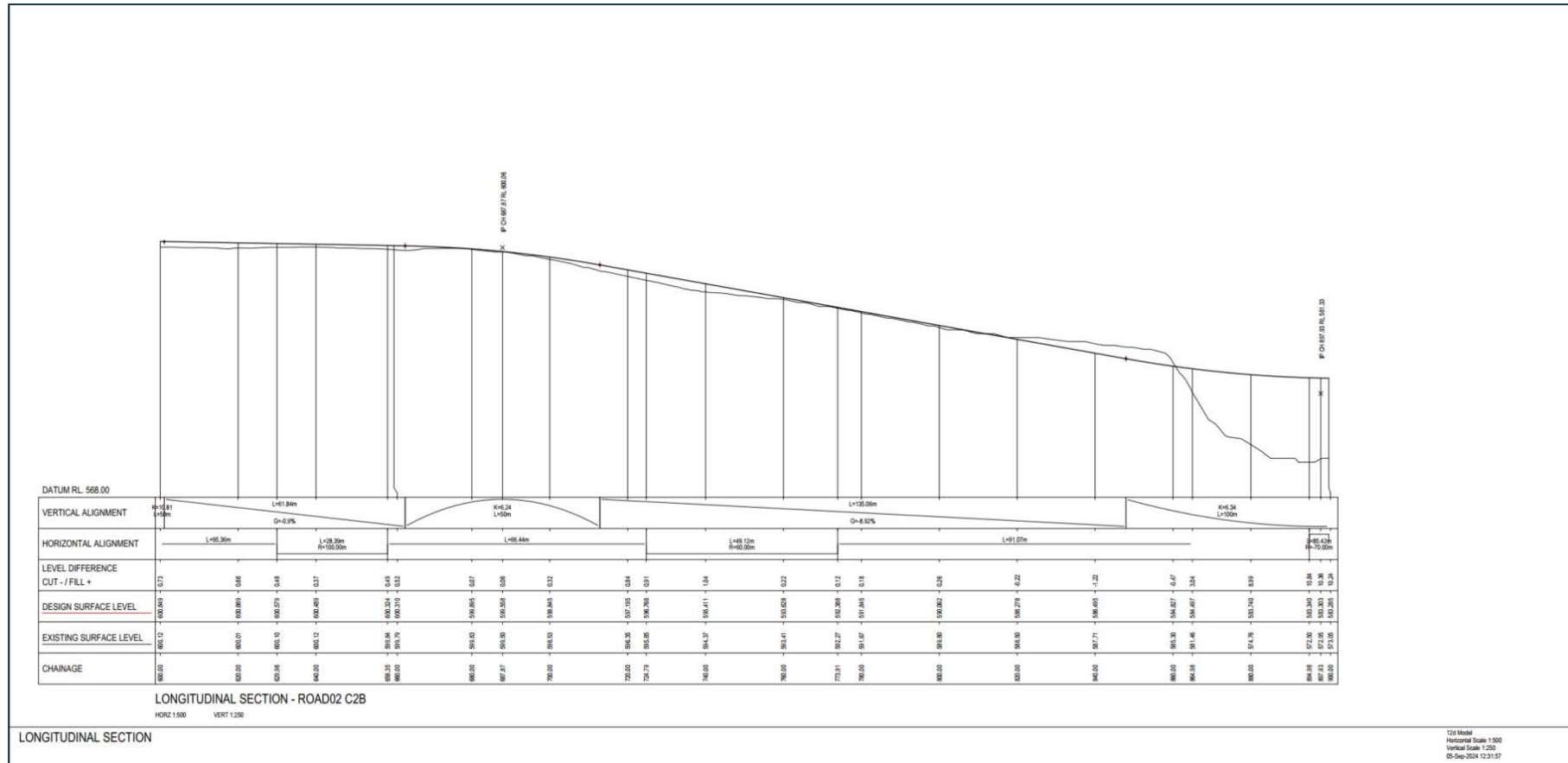


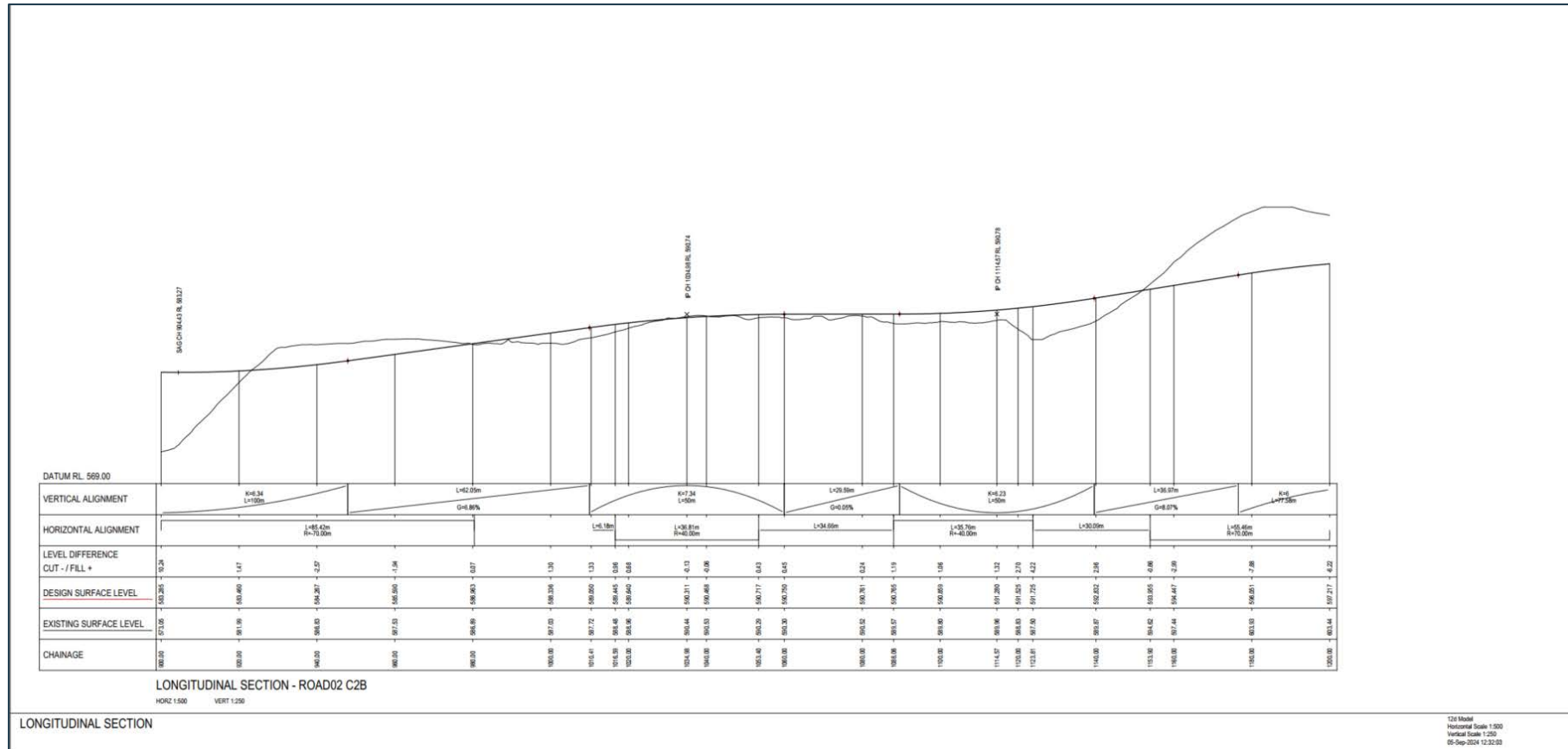


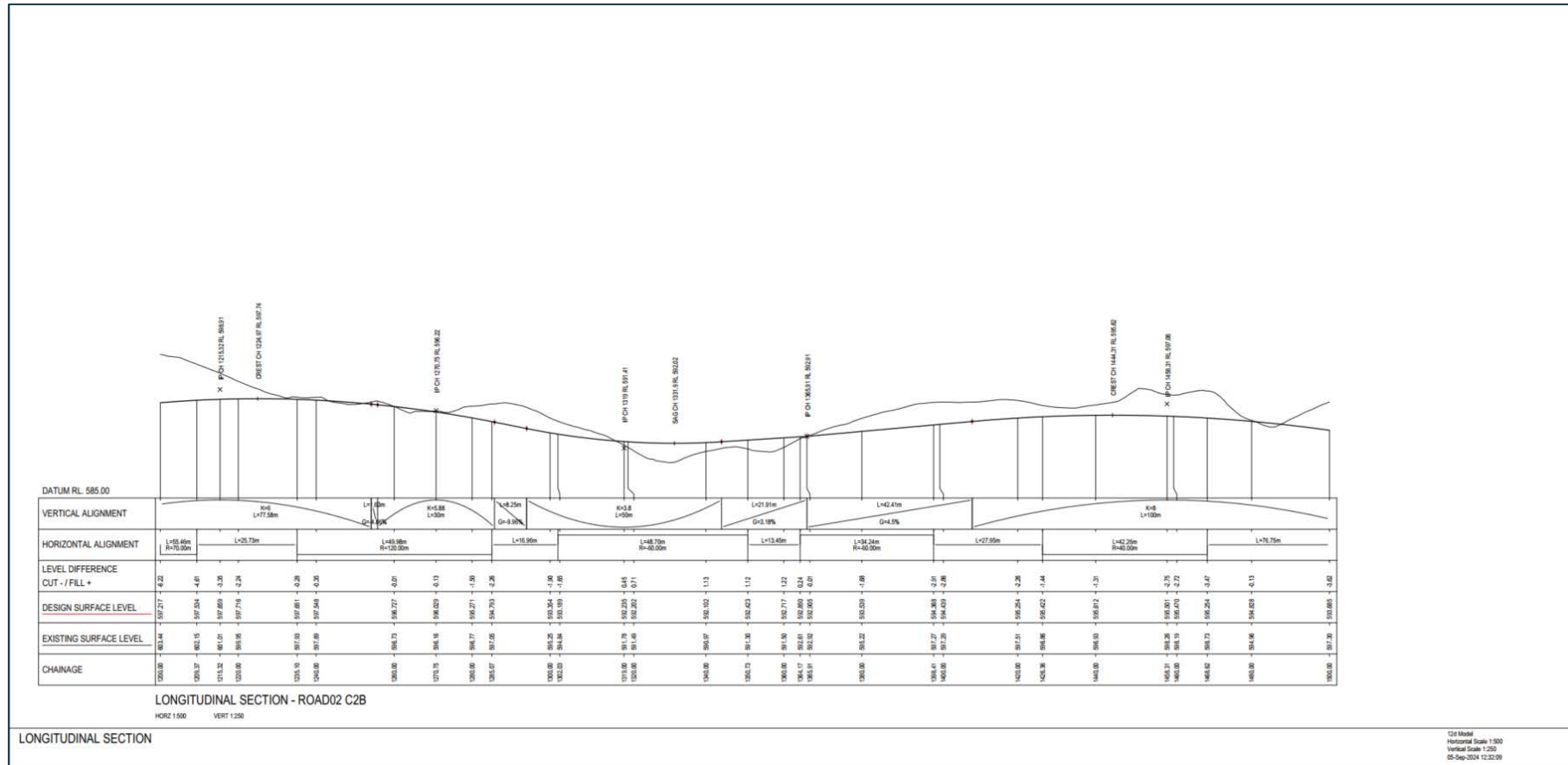
12d Model
Horizontal Scale 1:500
Vertical Scale 1:250
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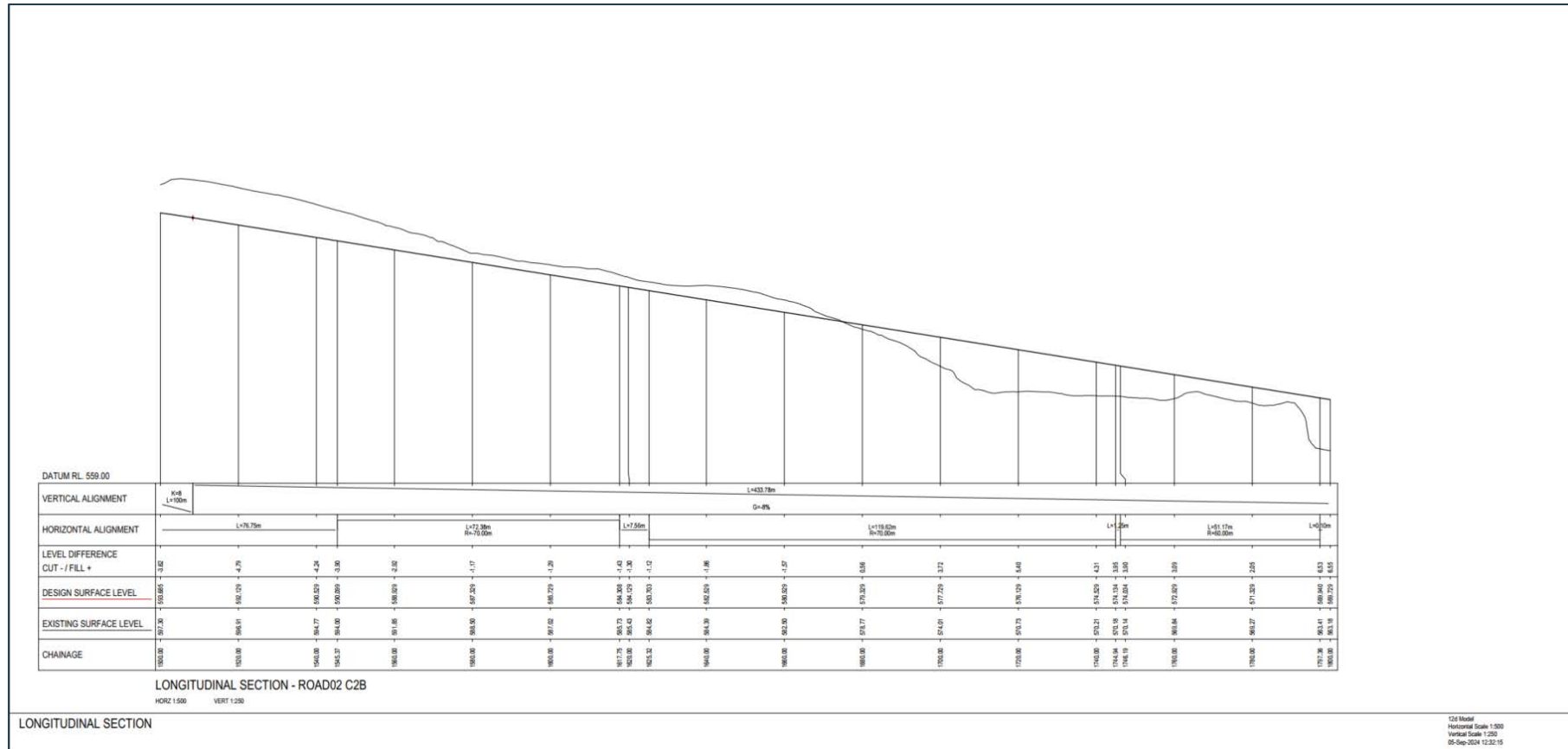


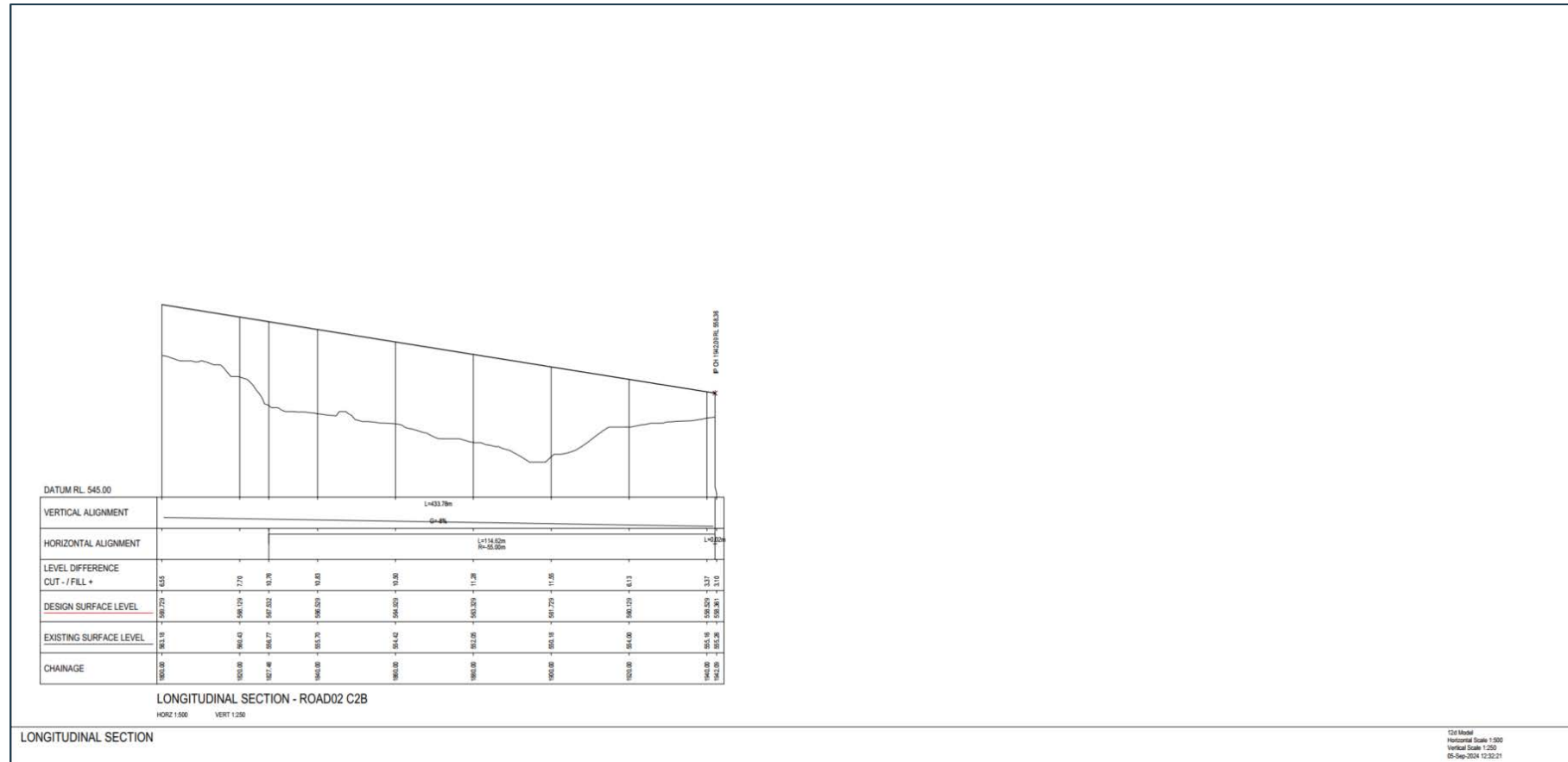


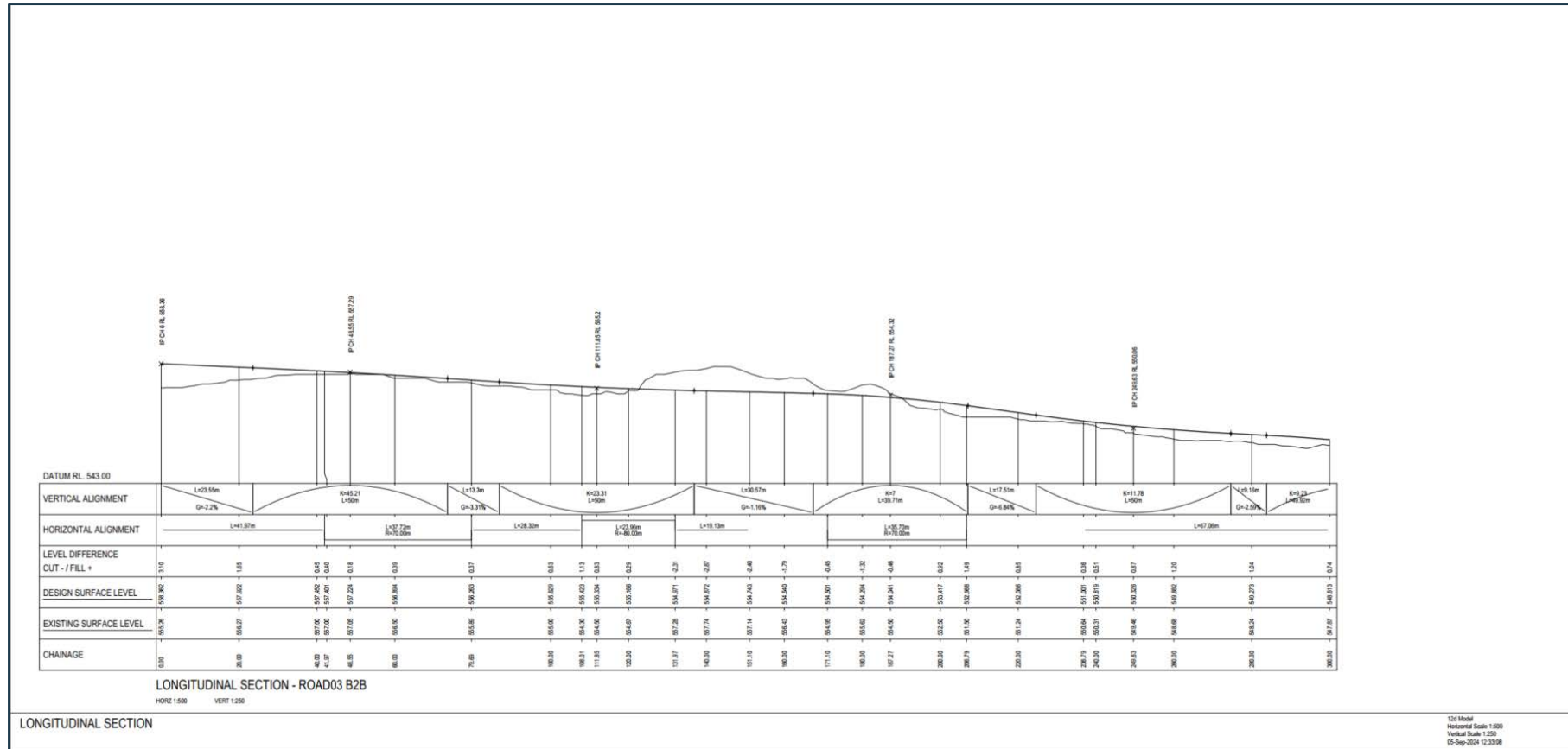


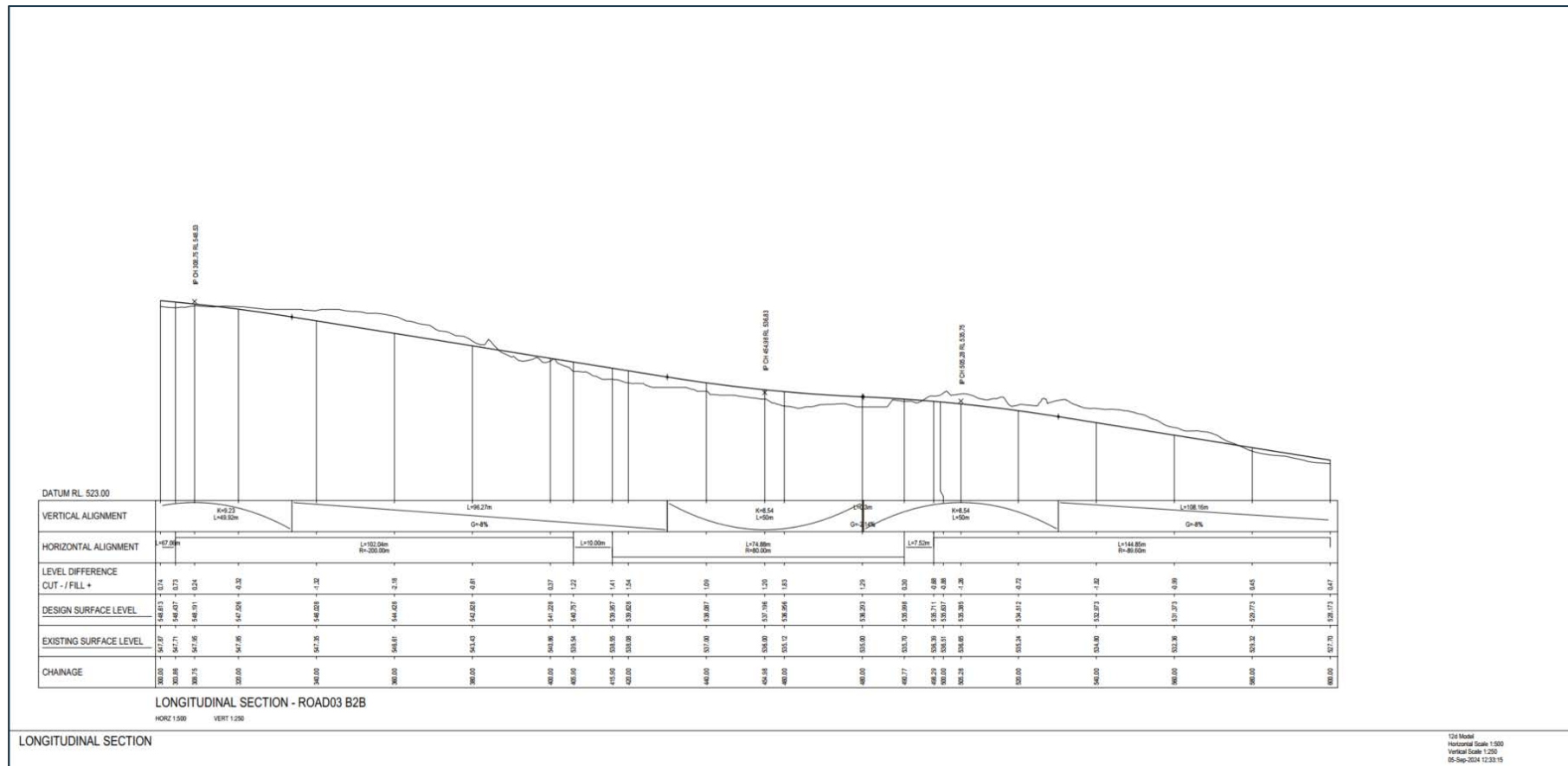


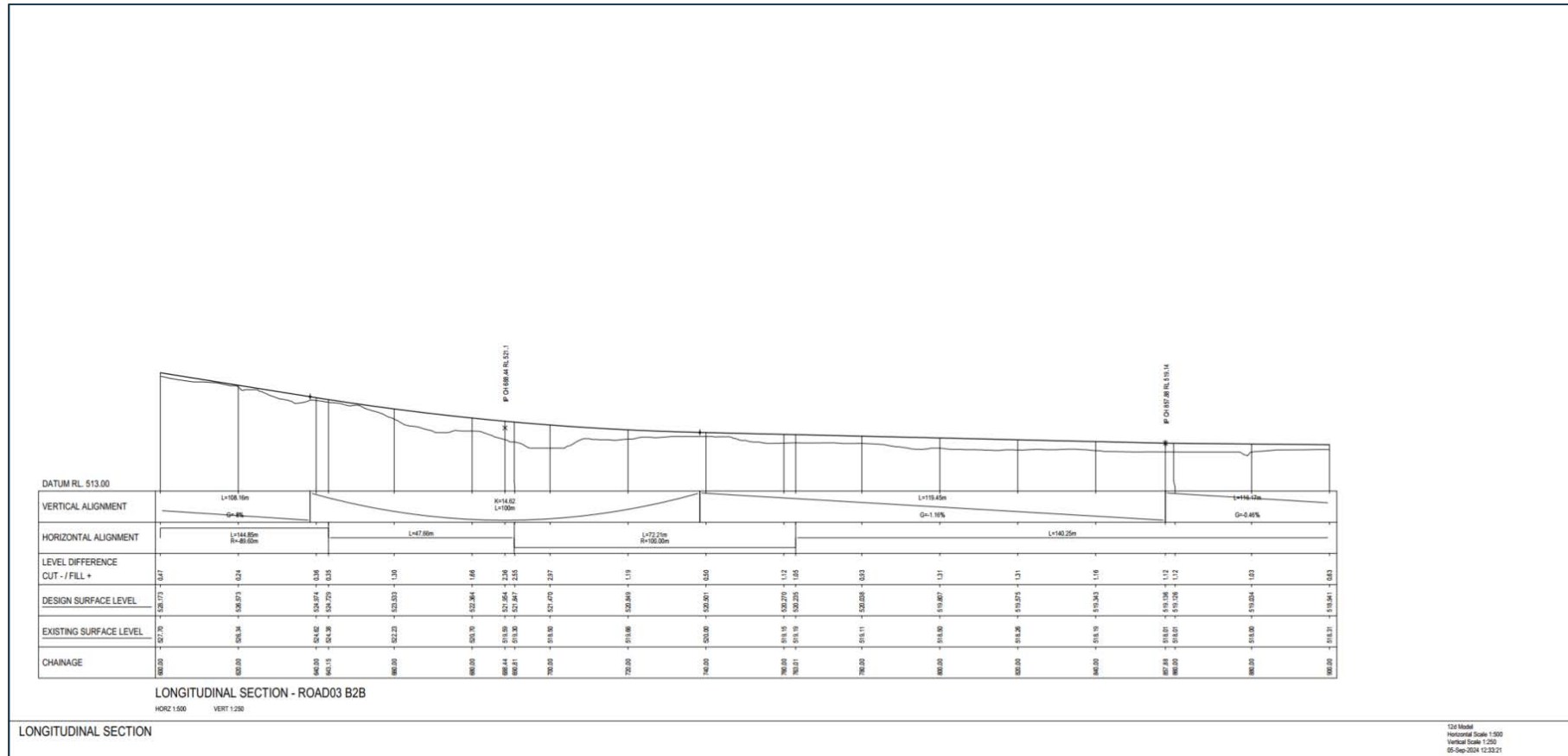


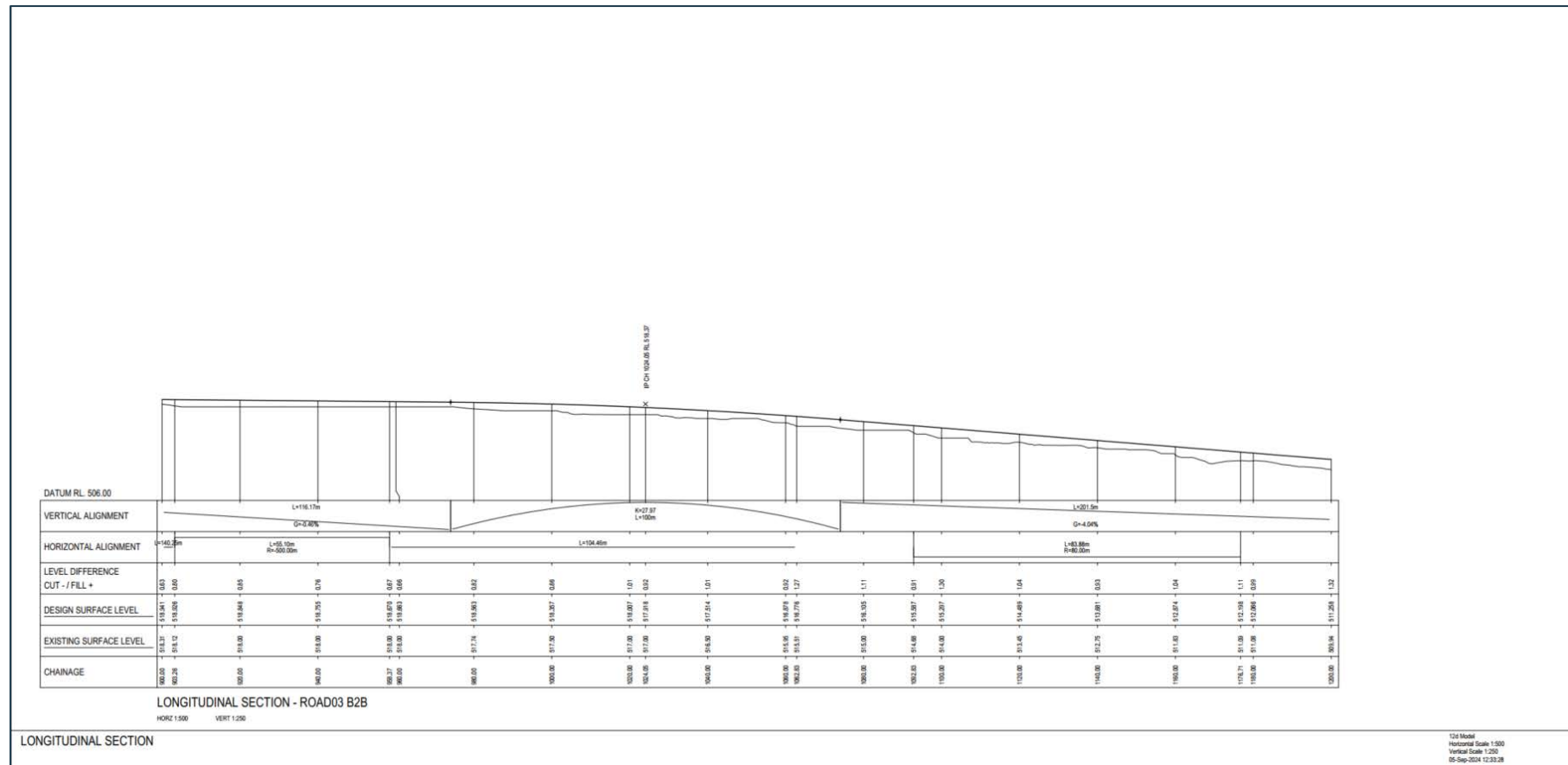


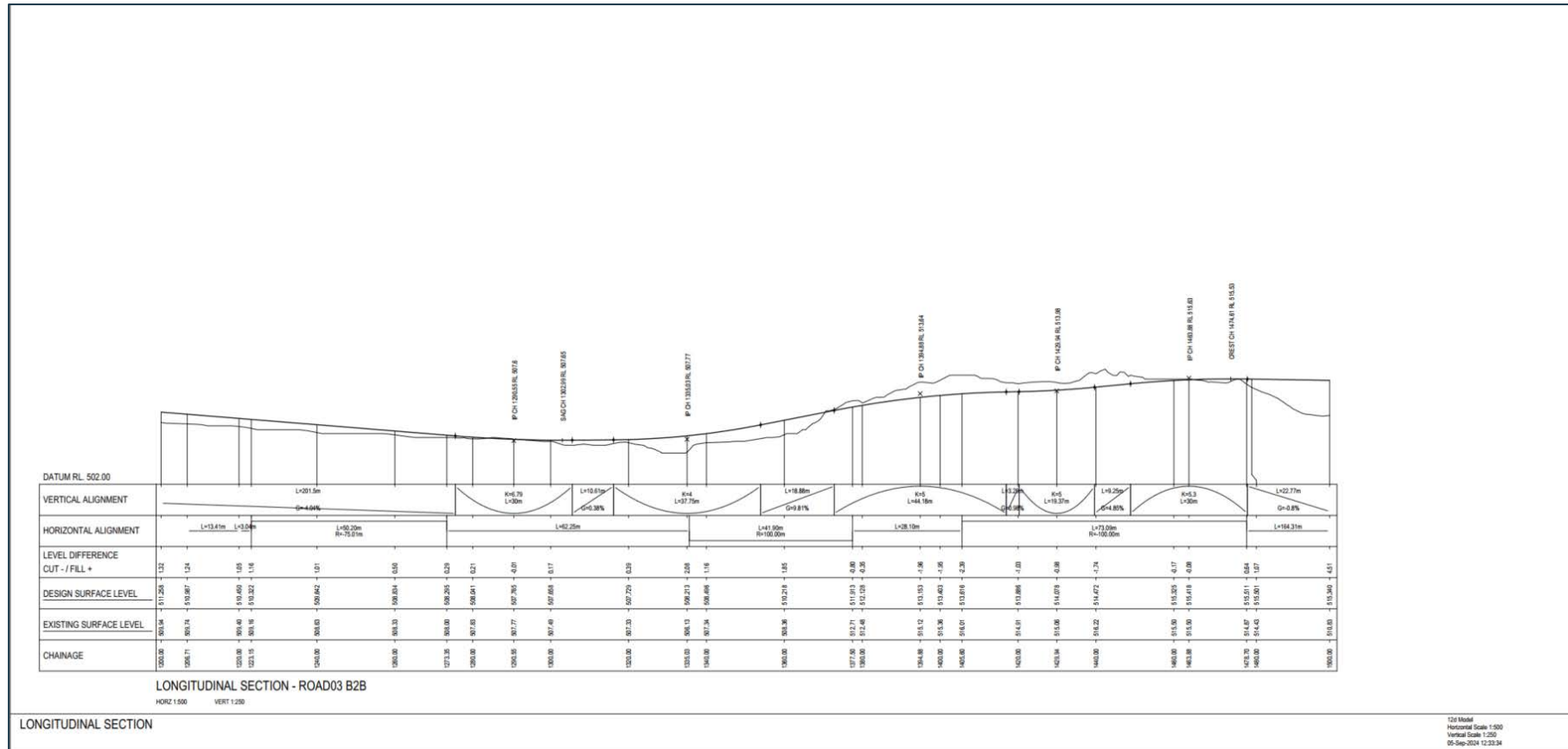


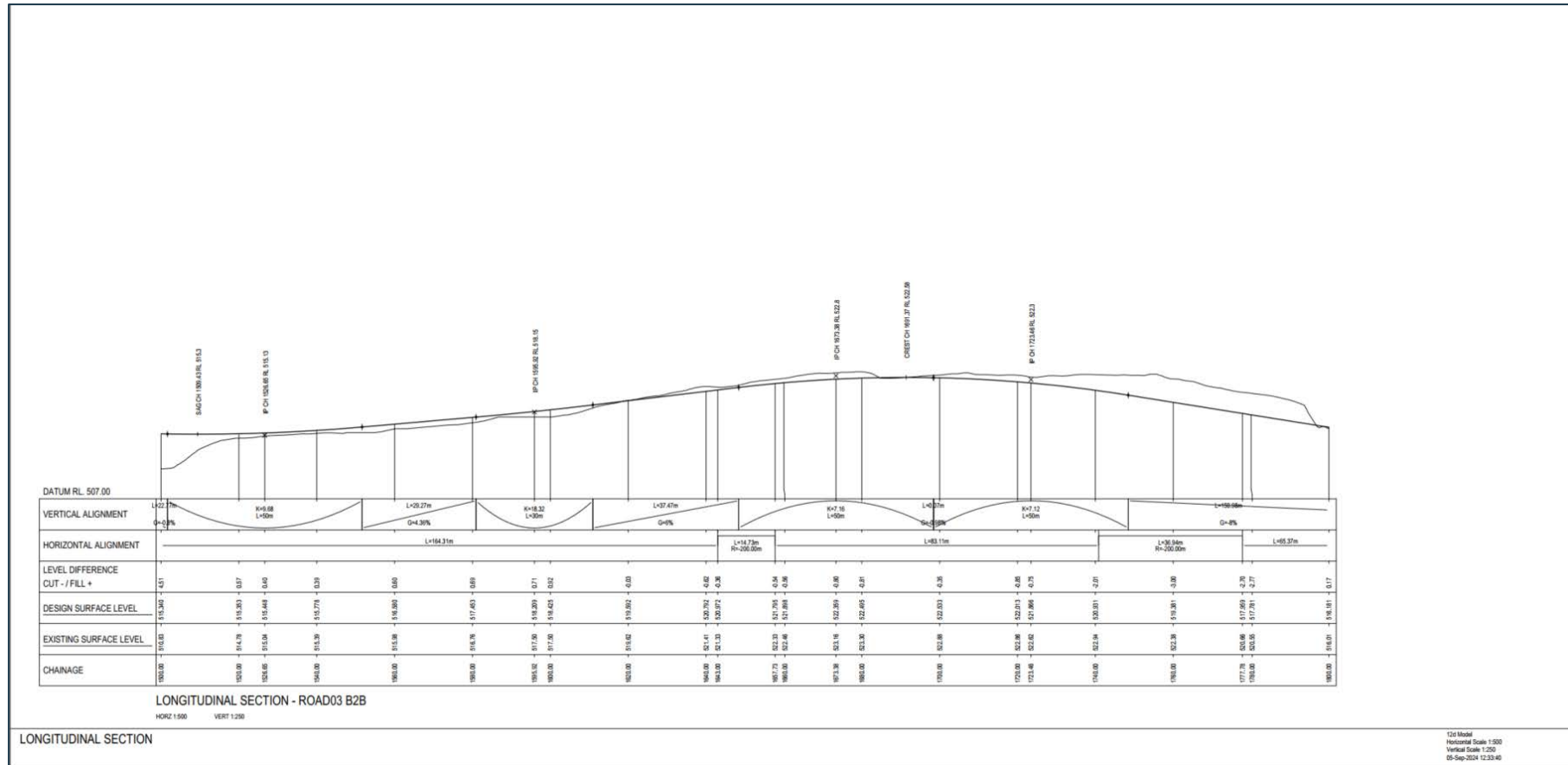


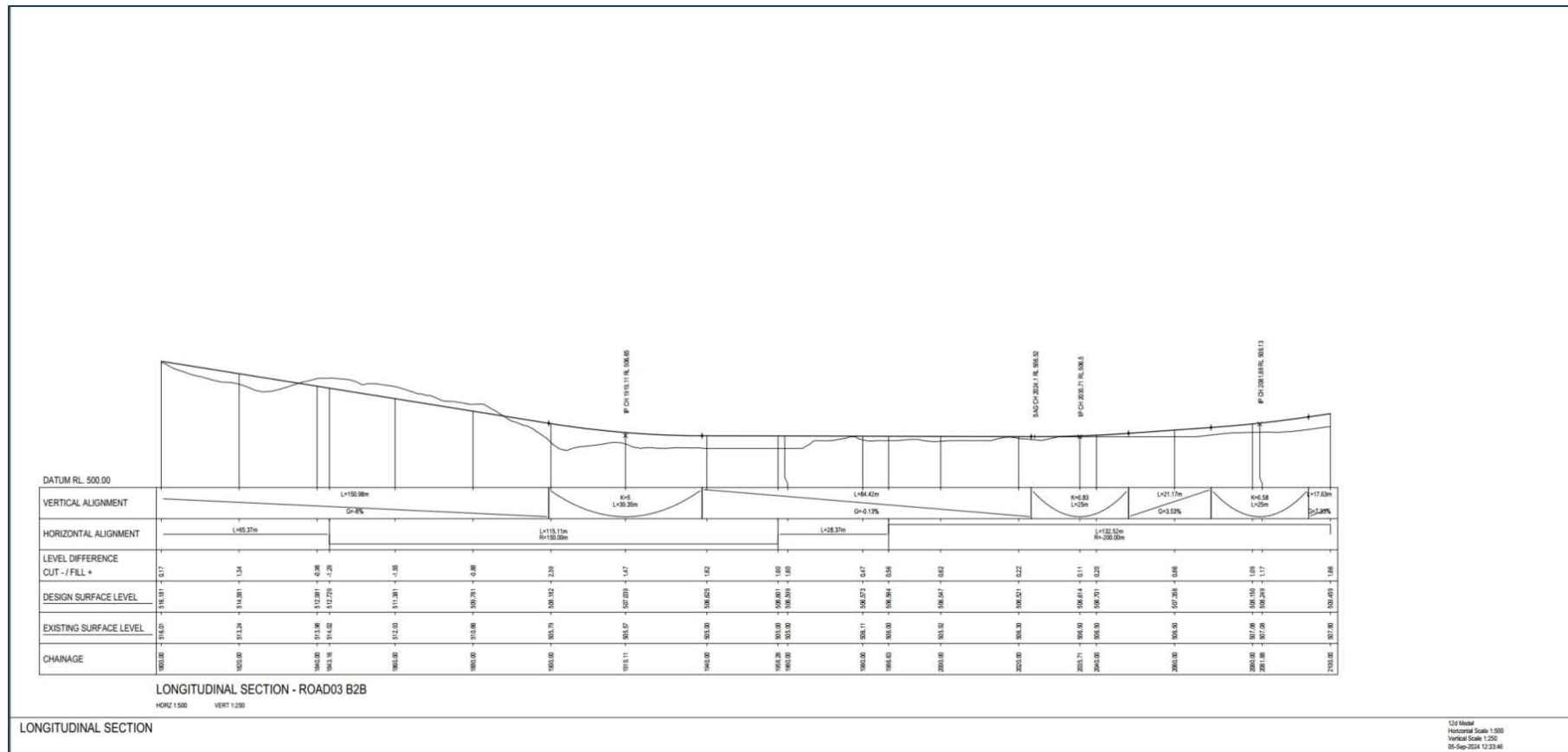


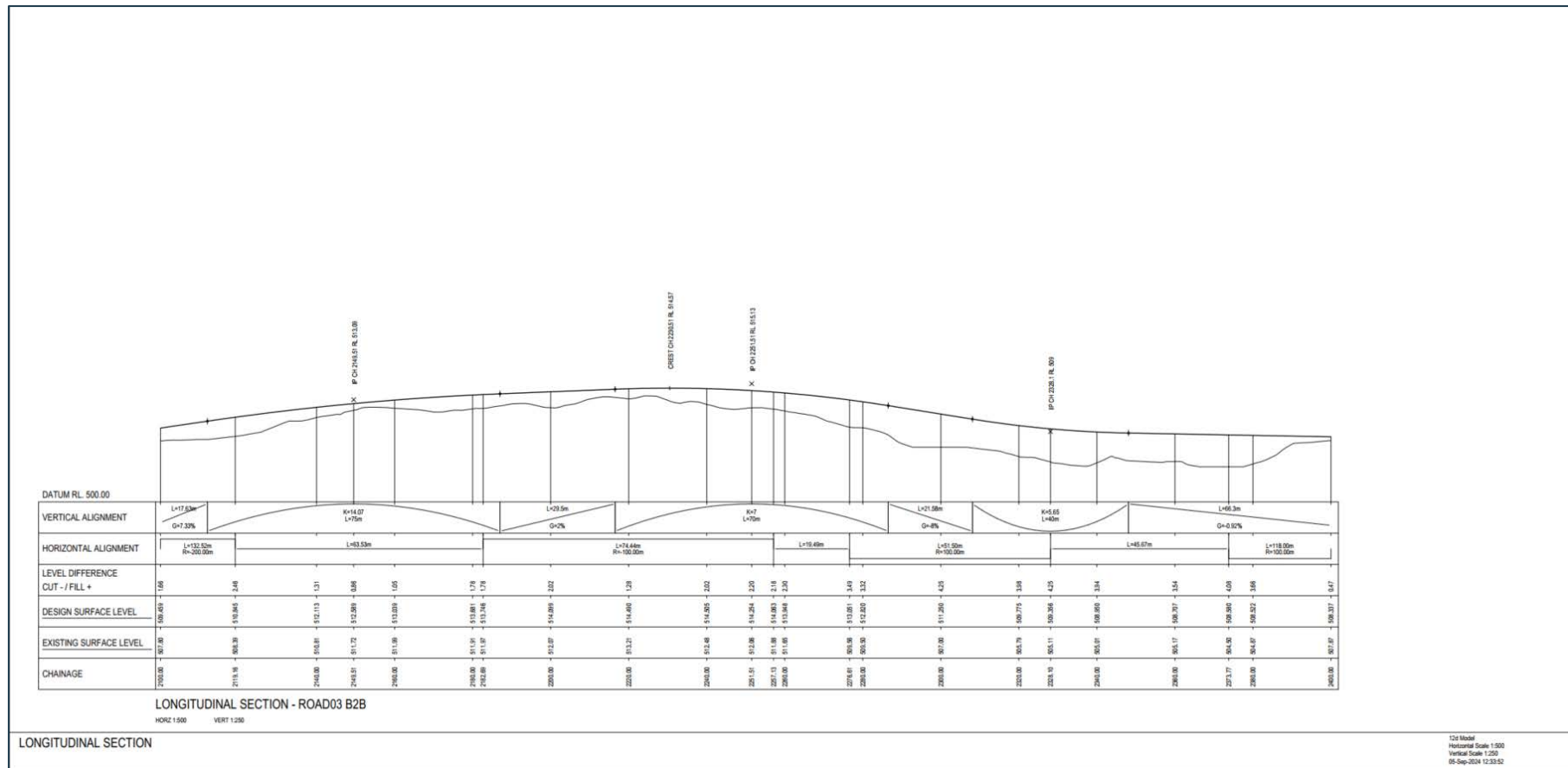


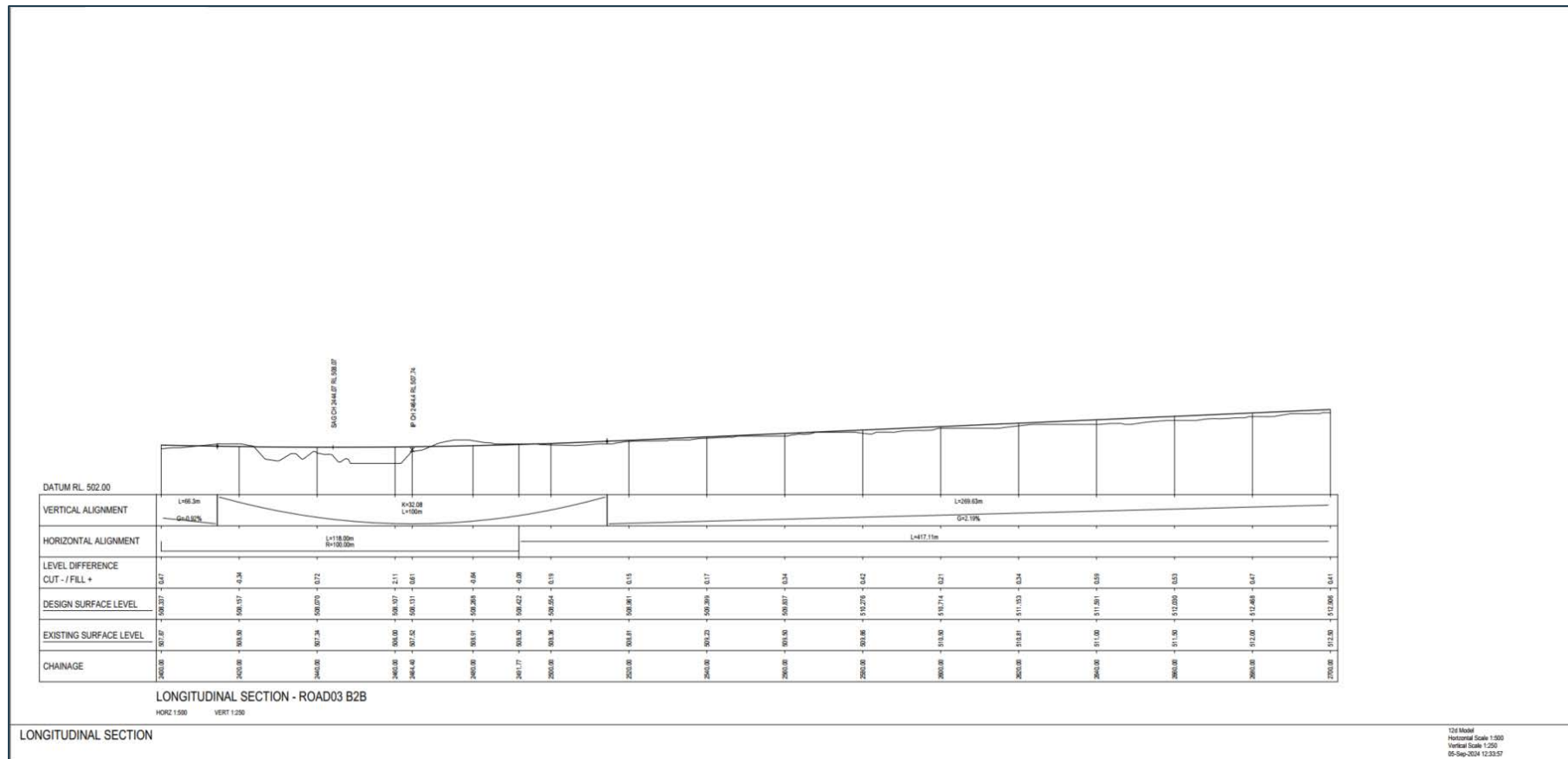


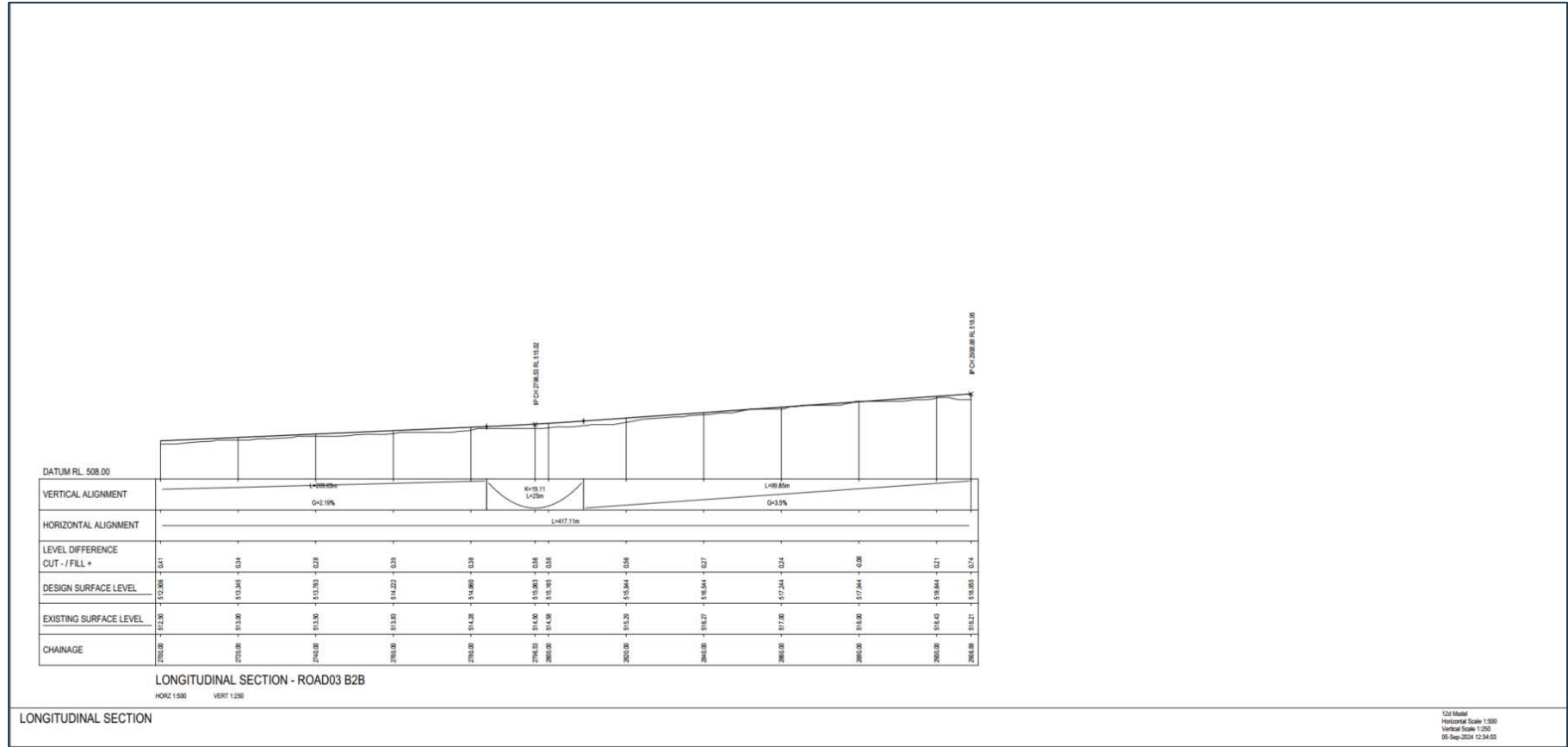


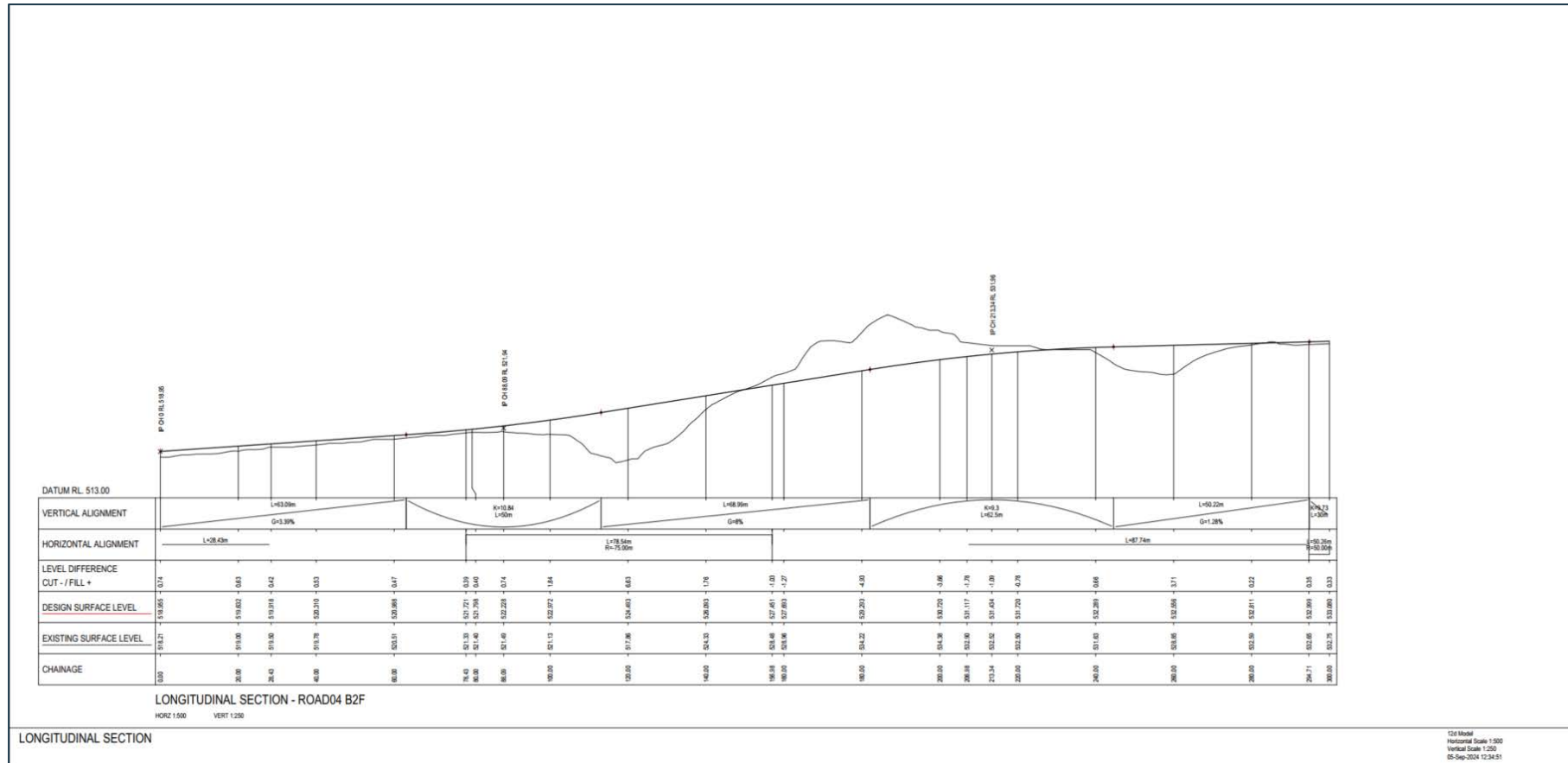


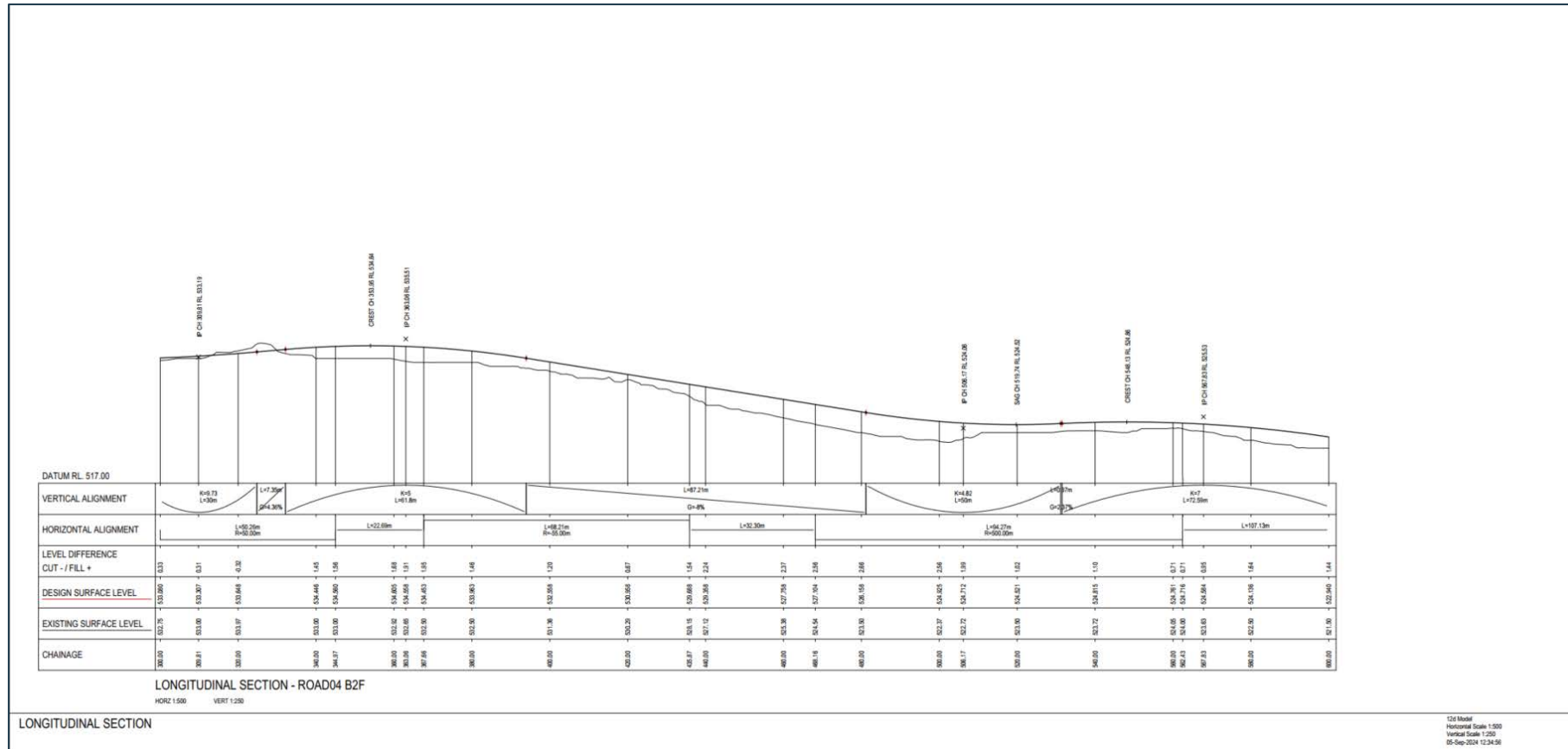


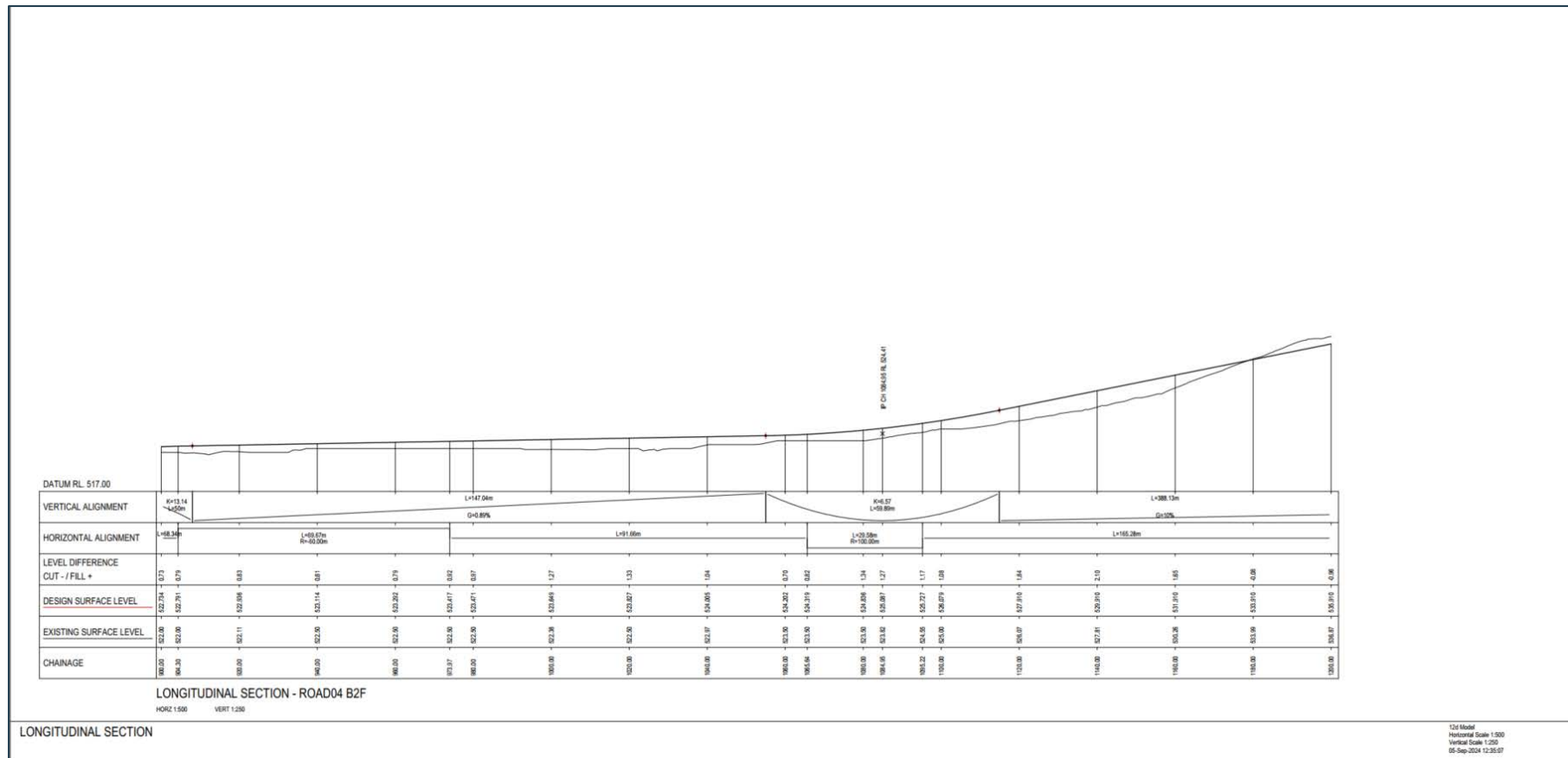


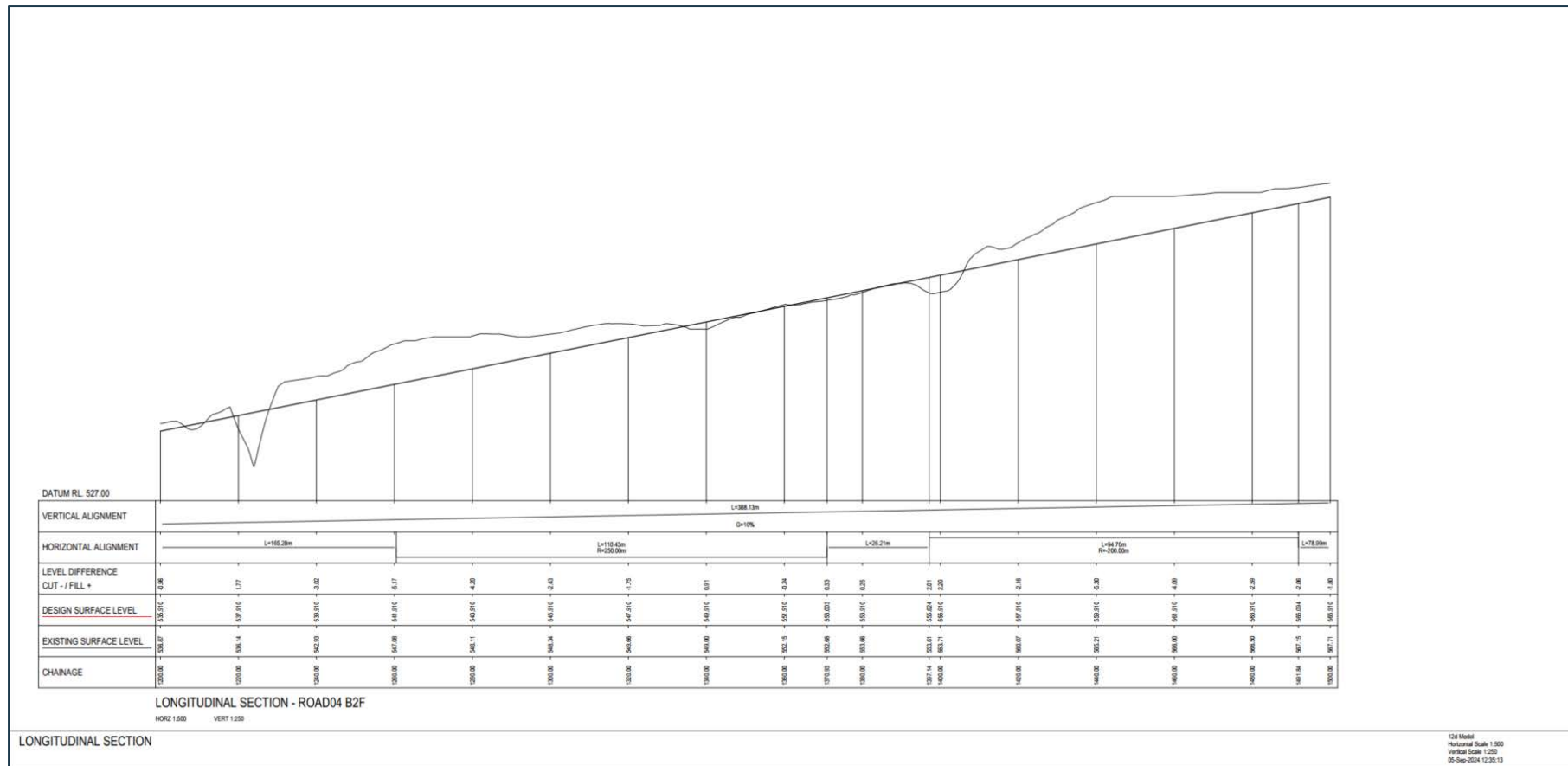


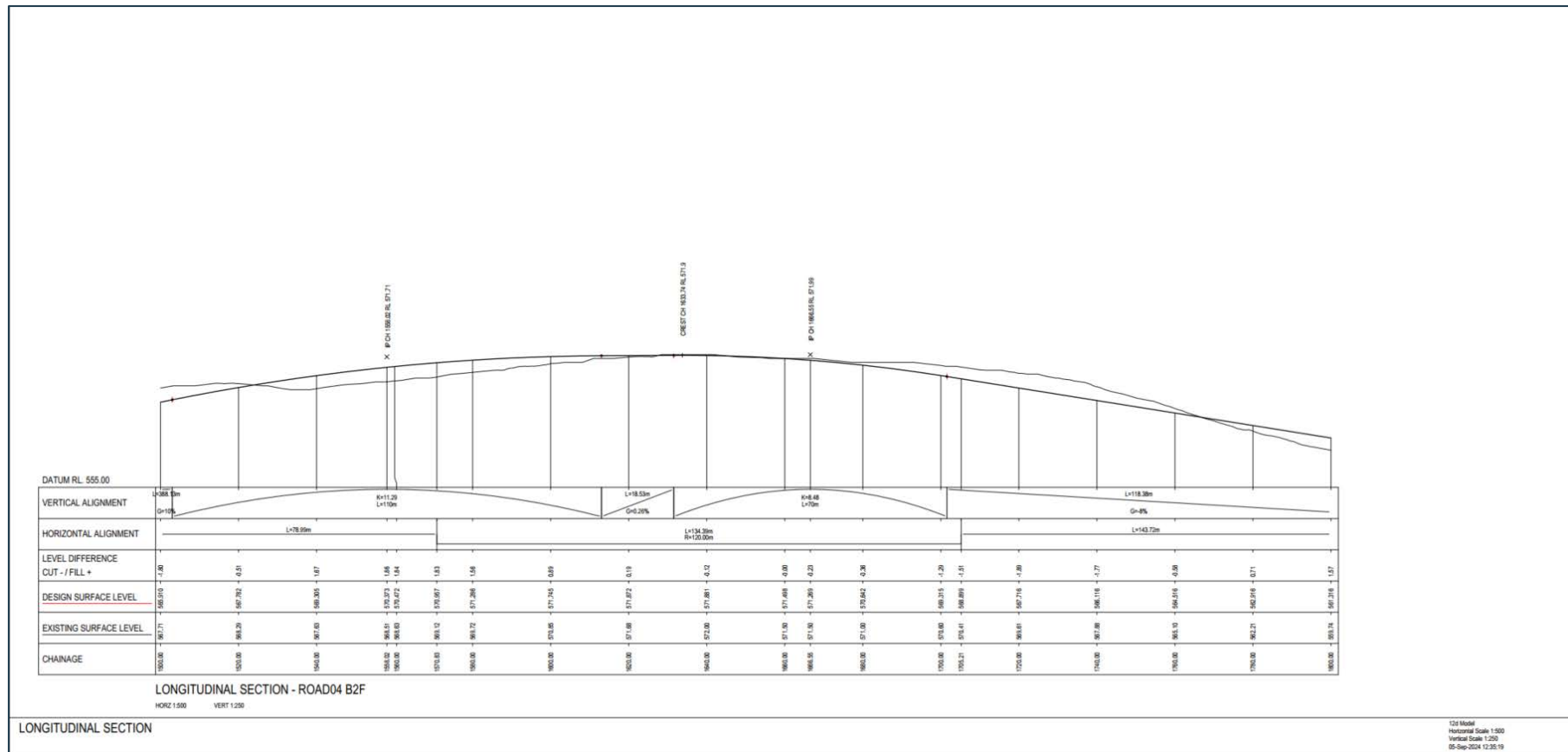


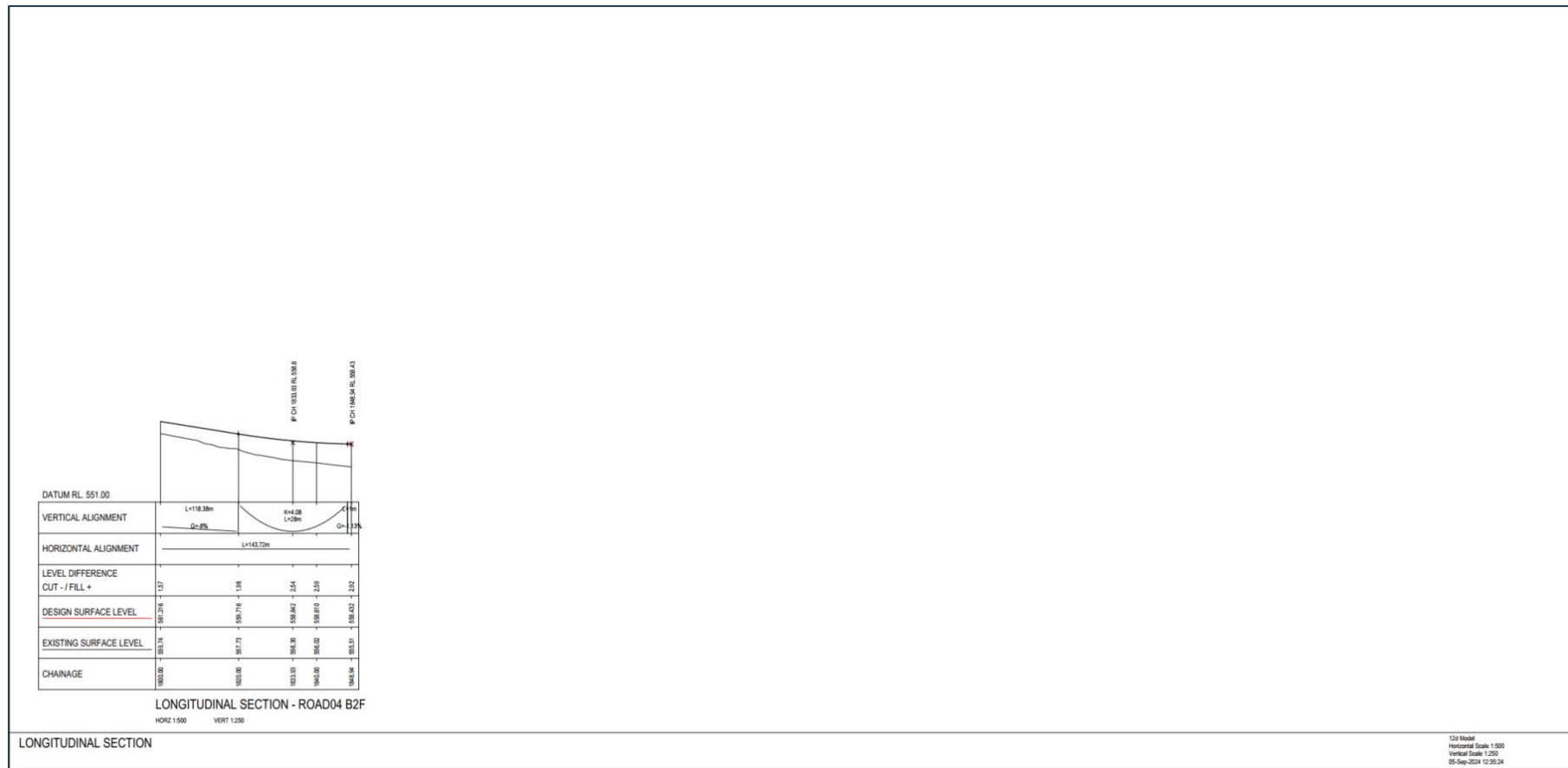


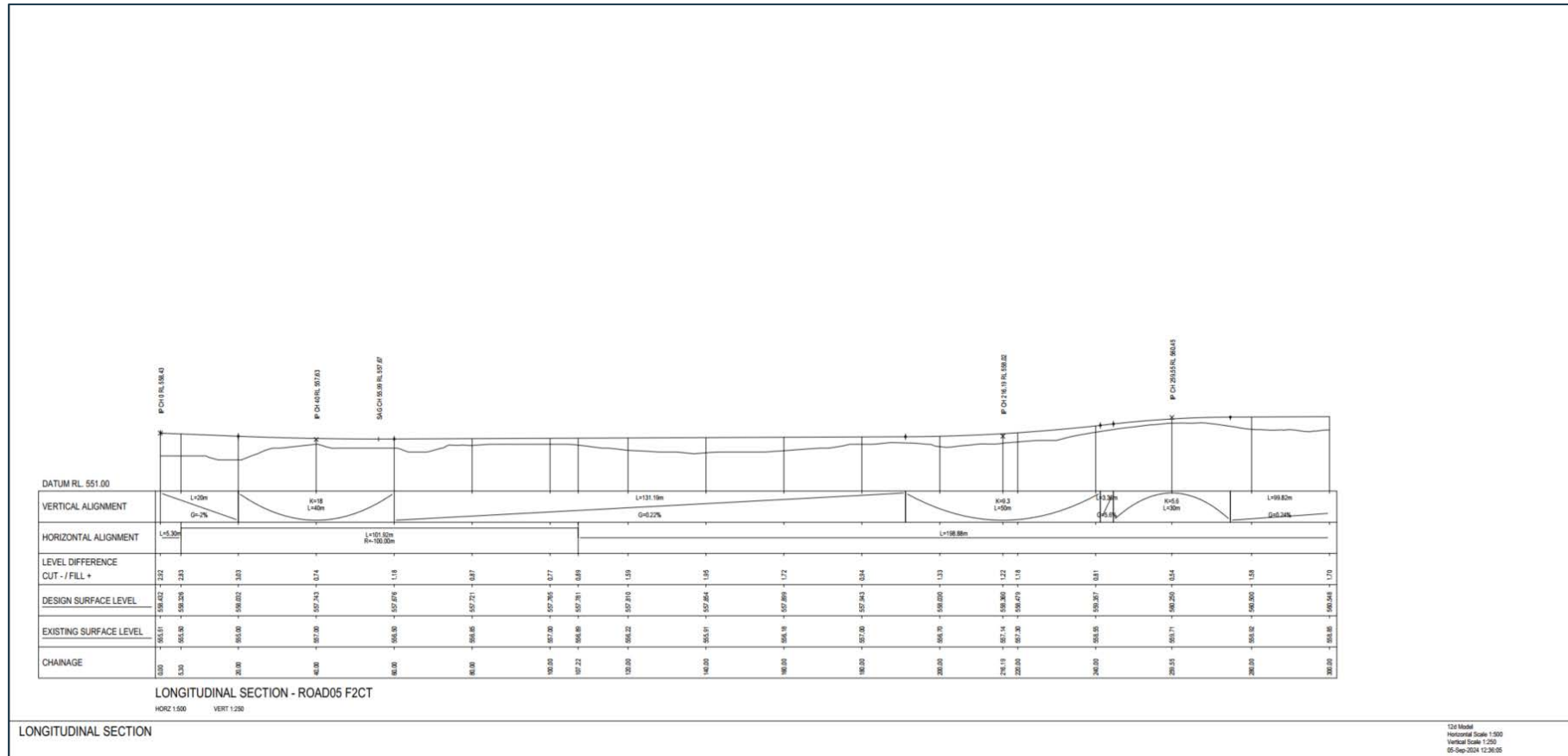


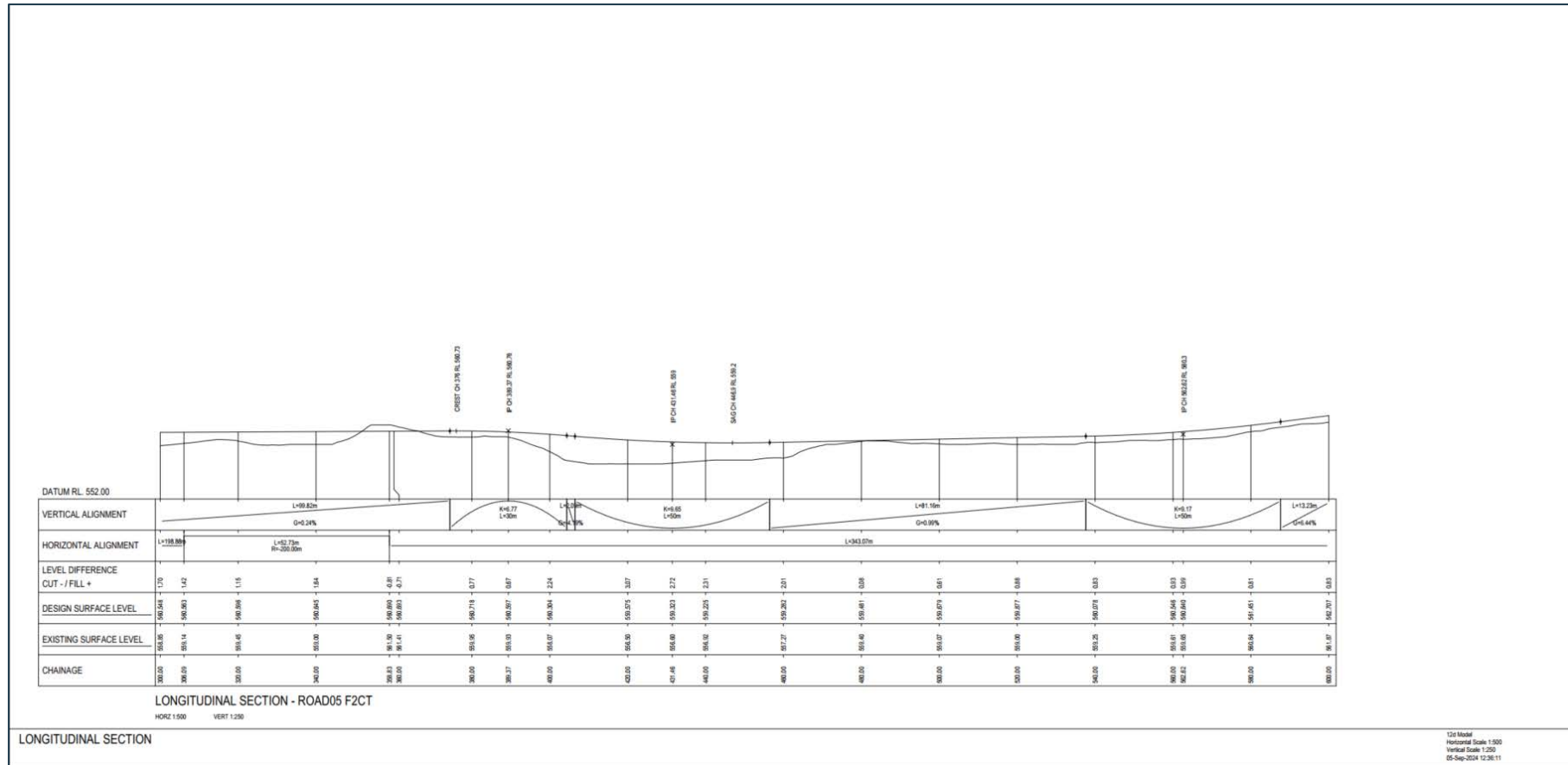


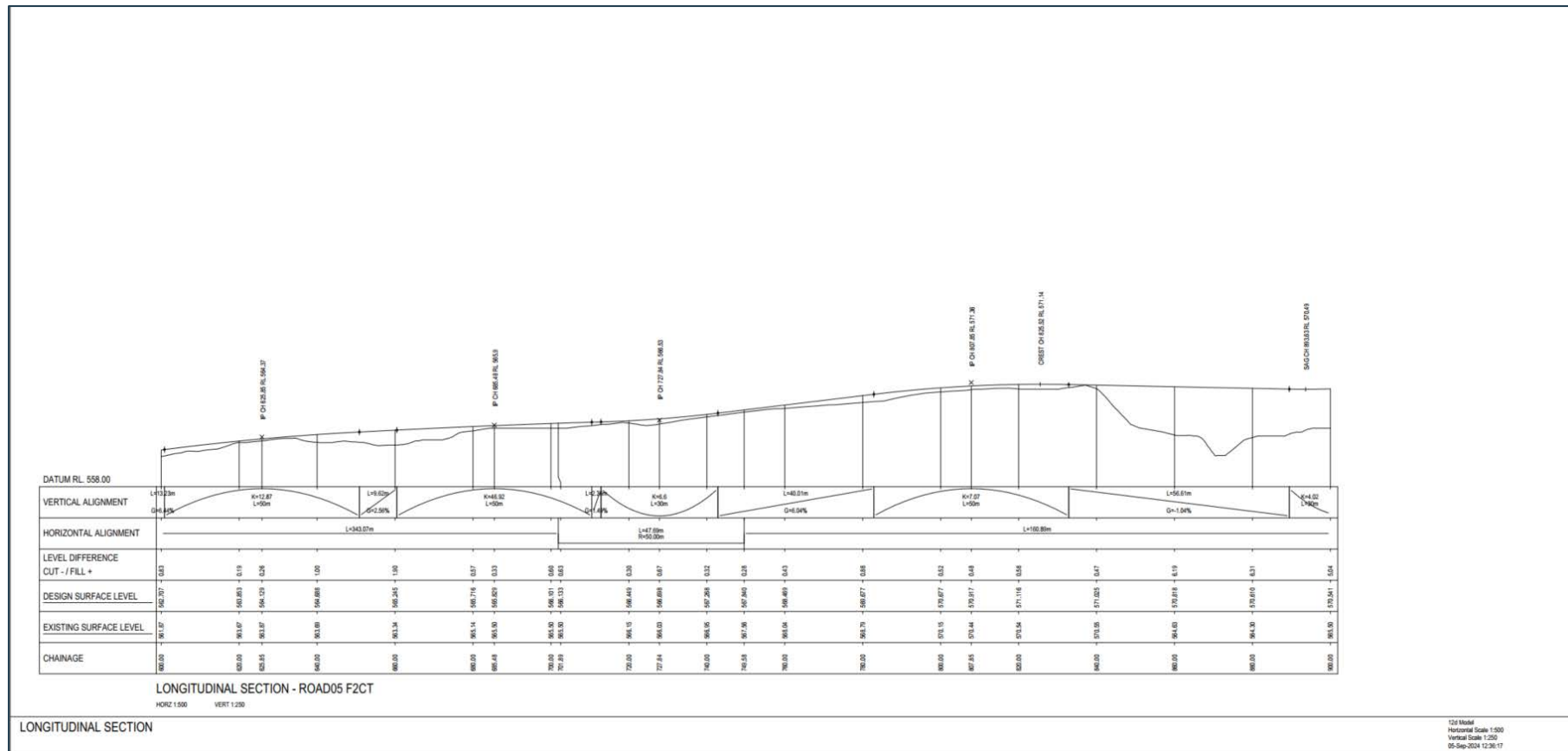


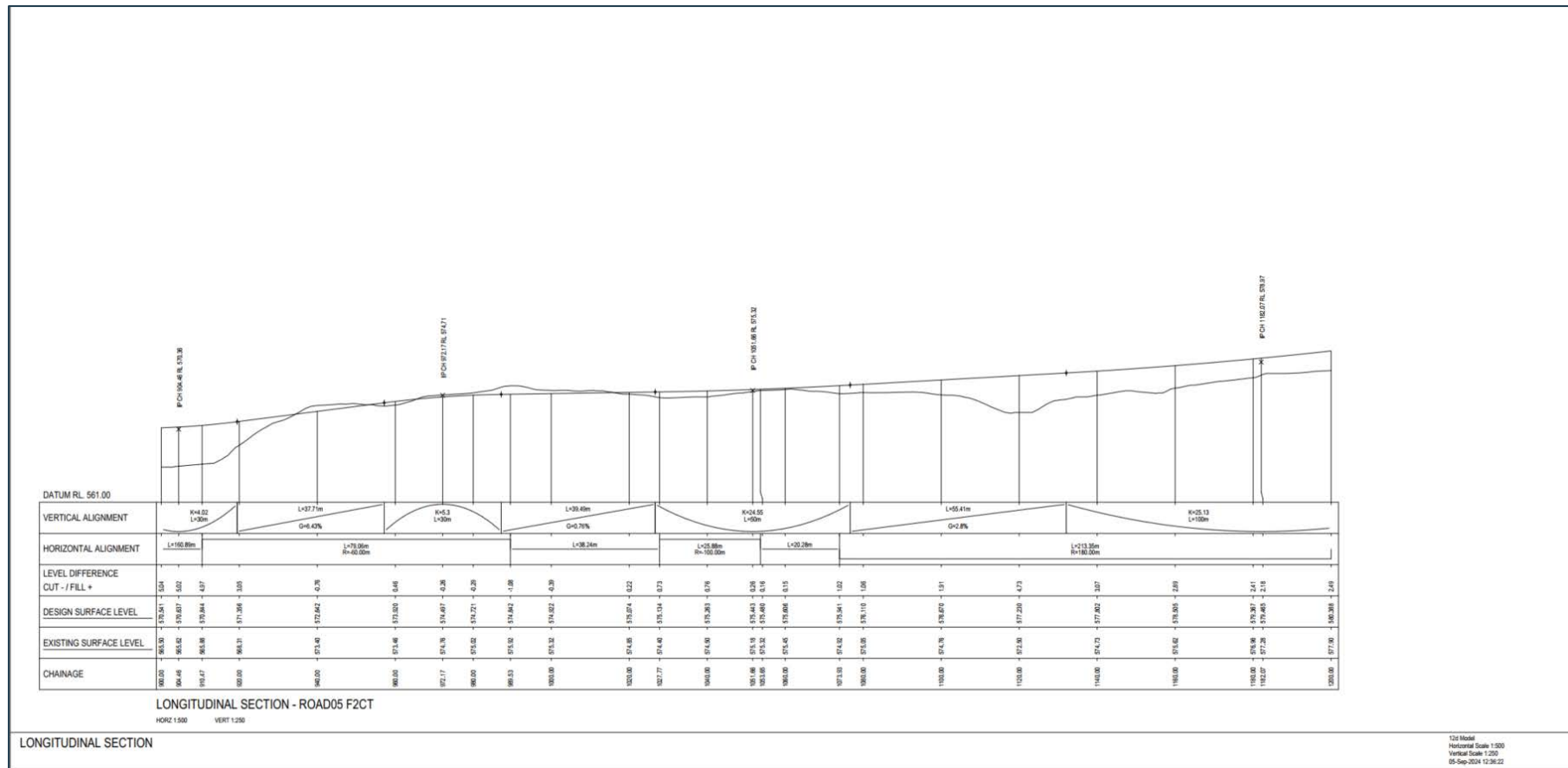


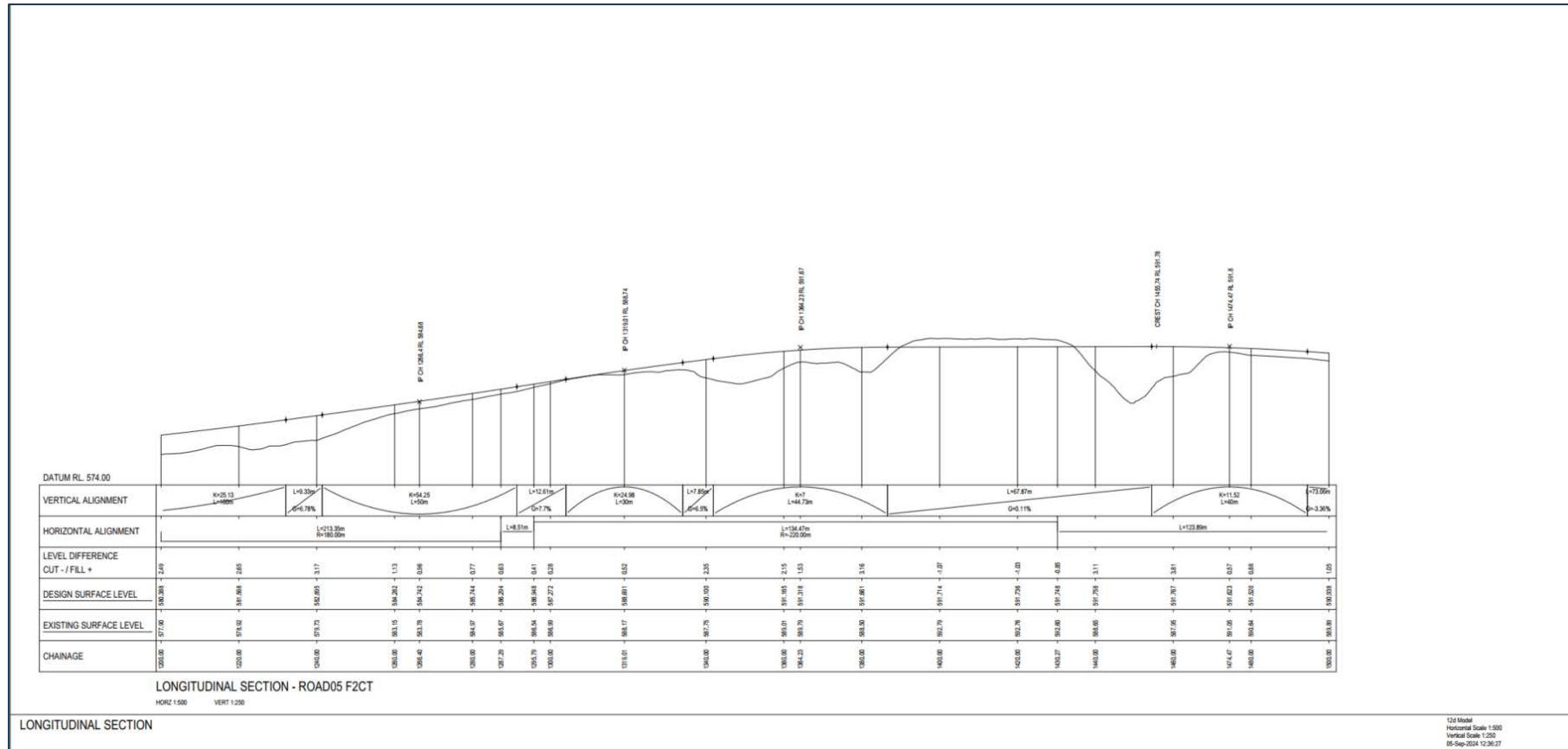


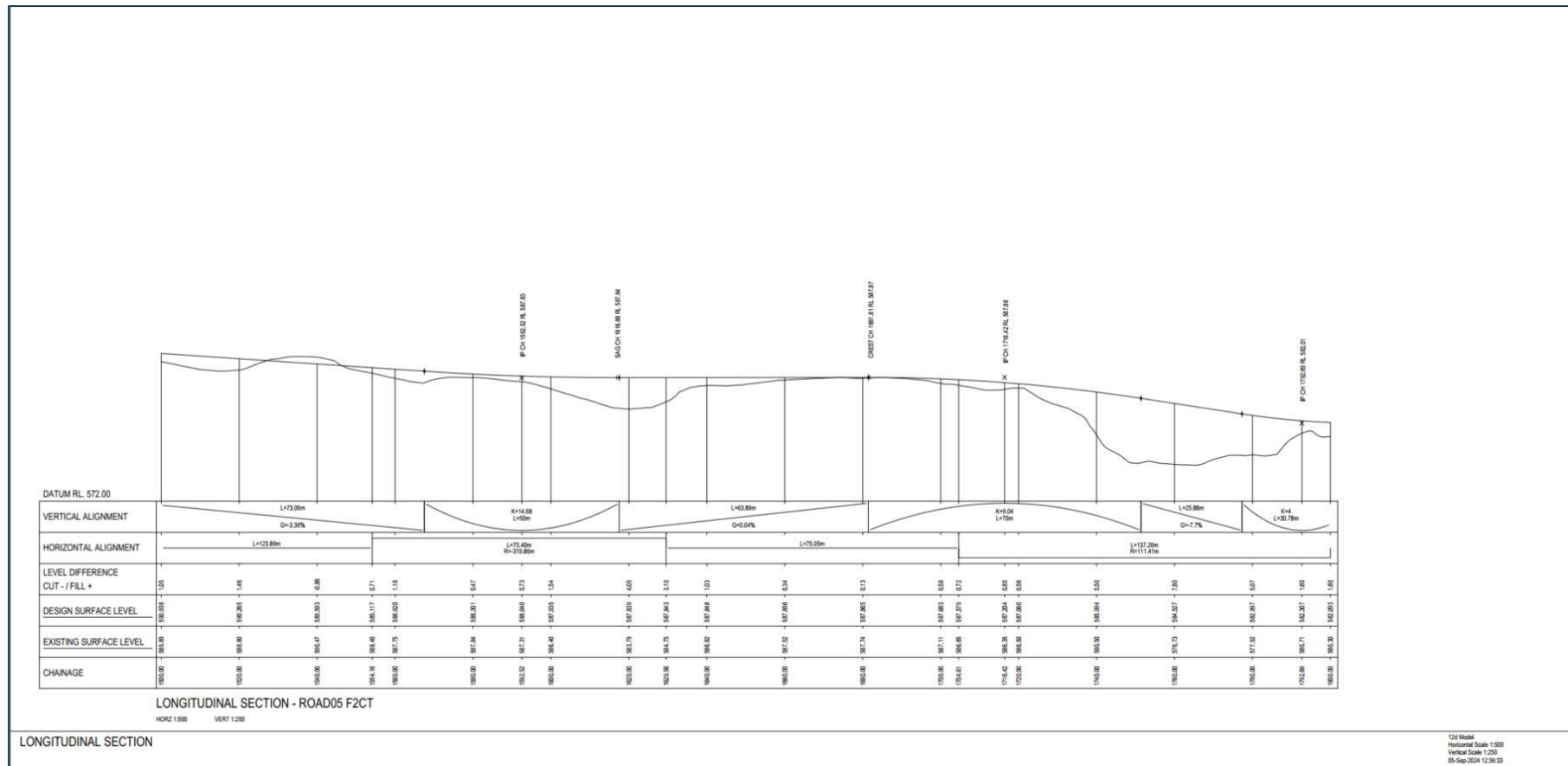


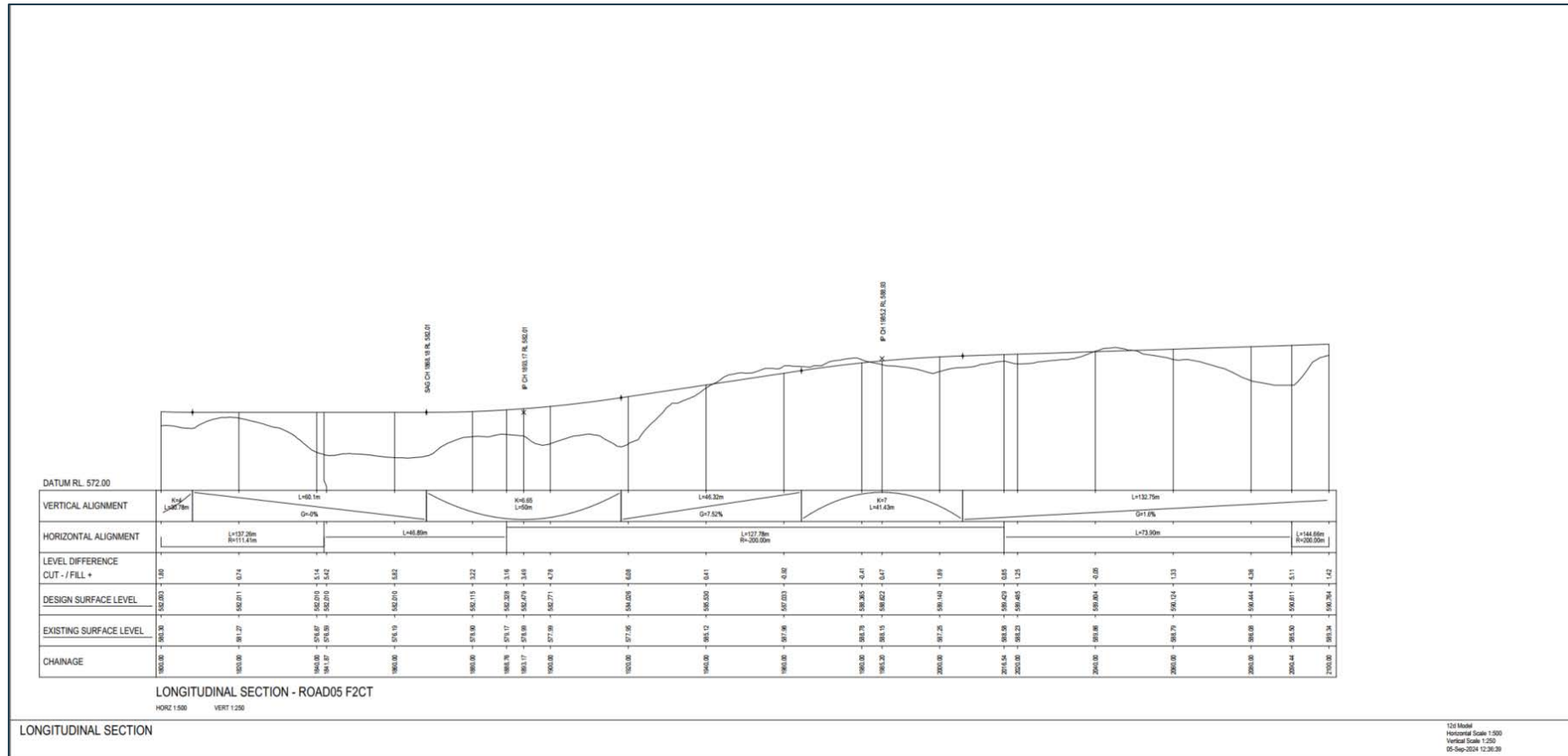


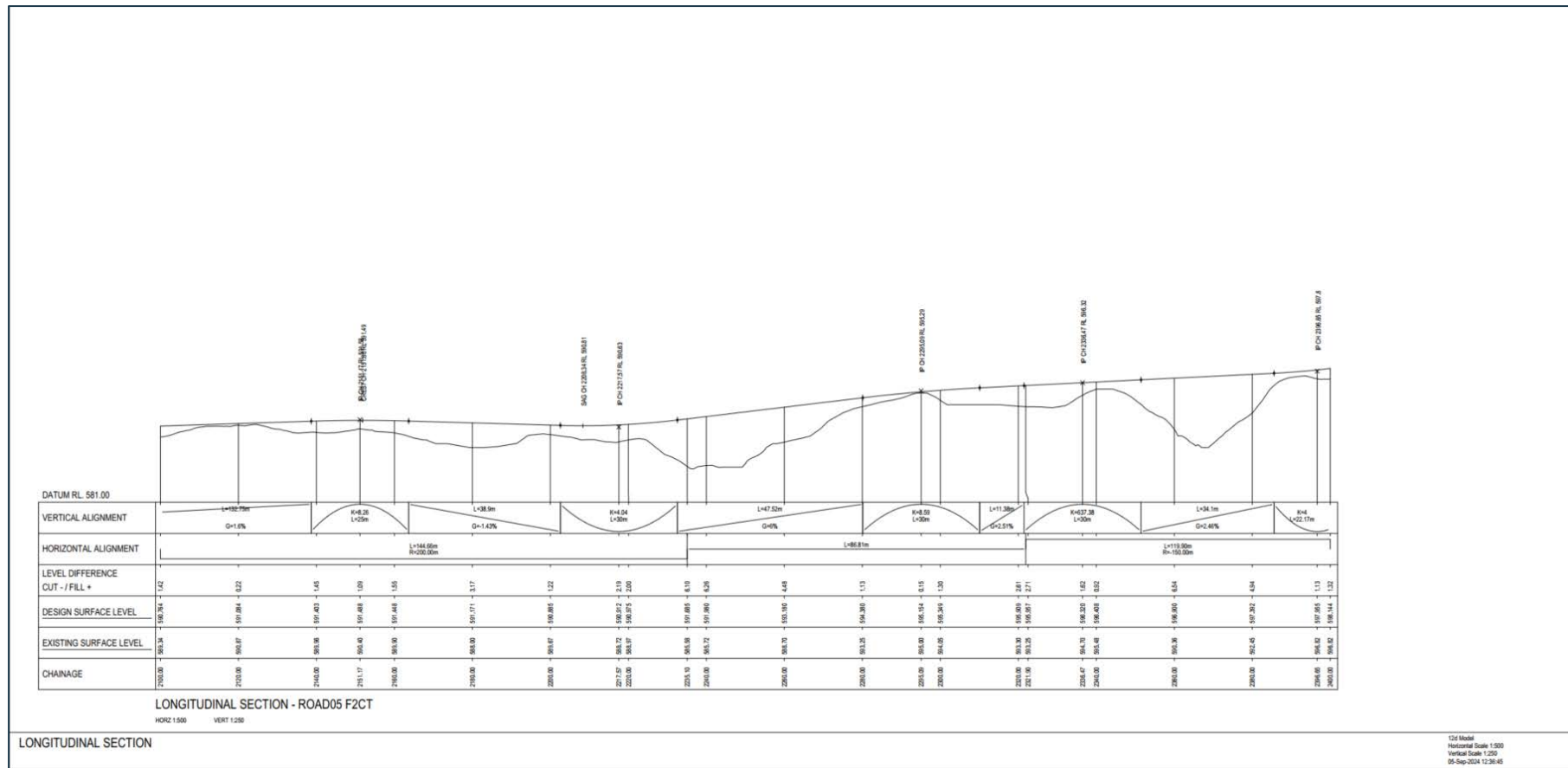


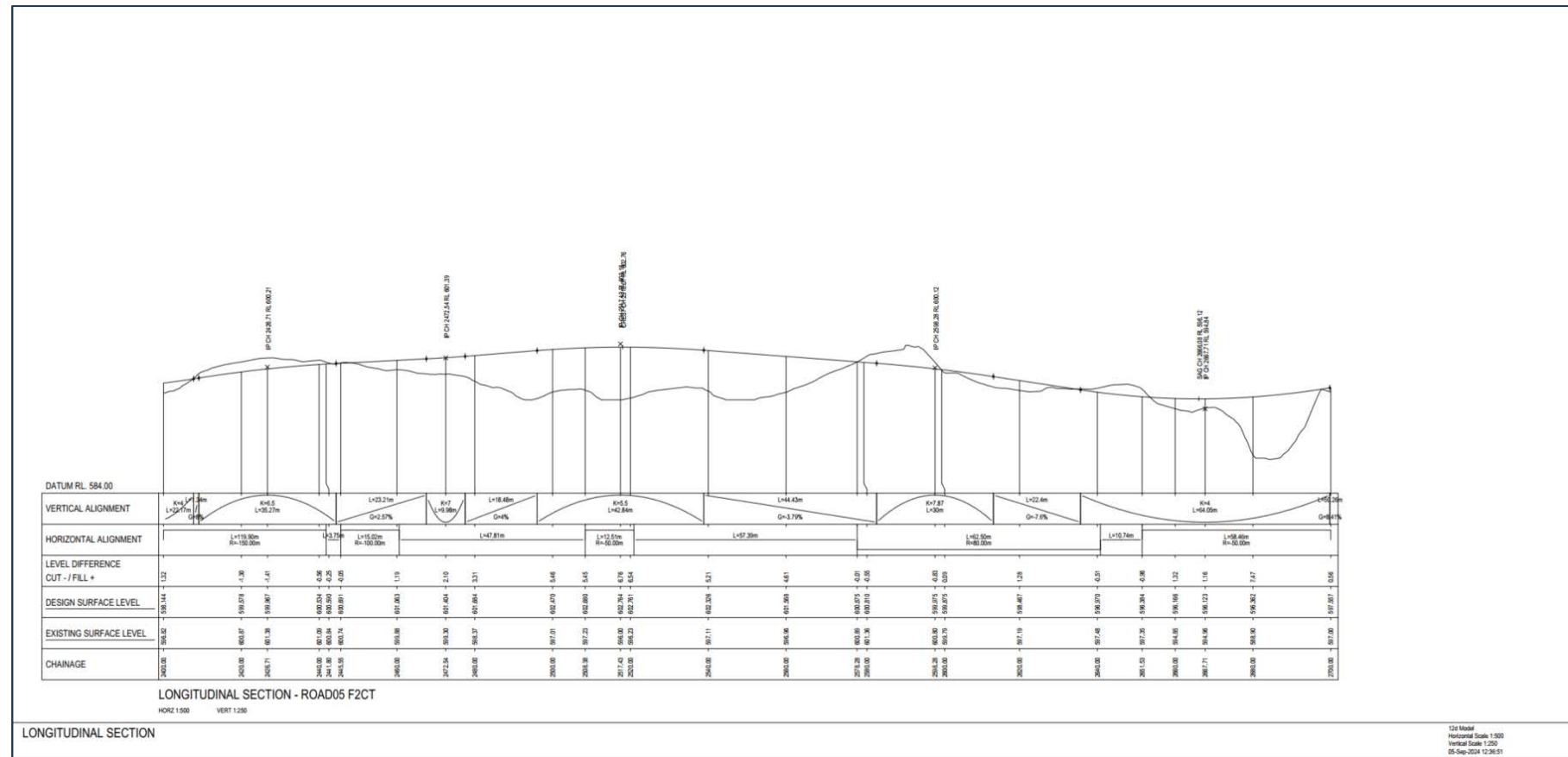


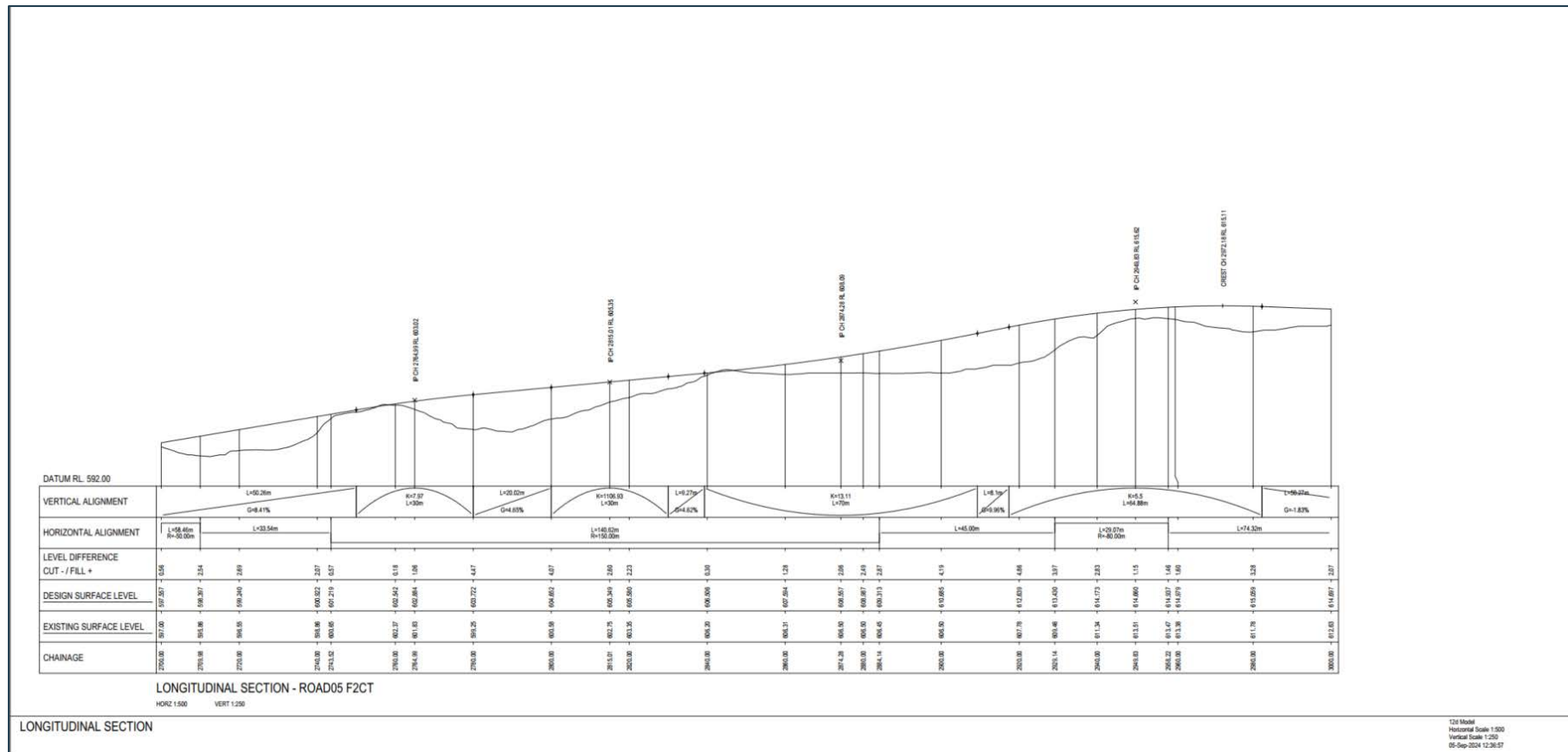


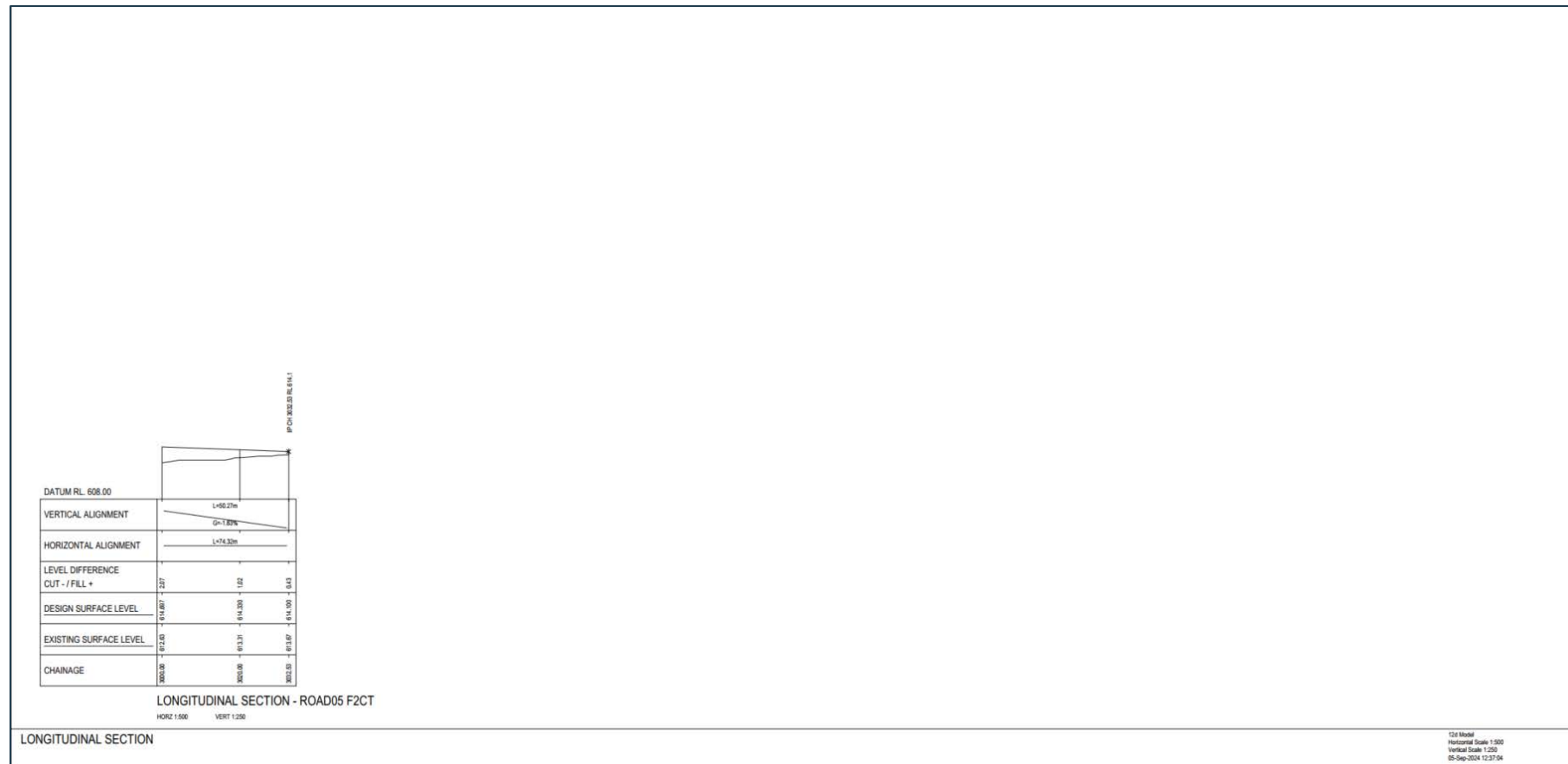




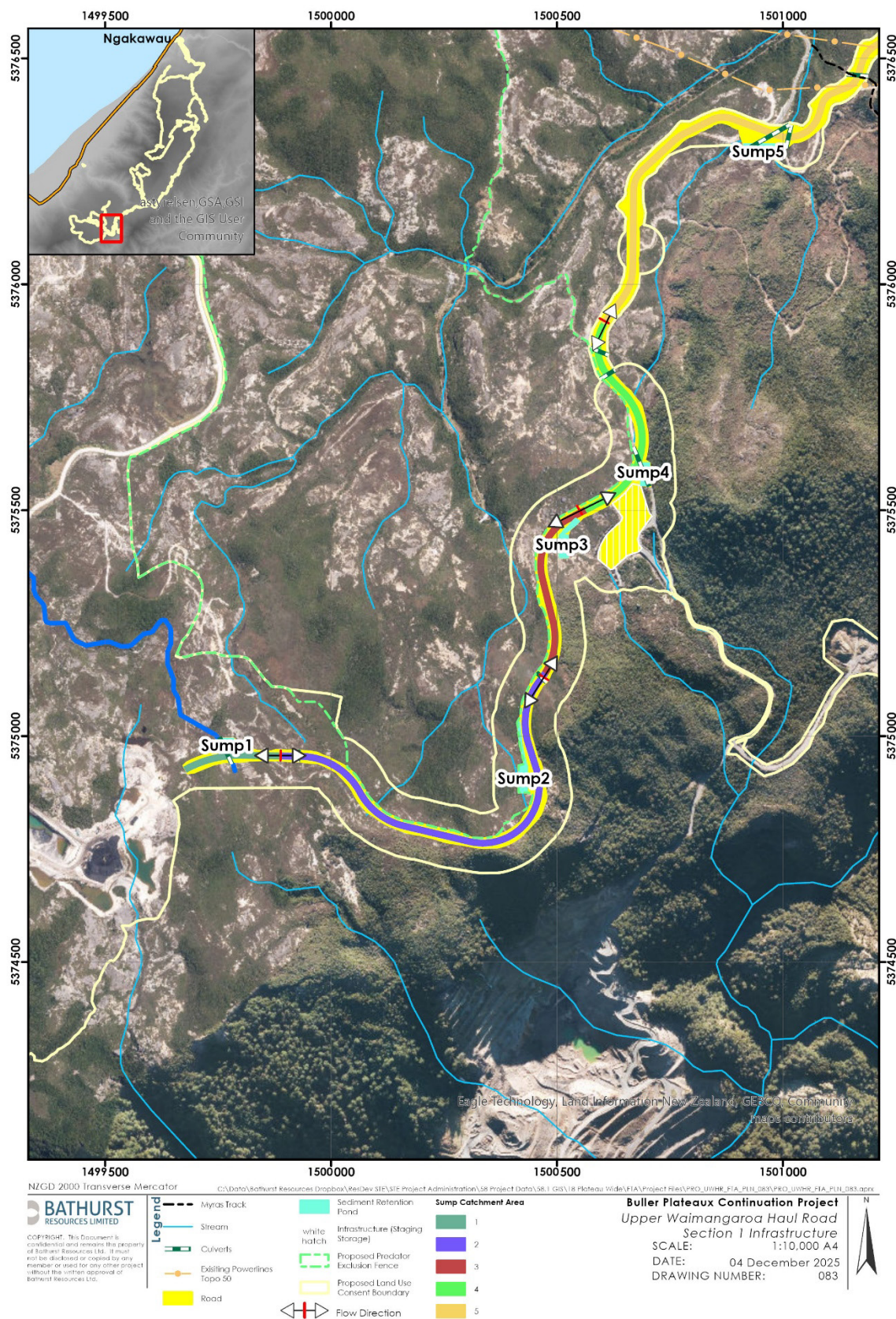


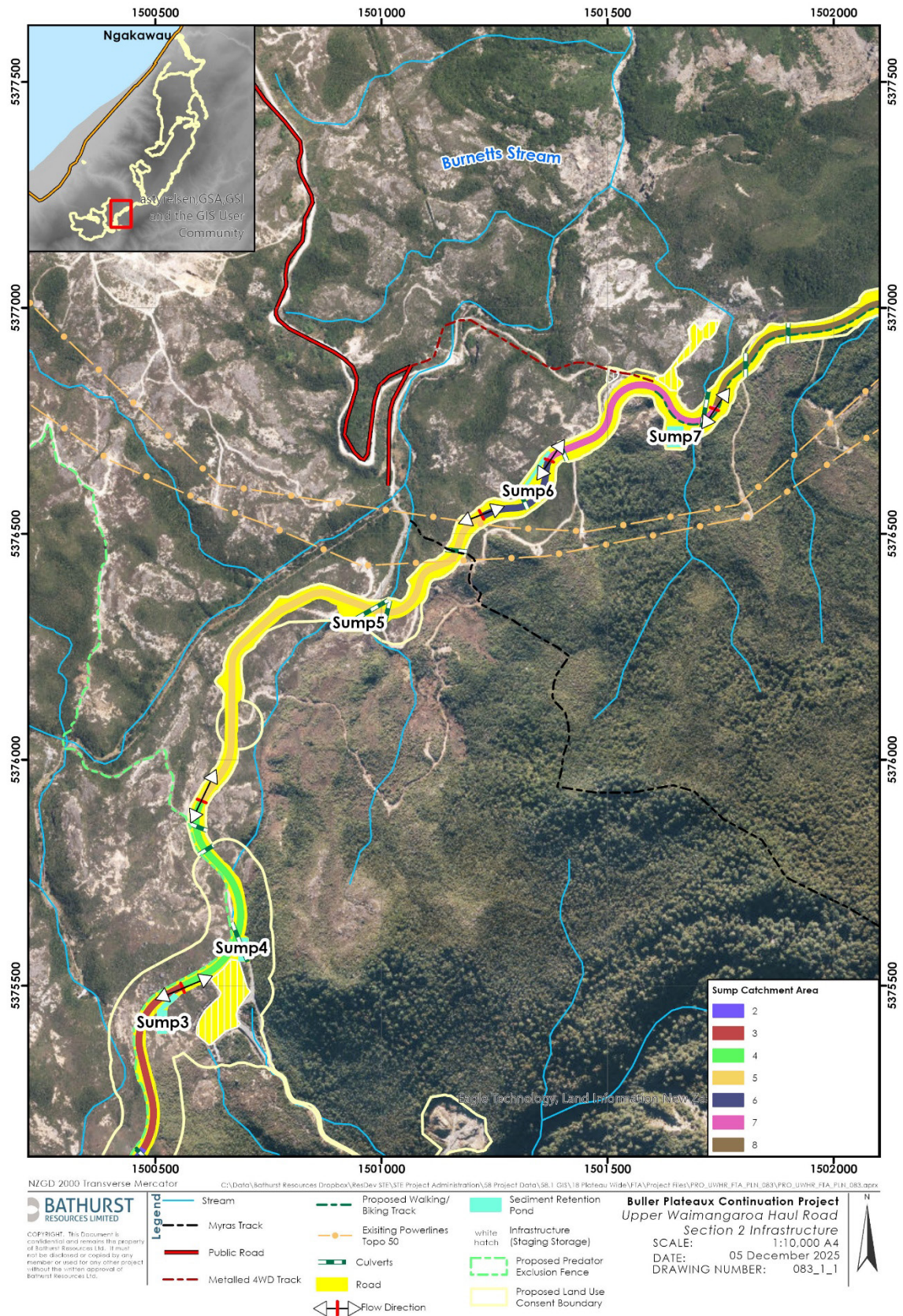


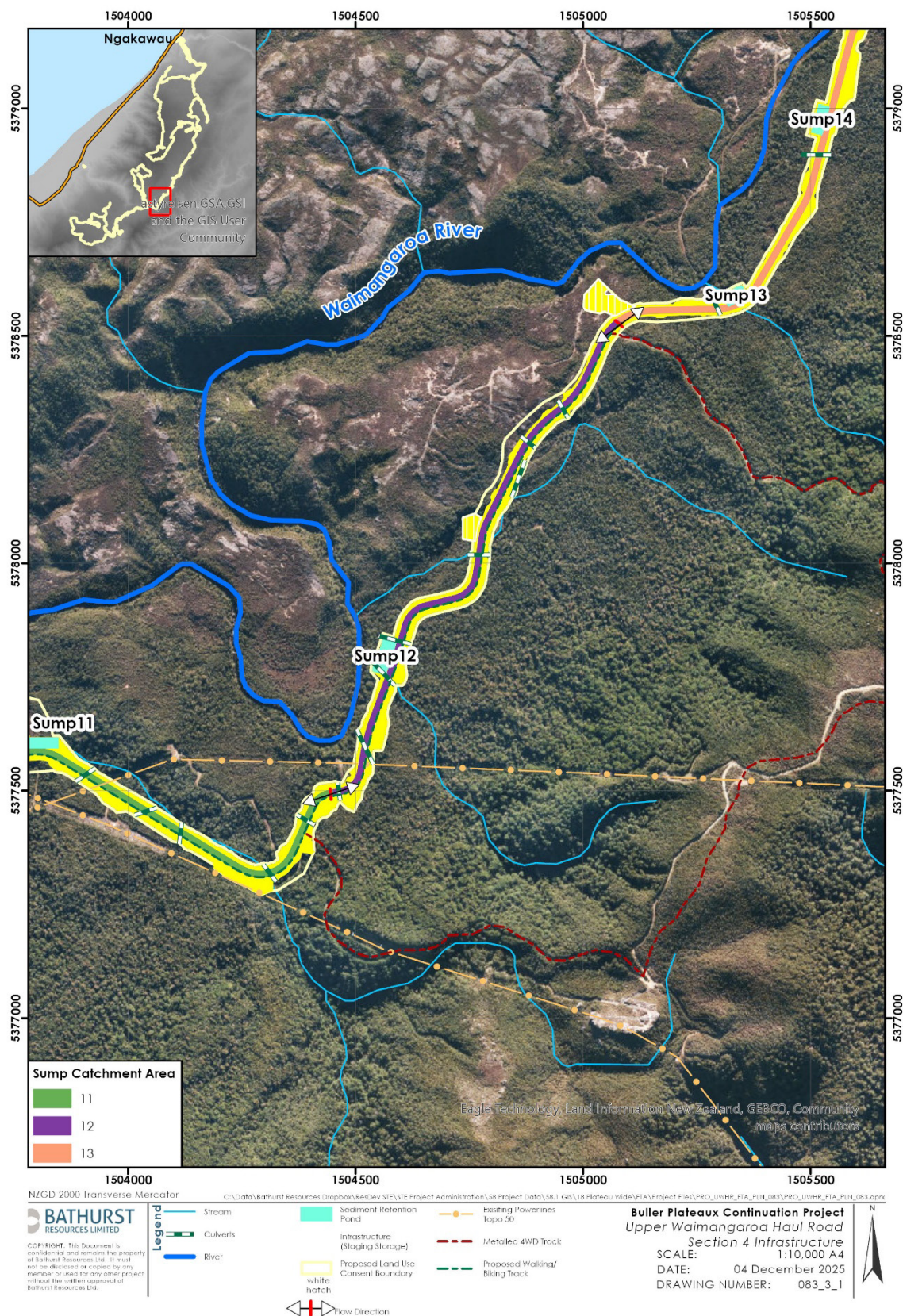


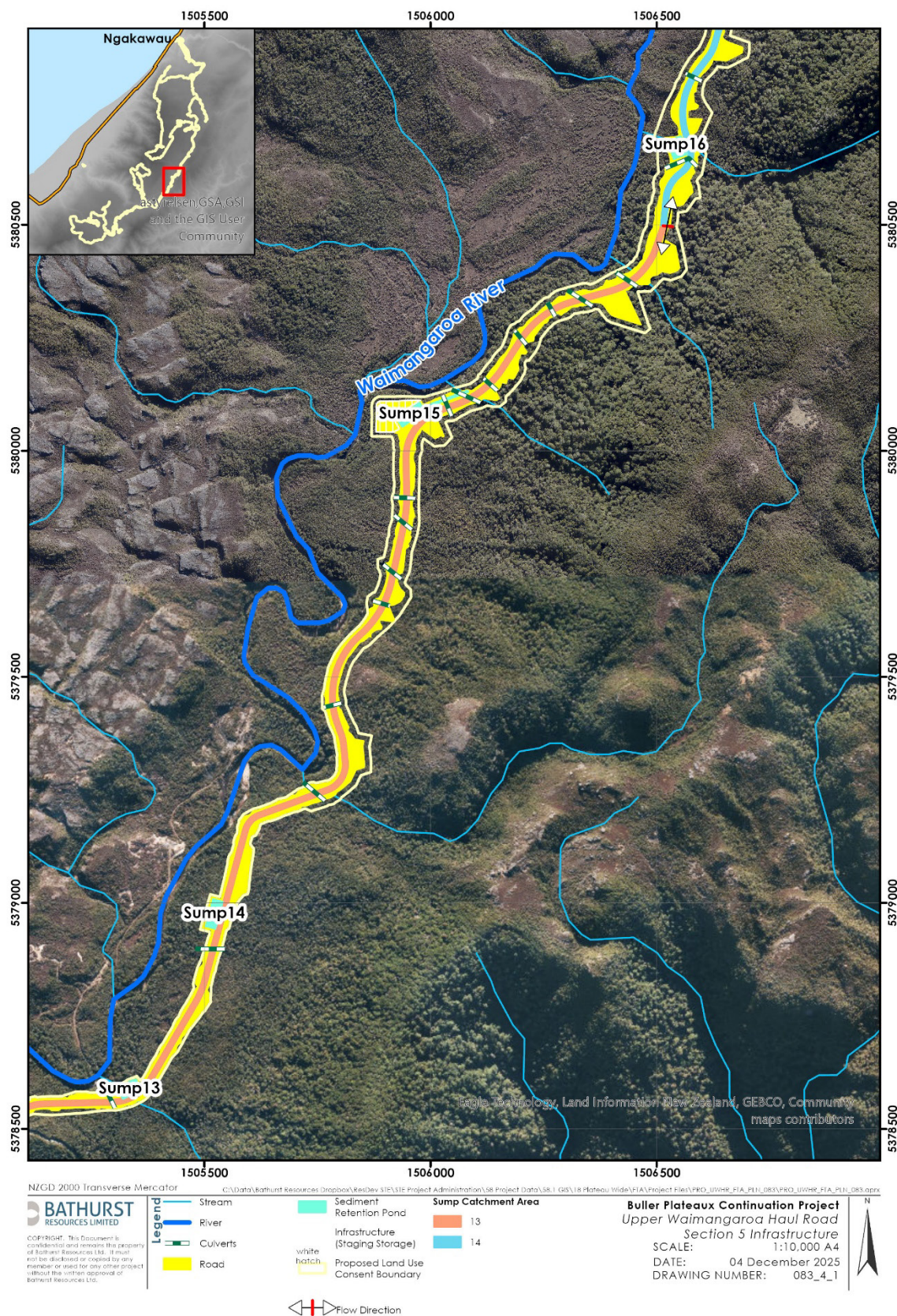


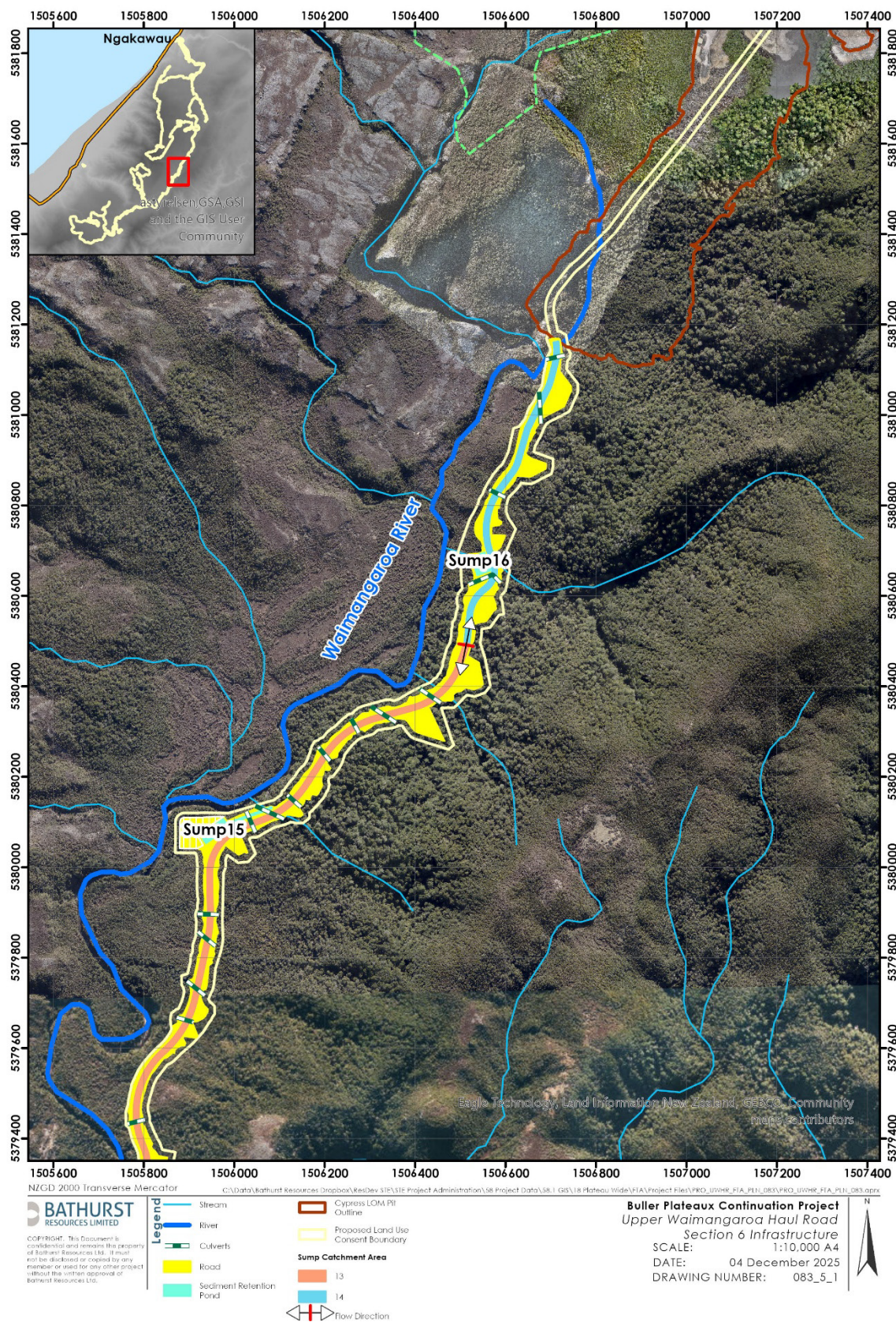
APPENDIX C Sediment control sumps and catchments











APPENDIX D Culvert Locations and Types

