APPENDIX W

INLAND RAIL

Geotechnical Factual Report

Part 1 of 2

HELIDON TO CALVERT ENVIRONMENTAL IMPACT STATEMENT

IR_1381

ARTC

Inland Rail: Phase 2 - Helidon to Calvert

Appendix W - Geotechnical Factual Report

Australian Rail Track Corporation

Reference: 3300

Document Number:
2-0001-330-EAP-10-RP-0222

Future Freight
Integrating Community, Environment and Engineering

Contents

Appendices

1 Introduction

Golder Associates Pty Ltd (Golder) have been engaged by FFJV to undertake the geotechnical investigation and factual reporting for Helidon to Calvert (H2C) of the Inland Rail scheme. The factual report provides geological, hydrogeological and geotechnical information along the alignment for the purpose of feasibility design.

1.1 Supporting documents

The factual information collected from the geotechnical investigation are included as appendices to this report:

- *Golder Geotechnical Factual Report (1893802-024-Rev2)*

2 Geotechnical field investigation

The investigation fieldwork was undertaken in accordance with the FFJV *Geotechnical Investigation Plan (2-0001-320-IGE-02-PL-0001)*. The intrusive investigation comprised a series of boreholes, test pits, auger holes, in situ testing and sampling, installation of groundwater monitoring piezometers, groundwater monitoring and sampling and laboratory testing. The scope of investigation was reduced in agreement with the client (ARTC) to the minimum amount of investigations required to comply with the Environmental Impact Statement (EIS). The geotechnical testing summarised in this report is for the revised EIS scope of works only.

2.1 Methodology

The site investigation was carried out over several mobilisations between July and December 2018 and comprised a site reconnaissance, borehole drilling, seismic refraction, in situ soil sampling, geological mapping and groundwater sampling. The investigation site works was carried out under the full-time supervision of Golder. A summary of the intrusive geotechnical investigations is provided below with all the results presented in the Golder Factual Report in Appendix A.

2.1.1 Borehole summary

A summary of the completed geotechnical investigations is provided in Table 1. The scope of the site investigation works ultimately completed for H2C has been substantially less than was originally intended, due predominantly to access restrictions in the field.

Table 1 H2C borehole summary of completed investigations

Investigation ID	Feature	Drilled depth (m bgl)	Piezometer installed (Y/N)	Date completed
330-01-BH2101	Tunnel	130.14	Y	28 September 2018
330-01-BH2102	Tunnel	50.36	Y	10 September 2018
330-01-BH2103	Tunnel	30.80	Y	19 September 2018
330-01-BH2104	Tunnel	31.02	Y	12 September 2018
330-01-BH2203	Bridge	25.18	Y	24 August 2018
330-01-BH2207	Bridge	20.53	Y	2 September 2018
330-01-BH2212	Bridge	27.00	Y	20 September 2018
330-01-BH2216	Bridge	25.50	Y	10 October 2018

Investigation ID	Feature	Drilled depth (m bgl)	Piezometer installed (Y/N)	Date completed
330-01-BH2224	Bridge	26.43	Y	24 September 2018
330-01-BH2227	Bridge	20.09	Y	30 September 2018
330-01-BH2301	Cut	30.99	Y	16 September 2018
330-01-BH2303	Cut	30.91	Y	3 September 2018
330-01-BH2306	Cut	31.06	Y	5 December 2018
330-01-DH2503	Culvert	15.07	Y	24 September 2018

Table note:

bgl = below existing ground level

2.1.2 Seismic refraction summary

The seismic report is provided in the Golder Factual Report, Appendix A. The seismic surveys were undertaken at proposed bridge locations.

2.2 Laboratory testing

Laboratory testing results are provided in the Golder Factual Report (refer Appendix A).

2.3 Groundwater

Groundwater monitoring and sampling was undertaken as part of the geotechnical investigation for Helidon to Calvert. The results are presented in the Golder Factual Report (refer Appendix A).

APPENDIX W

Geotechnical Factual Report

Appendix A Golder Geotechnical Factual Report (1893802-024-R-Rev2)

HELIDON TO CALVERT ENVIRONMENTAL IMPACT STATEMENT

REPORT

Geotechnical Factual Report

Inland Rail Project - Helidon to Calvert Section

Section 330

Submitted to:

Future Freight Joint Venture
Level 14, 32 Turbot Street
Brisbane, QLD 4000

Submitted by:

Golder Associates Pty Ltd
147 Coronation Drive Milton, Queensland 4064 Australia

+61 7 3721 5400

1893802-024-R-Rev2

18 April 2019

Table of Contents

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

This report presents factual data from the geotechnical investigation carried out by Golder Associates Pty Ltd (Golder) as part of the feasibility design phase for the Inland Rail, Phase 2 project. The investigations were undertaken for the Future Freight Joint Venture (FFJV) within Section 330, Helidon to Calvert (H2C). The investigations provide subsurface profile information to aid in the feasibility design of the proposed rail alignment. The coordinates, approximate surface reduced levels (RLs) and maximum exploration depths at the completed investigation locations are provided in Appendix A.

This factual report presents results from the geotechnical site investigations, geological site observations and laboratory testing. The results from geophysical seismic refraction surveys are presented in Appendix B of this report.

The investigation locations for H2C are presented in Figures 1.0 to 1.20 of this report.

2.0 PROJECT APPRECIATION

The proposed Inland Rail is to consist of a direct rail route that will extend approximately 1,700 km from Melbourne to Brisbane. The project will include enhancements or major upgrades to existing rail lines along some portions of the route and will require new construction in others. The proposed route has been subdivided into individual design packages located in Victoria, New South Wales and Queensland.

The H2C section is one of 13 packages that will make up the overall scheme. H2C is 47 km long and comprises a new dual gauge rail line connecting Helidon Spa (at the foot of the Great Escarpment near Toowoomba) with Calvert (near Ipswich) via Placid Hills, Gatton, Forest Hill, Laidley and Grandchester. The new line is intended for heavy freight transport with provision for double stacked shipping containers (generating up to 30 tonne axle load).

Much of the H2C route will utilise the existing rail corridor, though it will also include a new 1.1 km length tunnel through the high topography of the Little Liverpool Range that is between Laidley and Grandchester, and a new alignment between Helidon and Gatton.

3.0 SITE DESCRIPTION AND REGIONAL GEOLOGY

3.1 Topography

Figure 1 shows the proposed route of H2C together with the local topography. At the western end of H2C, between Helidon and Gatton, the alignment crosses the southern edge of the Helidon Hills. The topography is moderately undulating with the alignment crossing ridges, river terraces and flood plains as it generally runs parallel to and on the north side of Lockyer Creek.

The rail alignment then crosses broad alluvial plains of the Lockyer Valley, crossing Lockyer Creek at Gatton and continuing south-eastwards across alluvial plains to Laidley.

Between Laidley and Grandchester, the alignment rises into the relatively high topography of the Little Liverpool Range, before it descends into the adjacent Western Creek catchment and its alluvial plains, as far as the eastern extent of the package that lies approximately 2 km east of Calvert.

The western part of H2C is drained by Lockyer Creek and its tributaries. Lockyer Creek drains in an easterly direction joining the Brisbane River just downstream from Wivenhoe Dam.

The Western Creek on the southern side of the Little Liverpool Range is part of the larger Bremer River catchment that also joins the Brisbane River at Dinmore.

The creeks are deeply incised in their upper reaches, and there are extensive terrace deposits on their margins. The lower reaches (Lockyer Creek east from Grantham, and Western Creek east of Grandchester) have more developed meandering bends where they flow out to but remain relatively deeply incised into flat ‘overbank deposited’ alluvial plains.

3.2 Regional Geology

The sedimentary rocks of the Clarence Moreton Basin are gently folded, with a series of north-northwest (NNW) to south-southeast (SSE) trending axial planes and regional faults being mapped. The 'dip and scarp' slopes of cuestas reflect the folding of the bedded strata in the region; strata within the Little Liverpool Range have a large-scale shallow dip towards the south east.

Table 1 is an abbreviated stratigraphic chart that summarises the succession of key geological units crossed by the alignment (Geoscience Australia, Australian Stratigraphic Units Database).

Table 1: Geological Stratigraphic Chart

Geological Unit	Age	Local map symbol	Description - typical
Caenozoic Era			
Colluvium	Pleistocene to Modern		Hillslope deposits; clayey sand with gravel and cobbles and some boulders of sandstone.
Alluvium	Pleistocene to Modern	Qa, Cza	In broader vales, typically heavy textured grey soils overlying sandy clay; sandy clay remains as marginal stranded river terraces. Alluvial soils associated with streams that rise in nearby sandstone areas are dominated by sand.
Laterite and Duricrust	Oligocene to Pleistocene	Td	Hardened 'duricrusts' within an otherwise leached laterite (saprolite) soil sequence
Tertiary Volcanics	Palaeocene to Eocene	Tb	Localised dykes; multiple olivine basalt flows likely to be intensely laterite weathered.
Undifferentiated Tertiary Sediments	Tertiary	Ts	Clayey poorly cemented sandstone, potentially with conglomerate and siltstone, and trace volcanic rocks.
Unconformity			
Mesozoic Era			
Injune Creek Group			
Walloon Coal Measures	Middle to Late Jurassic	Jw	Thin fine-grained calcareous sandstone, siltstone and claystone with shale; minor seams of coal. Frequently bleached feldspathic and lithic sandstone, kaolinitic (clay content).

Bundamba Group

Marburg Subgroup Koukandowie Formation Heifer Creek Sandstone Member (Undifferentiated Koukandowie Formation) Ma Ma Creek Member Gatton Sandstone Calamia Member Koreelah Conglomerate Member	Early to Middle Jurassic	Jbmk & Jbmg	*Koukandowie Formation*: 'flaggy' bedded sandstone, grey siltstone and shale (that typify the Ma Ma Creek Member) and polymictic (multiple rock types) conglomerate and a fining-upward grain size sequence of very coarse grained quartz lithic mostly thickly cross-bedded sandstone through to siltstone (together comprising the Heifer Creek Member). *Gatton Sandstone*: Thinly to thickly bedded (including cross-bedded units of coarse-grained sandstone) coarse-and medium-grained (feldspathic to lithic) sandstones, some granule (gravel and trace of cobbles) conglomerate (dominating the Koreelah Member) at base of the Formation.
Woogaroo Subgroup	Late Triassic to Early Jurassic	R-Jbw	Bedded fine to medium grained quartz-lithic and quartz sandstone, quartz rich granule conglomerate, silty sandstone, and laminated claystone.

4.0 INVESTIGATION SCOPE

The field investigation was carried out from 9 July 2018 to 5 December 2018. The scope of works undertaken comprised the following:

- 26 seismic refraction surveys and two (2) boreholes with televiewer logging;
- 13 geotechnical boreholes extending to depths between 20.09 m and 130.14 m below ground level (bgl);
- One (1) auger hole extending to 15.07 m bgl;
- Installation of 14 groundwater monitoring wells, located at each geotechnical borehole and auger hole location; and
- Laboratory testing of selected recovered samples.

The investigation locations are shown in Figures 1.0 to 1.20. A summary of the fieldwork activities is provided in Appendix A.

4.1 Site Access and Set-out

Investigation locations were nominated during the tender period.. Reconnaissance at each of the proposed locations was carried out to determine appropriate access and to conduct ecological and cultural heritage surveys as well as underground service location. Each location was marked with a wooden peg and the location recorded using a hand held GPS device, in accordance with the Geotechnical Investigation Plan (2-0001-320-IGE-02-PL-0001). As-drilled coordinates were also recorded using a hand-held GPS device. The RL (m AHD) has been inferred from a Data Elevation Model (DEM) derived from Lidar survey data provided by FFJV.

4.2 Geophysical Surveys

The report on the seismic refraction surveys and televiewer downhole logging is provided in Appendix B.

4.3 Auger Holes and Geotechnical Boreholes

The auger hole (designated*330-01-DH 2503*) was drilled to a depth of 15.07m bgl using a solid stem auger that was periodically retrieved to enable nominally undisturbed tube (U50) sampling and standard penetration testing (SPT) to be undertaken in the uncased borehole. Soil descriptions were carried out on the drill cuttings and recovered samples. On completion, the auger hole was backfilled with drill cuttings. A report of the auger hole is provided in Appendix C.

Geotechnical boreholes (prefixed 330-01-BH) were commenced using a solid stem auger, before being progressed by rotary drilling (water flush) techniques (with the exception of 330-01-BH2101 and 330-01-BH2102). If rock that was suited to rotary coring was identified, NMLC drilling techniques were then used to complete the borehole.

Borehole 330-01-BH2101 commenced using percussion drilling techniques to 63.74 m bgl and HQ3 coring techniques were used to collect core samples to 130.14 m bgl. Borehole 330-01-BH2102 commenced using a solid stem auger and was completed using rotary coring HMLC drilling.

Non-Destructive digging (NDD) using a water jet and vacuum pump was completed in boreholes 330-01-BH2216 and 330-01-BH2224 to 1.75 and 1.4 m bgl respectively due to proximity to the road and potential presence of buried services. Sampling was therefore not possible in the top 2.0 m of these boreholes, except for surface material between ground level and 0.1 m. Detailed reports of the boreholes are provided in Appendix C.

4.4 Observation and Logging

All geotechnical investigation activities were carried out in accordance with the relevant sections of the following Australian Standards.

- AS1289 – Methods of Soil Testing for Engineering Purposes[1];
- AS 1726:2017 – Geotechnical Site Investigation[2]; and
- Minimum Construction Requirements for Water Bores in Australia[3] .

All drilling was carried out under the full-time observation of a geotechnical engineer or geologist from Golder.

5.0 FIELDWORK FINDINGS

5.1 Summary of Observations

The western end of the alignment extends from the foot of the Great Escarpment at Helidon, passes across undulating country north of the Warrego Highway, before crossing onto broad alluvial plains.

East of Laidley the alignment rises into the Little Liverpool Range hills. It emerges again onto broad alluvial plains, associated with Western Creek as far as Calvert.

The tables below summarise the extent of geotechnical investigation. Descriptions are provided based on field observation and a review of factual information drawn from the investigations.

[1] Standards Australia. (2000). *Methods of Soil Testing for Engineering Purposes* (AS 1289).

[2] Standards Australia. (2017). *Geotechnical site investigations* (AS1726:2017).

[3] National Uniform Drillers Licensing Committee 2011. (2012). *Minimum construction requirements for water bores in Australia* (3rd ed.).

5.1.1 Helidon (Approximate CH26500 to CH28300)

Table 2: Helidon - Summary of Field Observations

Chainage	Setting	Geotechnical Investigation
CH26500 to CH28300	Alluvial flood plain or potentially an older stranded alluvial terrace	none

The alignment shares the present Queensland Mainline Rail Corridor, on the northern margin of the Lockyer Creek alluvial flood plain or potentially an older alluvial terrace that extends across the north side of Helidon village. Lockyer Creek has a flashy regime, it is joined in this terrain by a series of ephemeral 'high energy' creeks that flow from the Great Escarpment and from the Helidon Hills.

5.1.2 Helidon to Gatton (Approximate CH28300 to CH40000)

Table 3: Helidon to Gatton - Summary of Field Observations

Chainage	Setting	Geotechnical Investigation	
		Geophysical Seismic Refraction	Geotechnical Borehole Drilling
CH28300 to CH29400	Moderately undulating terrain underlain by the Marburg Subgroup rocks	330-01-SR2301 330-01-SR2302 330-01-SR2302-2	330-01-BH2301
CH29400 to CH33350	Low (some steep sided) hills underlain by Woogaroo Subgroup rocks	330-01-SR2303 330-01-SR2304	330-01-BH2303
CH33350 to CH33980	Terraced river valley	330-01-SR2202 330-01-SR2203	330-01-BH2203
CH33980 to CH40000	Moderately undulating terrain predominantly underlain by the Wooogaroo Subgroup rocks	330-01-BH2203-2 330-01-BH2306	330-01-BH2207

East from Helidon the alignment crosses into a locality of low (but some steep sided) hills that represent Woogaroo Subgroup rocks.

The 'Helidon Sandstone' within the Woogaroo Subgroup comprises characteristically, thickly bedded quartzose sandstone. Superficial soils include 'rocky' colluvium.

The Helidon Hills (north of the Warrego Highway and west of Sandy Creek) represent relatively high strength strata within the Woogaroo Subgroup. The lower terrain south of the highway crossing is interpreted to be underlain by lower strength labile (feldspathic) sandstone and siltstone within the Subgroup. Older road cuttings exhibit weathered and eroded (undercutting) strata of bleached, feldspathic sandstone.

Sandy Creek appears to have high bedload and perhaps anastomosing characteristics within a distinctly terraced and incised valley.

Sandy Creek has been exploited for sand and gravel, and broad pits have been partly refilled with sandy alluvium.

5.1.3 Gatton to Laidley (Approximate CH40000 to CH57900)

Table 4: Gatton to Laidley - Summary of Field Observations

Chainage	Setting	Geotechnical Investigation	
		Geophysical Seismic Refraction	Geotechnical Borehole Drilling
CH40000 to CH57900	Broad flood plains, incised river valley (Lockyer Creek), High point in the underlying Gatton Sandstone Formation bedrock at Gatton	330-010SR2204 330-01-SR2214 330-01-SR2205 330-01-SR2206 330-01-SR2207	330-01-BH2503 330-01-BH2212 330-01-BH2216

The alignment is proposed to share the existing rail corridor across the broad flood plain in the Lockyer Valley. The plain has only very slight undulation with smooth rises and falls between runoff creeks and ditches.

The superficial flood plain soils are dominated by relatively heavy (high plasticity) clay, grading to more granular soils with depth. The flood plains are dissected by relic abandoned and infilled river meander beds. Flood return channels converge to form substantial gullies into Lockyer Creek.

A bridge is planned to cross the incised Lockyer Creek adjacent to the current rail crossing in Gatton.

Gatton township is built on a high point in the underlying Gatton Sandstone bedrock.

5.1.4 Laidley to Grandchester (Approximate CH57900 to CH63200)

Table 5: Laidley to Grandchester - Summary of Field Observations

Chainage	Setting	Geotechnical Investigation	
		Geophysical Seismic Refraction	Geotechnical Borehole Drilling
CH57900 to CH63200	Terraces at footslopes of Little Liverpool Range area of high topography, underlain by Marburg Subgroup rocks.	330-01-SR2307 330-01-SR2308 330-01-SR2101 330-01-SR2310	330-01-BH2101 330-01-BH2102 330-01-BH2103 330-01-BH2104 330-01-BH2306

East from Laidley the alignment will initially cross agricultural land on an embankment as it climbs towards a remnant river terrace that abuts the colluvium foot-slopes on the western side of the Little Liverpool Range hills.

The landscape has a tendency for soil creep and there is substantial evidence of shallow rotational and translational landsliding within steeper areas of the Little Liverpool Range. There is a widespread cover of cobble and boulder colluvium.

Slopes on the Little Liverpool Range are susceptible to erosion, and areas that have been partly cleared and poorly reinstated tend to break out into gullies that expose relatively shallow bedrock.

5.1.5 Western Creek (Approximate CH63200 to CH73420)

Table 6: Western Creek - Summary of Field Observations

Chainage	Setting	Geotechnical Investigation	
		Geophysical Seismic Refraction	Geotechnical Borehole Drilling
CH63200 to CH73420	Terrace at footslopes of Little Liverpool Range; broad plains with abandoned filled channels, incised river channel (Western Creek).	north from present alignment: 330-01-SR2208 330-01-SR2311 330-01-SR2209 330-01-SR2210 330-01-SR2211 330-01-SR2211-2 330-01-SR2212 330-01-SR2213	330-01-BH2224 330-01-BH2227

An embankment will be required to carry the alignment from the river terrace, within and parallel to an ephemeral river channel at the toe of the Little Liverpool Range between CH63500 and CH65000.

The rail line will share the existing rail corridor embankment through the relatively flat and low-lying Grandchester area to Calvert. The landscape is typified by flat plains comprising alluvial 'overbank deposits' with distinct low points and channels that are remnant of former river alignments and that carry runoff and flood flows.

The Western Creek is deeply incised into the alluvial flood plain (and terraced) landscape. The flood plain soils are generally heavy textured grey clay.

5.2 Geotechnical Laboratory Testing

Soil and rock samples were selected by Golder and reviewed by FFJV for NATA accredited laboratory testing in accordance with current testing standards outlined in AS1289 "Methods of testing soil for engineering purposes", AS4133.0 "Methods of testing rocks for engineering purposes" and in American Society for Testing and Materials (ASTM). The laboratory testing program comprised the following:

- Particle Size Distribution (AS1289 3.6.1);
- Atterberg Limits and Linear Shrinkage (AS1289 3.1.2, 3.2.1, 3.3.1, 3.4.1);
- Emerson Class (AS1289.3.8.1);
- Shrink Swell Index (AS1289 7.1.1);
- Triaxial - Unconsolidated Undrained (AS1289.6.4.1);
- Point Load Index (AS4133.4.1);
- Unconfined Compressive Strength Test (of rock) with measurement of Poisson's Ratio and Young's Modulus (AS4133.4.2, 4.3);
- Brazilian Test – Indirect Tensile (ASTM D3967);
- Petrographic Reporting (ASTM C295);
- Slake Durability Index (AS4133.3.4);

- Soil Particle Density (AS1289.3.5.1);
- Particle Density and Water Absorption (AS1141.6.1);
- Aggregate Crushing Value (AS1141.21);
- Degradation Factor (AS1141.25); and
- Aggressivity Suite (pH, soluble sulfate and Chloride content).

Results of the laboratory testing have been summarised and the test reports compiled in Appendix D.

6.0 HYDROGEOLOGICAL FIELD INVESTIGATION

Hydrogeological investigations were conducted as part of the field investigation by qualified hydrogeologists or qualified field engineers with advice from a qualified hydrogeologist. Field investigations included:

- Water pressure testing in open holes;
- Standpipe piezometer installation;
- Slug testing and falling head testing in standpipe piezometers;
- Groundwater level monitoring; and
- Groundwater sampling.

The locations of all standpipe piezometers and groundwater sampling are reported on Figure 1.0 to Figure 1.20.

6.1 Hydraulic Testing in Open Holes

Three falling head tests were conducted by a qualified field hydrogeologist in a single bore (330-01-BH2101). Testing was carried out in packer isolated test intervals to estimate aquifer parameters at a specific depth. Test intervals were selected based on geotechnical logs, core photos and geophysical logs of each bore by a qualified hydrogeologist. The test sections were isolated using downhole packer equipment and were conducted in accordance with ISO 22282-2012-3:2012 Geotechnical Investigation and Testing. A summary of falling head test details and results is reported in Table 7. Falling head tests were analysed using AQTESOLV Pro 4.5 which is an industry standard program widely used in the field of hydrogeology for hydraulic parameter estimation. A summary of hydraulic testing results is reported in Table 2 and AQTESOLV analysis reports for individual tests are provided in Appendix E.

It should be noted that the borehole was drilled using a polymer mud with limited additives such as clay breaker. The borehole was flushed with clean water until all drilling fluids were removed from the borehole.

Table 7: Summary of Downhole Hydraulic Test Results for 330-01-BH2101

Test Number	Test Interval (m bgl)	Test Method	Formation	Analytical Method	Hydraulic Conductivity (m/s)
Test 1	93.5 to 130.0	Falling Head Test	Sandstone/Siltstone/Shale	Hvorslev	2.4×10^{-09}
				KGS Model	1.7×10^{-09}
Test 2	87.5 to 92.5	Falling Head Test	Sandstone/Siltstone/Coal	Hvorslev	1.1×10^{-09}
				KGS Model	2.3×10^{-09}
Test 3	81.5 to 86.5	Falling Head Test	Sandstone	Hvorslev	1.7×10^{-08}
				KGS Model	1.2×10^{-08}

6.2 Standpipe Piezometer Installation

Drilling and installation of standpipe piezometers were conducted according to the “Minimum Construction Requirements for Water Bores in Australia (2012)”. The design of the standpipe piezometer was provided by a qualified hydrogeologist, with installation conducted by the drilling contractor under the supervision of a qualified field engineer.

All standpipe piezometers were equipped with 50 mm diameter class 18 PVC screw jointed with 0.4 mm slotted screens and blank casing. A borehole diameter of 96 mm was drilled for the installation of the standpipe piezometers. A filter pack (1 to 3 mm washed and graded sand/gravel) was placed in the annulus of the borehole around the screen section which was then sealed with a bentonite plug. The annular space above the bentonite plug was grouted to the surface where a protective steel (gatic) cover was installed at ground level. A summary of the bore completion is reported in Table 8 and details are reported on bore logs in Appendix C.

Table 8: Summary Standpipe Piezometers Construction for H2C

Standpipe Piezometer ID	Stickup (m agl)	Bore Depth (m bgl)	Grout Interval (m bgl)	Bentonite Interval (m bgl)	Filter Pack Interval (m bgl)	Screen Interval (m bgl)	Sump (m bgl)
330-01-BH2101	0.0 (gatic cover)	129	0.0 to 6.0	6.0 to 100.0	100.0 to 129.0	111.0 to 129.0	None
330-01-BH2102	0.0 (gatic cover)	50	0.0 to 24.0	24.0 to 25.0	25.0 to 50	41.0 to 50	None
330-01-BH2103	0.0 (gatic cover)	30.0	0.0 to 15.0	15.0 to 16.0	16.0 to 30.0	24.0 to 30.0	None
330-01-BH2104	0.0 (gatic cover)	31.0	0.0 to 14.0	14.0 to 15.0	15.0 to 31.0	19.0 to 31.0	None

Standpipe Piezometer ID	Stickup (m agl)	Bore Depth (m bgl)	Grout Interval (m bgl)	Bentonite Interval (m bgl)	Filter Pack Interval (m bgl)	Screen Interval (m bgl)	Sump (m bgl)
330-01-BH2203	0.0 (gatic cover)	12.2	0.0 to 5.0	5.0 to 6.0	6.0 to 12.2	7.0 to 12.0	None
330-01-BH2207	0.0 (gatic cover)	20.5	0.0 to 10.5	10.5 to 20.5	11.5 to 20.5	12.5 to 20.5	None
330-01-BH2212	0.0 (gatic cover)	27.0	0.0 to 22.0	22.0 to 23.0	23.0 to 27.0	24.0 to 27.0	None
330-01-BH2216	0.0 (gatic cover)	25.5	0.0 to 17.5	17.5 to 18.5	18.5 to 22.5	19.5 to 22.5	None
330-01-BH2224	0.0 (gatic cover)	21.5	0.0 to 7.5	7.5 to 8.5	8.5 to 21.5	15.5 to 21.5	None
330-01-BH2227	0.0 (gatic cover)	20.0	0.0 to 15.0	15.0 to 16.0	16.0 to 20.0	17.0 to 20.0	None
330-01-BH2301	0.0 (gatic cover)	30.0	0.0 to 11.0	11.0 to 12.0	12.0 to 30.0	24.0 to 30.0	None
330-01-BH2303	0.0 (gatic cover)	30.0	0.0 to 14.0	14.0 to 15.0	15.0 to 30.0	18.0 to 30.0	None
330-01-BH2306	0.0 (gatic cover)	30.0	0.0 to 9.0	9.0 to 10.0	10.0 to 30.0	24.0 to 30.0	None
330-01-DH2503	0.0 (gatic cover)	15.0	0.0 to 7.0	7.0 to 8.0	8.0 to 15.0	9.0 to 15.0	None

The completed standpipe piezometers were flushed after installation to remove drilling fluid (drill muds, polymers and additives) from the piezometer. Additional volumes of groundwater were purged using either a manual bailor or a 12-volt Twister groundwater pump which was completed prior to sampling for water quality analysis. Multiple groundwater bore volumes were removed from each standpipe piezometer to stimulate flow of ambient groundwater toward the standpipe.

Field parameters for groundwater quality were monitored during development and purging to quantify when drilling influences were removed from the piezometer and groundwater representative of the aquifer was being purged. The standpipe piezometer was considered developed when purge water was free of sediment and field parameters had stabilised over subsequent readings. A summary of bore development and stabilised field water quality parameters prior to sampling are reported in Table 9.

Table 9: Summary of Development and Field Water Quality Parameters for H2C

Standpipe Piezometer ID	Development Date	Volume Purged (L)	Equivalent bore volume	Field Water Quality Parameters at conclusion of bore development				
				pH	EC (µS/cm)	DO (ppm)	Temp (ºC)	Redox (mV)
330-01-BH2101	28/09/2018	240	-	8.77	1746	6.41	24.02	102
330-01-BH2102	24/10/2018	100	2.1	7.39	4142	2.7	22.6	-1324
330-01-BH2103	20/11/2018	80	2.4	7.68	7098	5.23	22.1	-31.6
330-01-BH2104	22/10/2018	95	3.1	7.73	3322	1.57	21.6	6.5
330-01-BH2203	Dry bore							
330-01-BH2207	25/10/2018	230	10.5	6.74	12292	1.14	21.7	-30.4
330-01-BH2212	24/10/2018	100	2.1	7.39	4142	2.7	22.6	-1324
330-01-BH2216	23/10/2018	460	10.2	7.10	8100	1.04	22.9	24.5
330-01-BH2224	26/10/2018	350	10.1	7.01	1284	1.61	23.3	1606
330-01-BH2227	No development, hydraulic testing and water sampling conducted yet							
330-01-BH2301	2/11/2018	11	0.8	Dry				
330-01-BH2303	24/10/2018	32	2.8	6.61	2535	1.85	22.6	23.3
330-01-BH2306	Dry bore							
33001-DH2503	20/10/2018	10	2.3	7.69	1192	5.18	28.5	61.2

pH – Log_{10} concentration of hydrogen within a sample (dimensionless)

EC (µS/cm) – Electrical conductivity measured in micro-Siemens per centimetre

DO (ppm) – Dissolved oxygen measured in parts per million

Temp (ºC) – Temperature measured in degrees Celsius

Redox (mV) – Reduction-Oxidation potential measured in milli-Volts

6.3 Slug Testing / Falling Head Testing in Standpipe Piezometers

In-situ hydraulic testing using the slug test method was conducted in each newly installed standpipe piezometer for a total of 11 tests. The slug tests involve inducing a sudden change in the groundwater level within the bore casing by inserting (falling head) and then removing (rising head) a solid slug or by sudden

displacement of the water column in the casing using a pneumatic slug (compressed gas) and then measuring the water level response.

The standing water level (SWL) was recorded before the slug was inserted in each bore. The hydraulic head (water level) was monitored until it returned (decreased) to within 90 per cent of the SWL, or when sufficient data was deemed to be collected at slow-recovering bores. A pressure transducer equipped with a built-in programmable data logger (water level probe) was installed in each standpipe piezometer to obtain continuous water level measurements during the test. The water level probe readings were confirmed by comparing manual measurements collected using a water level meter. The objective of a slug test is to estimate horizontal hydraulic conductivity of a water saturated rock or soil formation.

Slug test data were analysed using AQTESOLV Pro 4.5, which is an industry standard program widely used in the field of hydrogeology for hydraulic parameter estimation. Saturated horizontal hydraulic conductivity values calculated from slug test data in each bore are reported in Appendix F. The slug test data was analysed by using the Hvorslev (1951) and KGS (Hyder et al. 1994) solutions. Hydraulic conductivity is reported in meters per second (m/s) and is a measurement of how easily water can move through pore spaces in a geological formation.

Table 10: Summary of Slug Test Results for H2C

Standpipe Piezometer ID	Date Tested	Test Interval (m)	Formation Tested	Test Method	Analysis Method	Hydraulic Conductivity (m/s)
330-01-BH2101	07/12/2018	100.0 to 130.0	Sandstone/Siltstone	Falling Head Test	Hvorslev (early)	3.8×10^{-07}
					Hvorslev (late)	3.4×10^{-08}
					KGS Model (early)	2.6×10^{-07}
					KGS Model (late)	2.0×10^{-08}
330-01-BH2102	01/11/2018	41.0 to 50.0	Marburg Subgroup	Falling Head Test	Hvorslev	8.1×10^{-09}
					KGS Model	8.4×10^{-09}
330-01-BH2103	20/11/2018	24 to 30	Gatton Sandstone	Falling Head Test	Hvorslev	2.9×10^{-08}
					KGS Model	2.4×10^{-08}
330-01-BH2203*	24/10/2018	7.0 to 12.0	Alluvium	Falling Head Test	Hvorslev	1.5×10^{-06}
					KGS Model	1.3×10^{-06}
330-01-BH2207	25/11/2018	12.5 to 20.5	Woogaroo Subgroup	Falling Head Test	Hvorslev	1.8×10^{-05}
					KGS Model	9.4×10^{-06}
				Rising Head Test	Hvorslev	1.7×10^{-05}
					KGS Model	1.1×10^{-05}
330-01-BH2212	23/10/2018		Gatton Sandstone		Hvorslev	5.6×10^{-06}

Standpipe Piezometer ID	Date Tested	Test Interval (m)	Formation Tested	Test Method	Analysis Method	Hydraulic Conductivity (m/s)
		24.0 to 27.0		Falling	KGS Model	5.7 x 10^{-06}
				Rising Head Test	Hvorslev	6.1 x 10^{-06}
					KGS Model	5.5 x 10^{-06}
330-01-BH2216	23/10/2018	19.5 to 25.5	Gatton Sandstone	Falling Head Test	Hvorslev	4.4 x 10^{-06}
					KGS Model	2.6 x 10^{-06}
				Rising Head Test	Hvorslev	4.3 x 10^{-06}
					KGS Model	2.0 x 10^{-06}
330-01-BH2224	29/10/2018	15.5 to 21.52	Gatton Sandstone	Falling Head Test	Hvorslev	5.0 x 10^{-06}
					KGS Model	5.5 x 10^{-06}
				Rising Head Test	Hvorslev	6.2 x 10^{-06}
					KGS Model	4.3 x 10^{-06}
330-01-BH2303	31/10/2018	18.0 to 30.0	Gatton Sandstone	Falling Head Test	Hvorslev	1.5 x 10^{-08}
					KGS Model	1.1 x 10^{-08}
330-01-BH2306*	25/02/2019	21.0 to 30.0	Gatton Sandstone	Falling Head Test	Hvorslev	5.6 x 10^{-09}
					KGS Model	4.9 x 10^{-09}
330-01-DH2503	26/10/2018	9.0 to 15.0	Gatton Sandstone	Falling Head Test	Hvorslev	7.2 x 10^{-09}
					KGS Model	5.0 x 10^{-10}

**Note:- Monitoring bores 330-01-BH2203 and 330-01-BH2306 are dry bores and conducted falling head test introducing water and assuming bore achieved saturated condition during the test.*

6.4 Groundwater Level Monitoring

A water level probe was installed in each standpipe piezometer after installation, for groundwater level monitoring. The probes installed are from the In-Situ Rugged TROLL with a depth range dependent on the depth of installation, ranging between 9 to 30 m. The probes are recording groundwater levels at one hourly interval which are calibrated by manual measurements of the water level at the time of installation and prior to

removal of the water level probe for data download. Groundwater level statistics are summarised in Table 11 and hydrographs are presented in Figure G1.1 to Figure G1.12 in Appendix G. Daily rainfall data for hydrograph preparation was obtained from BoM rain gauge at University of Queensland, Gatton (SN 40082).

Table 11: Summary statistic of groundwater level monitoring for H2C

Standpipe Piezometer	Level probe installation depth (m AHD)	Water Level			
		Manual SWL (m AHD)	Date	SWL range from data logger (m AHD)	Date range
330-01-BH2101	132.1	162.46	30/11/2018	161.07 to 162.60	28/9/2018 to 30/11/2018
330-01-BH2102	118.79	146.8	08/09/2018	138.5 to 159.9	10/09/2018 to 23/10/2018
330-01-BH2103	131.8	140.8	20/11/2018	140.78 to 148.35	19/9/2018 to 20/11/2018
330-01-BH2104	132.13	156.5	12/09/2018	142.3 to 154.5	09/12/2018 to 22/10/2018
330-01-BH2203*	124.56	128.9	24/08/2018	124.5 to 124.7	02/09/2018 to 24/10/2018
330-01-BH2207	123.08	131.5	06/09/2018	131.3 to 131.7	02/09/2018 to 25/10/2018
330-01-BH2212	63.4	89.5	20/09/2018	84.1 to 89.5	20/9/2018 to 23/10/2018
330-01-BH2216	73.07	94.1	10/10/2018	94.0 to 94.4	10/10/2018 to 23/10/2018
330-01-BH2224	65.61	81.7	24/09/2018	81.7 to 81.8	24/09/2018 to 25/10/2018
330-01-BH2301	159.73	168.4	16/09/2018	159.6 to 163.3	16/09/2018 to 25/10/2018
330-01-BH2303	150	153.8	06/09/2018	150.6 to 159.6	03/09/2018 to 24/10/2018
330-01-DH2503	90.43	96.92	24/09/2018	92.0 to 96.3	24/09/2018 to 24/10/2018

Note: * Well has gone dry

6.5 Groundwater Sampling

One round of groundwater sampling was conducted in accordance with AS/NZ 5667.1:1998 and AS/NZ 5667.11:1998. The sampling was conducted after completion of bore development and purging was conducted using Super Twister pump or manual bailing or both methods. Samples were collected in laboratory provided bottles and shipped in a cooler box chilled with ice under Chain of Custody to ALS Laboratory in Brisbane (a NATA accredited laboratory). A summary of the analysis results is provided in Appendix H along with the ALS laboratory data sheets.

Samples were collected to provide quantitative data on water chemistry, durability and/or salinity parameters. In total 10 groundwater samples were collected from standpipe piezometers. Field QA/QC samples were collected during sampling along with field physiochemical measurements at the time of sampling. Quality control samples were collected to check that the samples were of acceptable quality on which to make decisions regarding water quality at the site. Quality control samples provide information that clarifies potential data errors attributable to cross contamination, inconsistencies in sampling and analytical issues. A summary of groundwater sampling and samples that exceeded holding time limits are reported in Table 12.

The following parameters were analysed for each sample set for H2C

- Water quality parameter suite
  - Major anions and cations (Ca, Mg, Na, K, Cl, F, SO_4, Carbonate and Bicarbonate Alkalinity, Hardness);
  - pH;
  - Conductivity plus TDS Calculated;
  - Total and dissolved metals (As, B, Ba, Be, Cd, Cr, Co, Cu, Mn, Fe, Ni, Pb, Se, V, Zn, Hg);
  - Nutrients (Nitrate, Nitrite, Ammonia, Total P&N, TKN and Reactive Phosphorus).
- Durability parameter suite
  - Major anions and cations (Ca, Mg, Na, K, Cl, F, SO_4, Carbonate and Bicarbonate Alkalinity, Hardness);
  - TDS;
  - pH;
- Salinity parameter suite
  - Major anions and cations (Ca, Mg, Na, K, Cl, F, SO_4, Alkalinity, Hardness);
  - Sodium Adsorption Ratio;
  - pH;
  - TDS.

Table 12: Summary of sampling and field water quality parameters for H2C

Standpipe Piezometer ID	Sampling Method	Date Sampled	Holding Time Exceedance
330-01-BH2101	HydroSleeve	07/12/2018	-
330-01-BH2102	Manual bailing	24/10/2018	pH
330-01-BH2103	Manual bailing	20/11/2018	pH
330-01-BH2104	Manual bailing	23/10/2018	pH
330-01-BH2203	Dry bore		
330-01-BH2207	Manual bailing	25/10/2018	pH
330-01-BH2212	Manual bailing	22/10/2018	pH
330-01-BH2216	Manual bailing	23/10/2018	pH
330-01-BH2224	Manual bailing	26/10/2018	pH
330-01-BH2301	Dry bore		
330-01-BH2303	Manual bailing	25/10/2018	-
330-01-BH2306	Dry bore		
330-01-DH2503*	Bore became dry during the development		
GW789 (Duplicate)	Manual bailing	23/10/2018	pH

7.0 CLOSURE

Details presented in this report are based on currently available geotechnical and hydrogeological information. Should you have any queries, or require further clarification, please contact Golder.

8.0 LIMITATIONS

Your attention is drawn to the document - “Important Information Relating to this Report”, which is included in Appendix I of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be, and to present you with recommendations on how to minimise the risks associated with the services provided for this project. The document is not intended to reduce the level of responsibility accepted by Golder Associates, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

Signature Page

Golder Associates Pty Ltd

Iain Turner
Principal Engineering Geologist

Peter Booth
Senior Engineering Geologist

IT/PB/DB/il

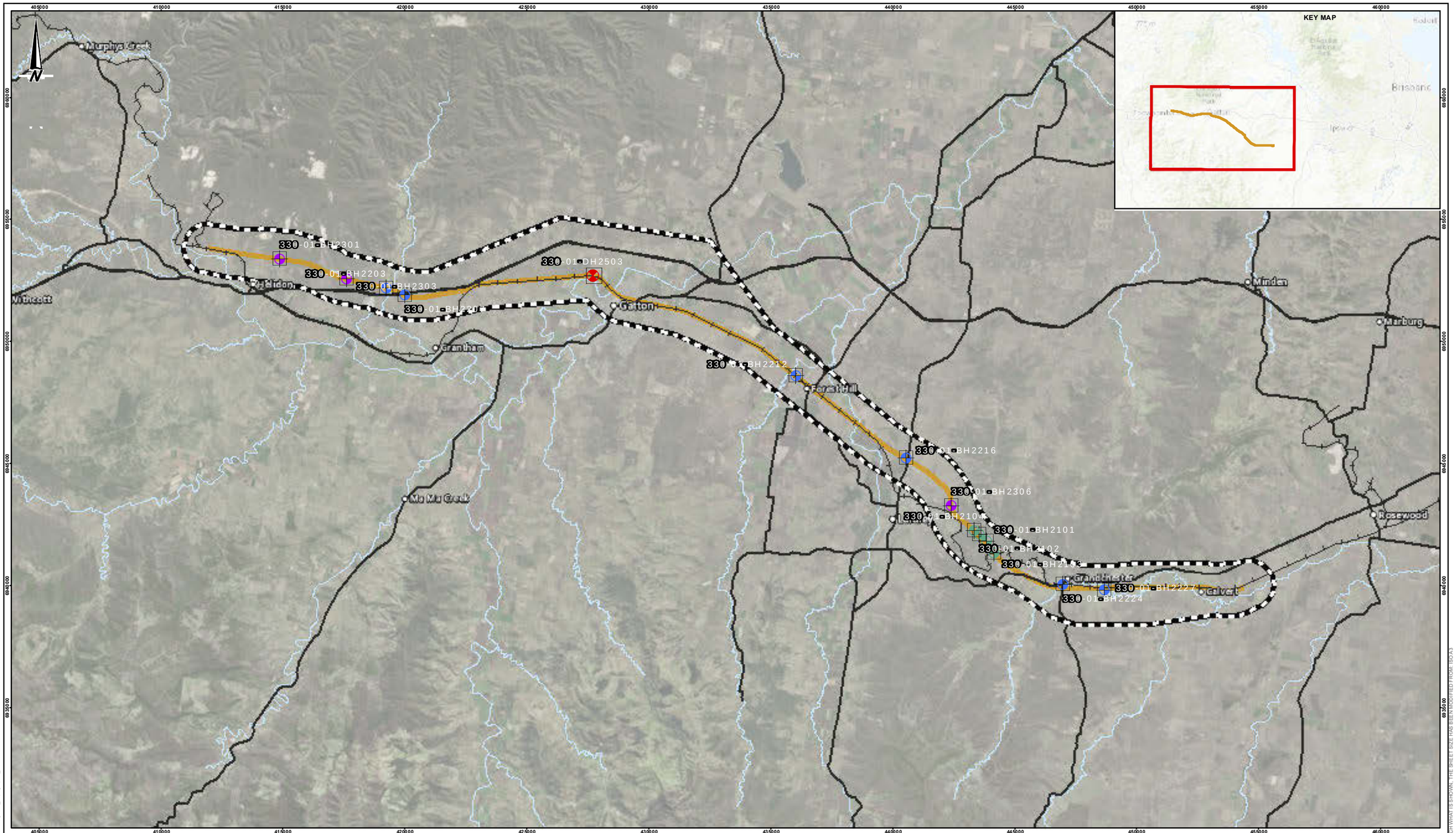
https://golderassociates.sharepoint.com/sites/23163g/deliverables/024 geotechnical factual report/rev2/1893802-024-r-rev2 h2c geotechnical factual report.docx

Figures

Figure 1.0: Helidon to Calvert Alignment Overview

Figures 1.1 to 1.20: Helidon to Calvert Alignment and Investigation Site Plan

Figure 2.1 to 2.20: Helidon to Calvert Alignment and Surface Geology



LEGEND

- Culvert Auger Hole with Monitoring Well
- Tunnel Borehole with Monitoring Well
- Bridge Borehole with Monitoring Well
- Cut Borehole with Monitoring Well
- H2C 330 SR Lines (As Acquired)
- H2C Alignment Centreline
- H2C 330 Study Area
- Cities and Towns
- Major Highway
- Main Road/Street
- Railway
- Water Courses

NOTE(S)

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 4,000 8,000
1:150,000 METRES

REFERENCE(S)

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
© STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES AND MINES), 2016

CLIENT
FUTURE FREIGHT JOINT VENTURE

CONSULTANT
GOLDER

DD-MMM-YY	17-Apr-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION OVERVIEW

PROJECT NO.	CONTROL	REV.	FIGURE
1893802	024	2	1.0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_Overview.mxd PRINTED ON: 2019-04-17 AT: 9:07:31 AM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ISO A3

25mm

0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:11:03 AM

LEGEND

- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar.
Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

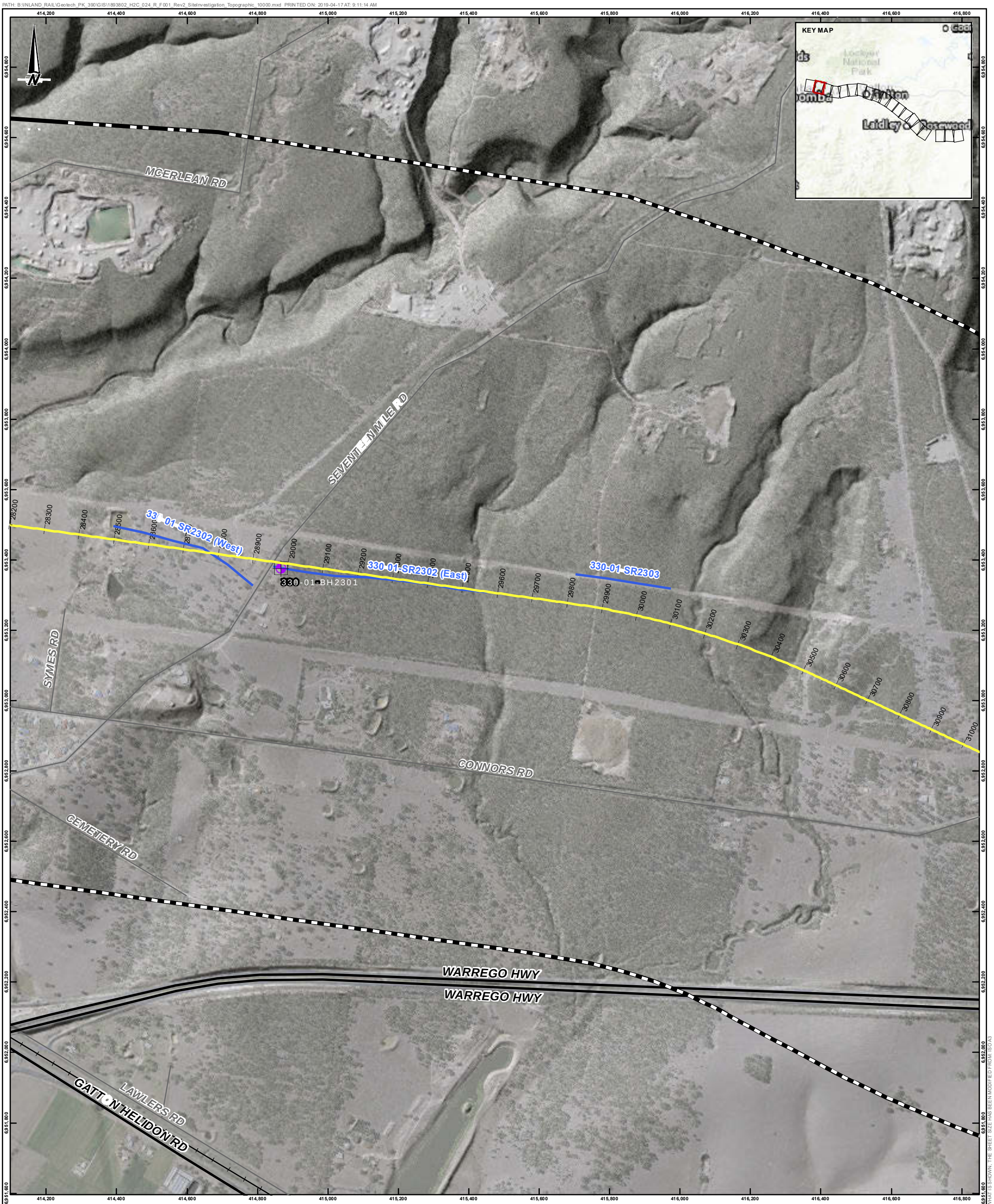
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:11:14 AM



LEGEND

- Cut Borehole with Monitoring Well
- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

0 25mm

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:11:24 AM

LEGEND

- Cut Borehole with Monitoring Well
- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

25mm

0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:11:39 AM

LEGEND

- Bridge Borehole with Monitoring Well
- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
0 25mm

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:11:53 AM

LEGEND

- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:12:09 AM

LEGEND

- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

0 25mm

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:12:22 AM

LEGEND

- Culvert Auger Hole with Monitoring Well
- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

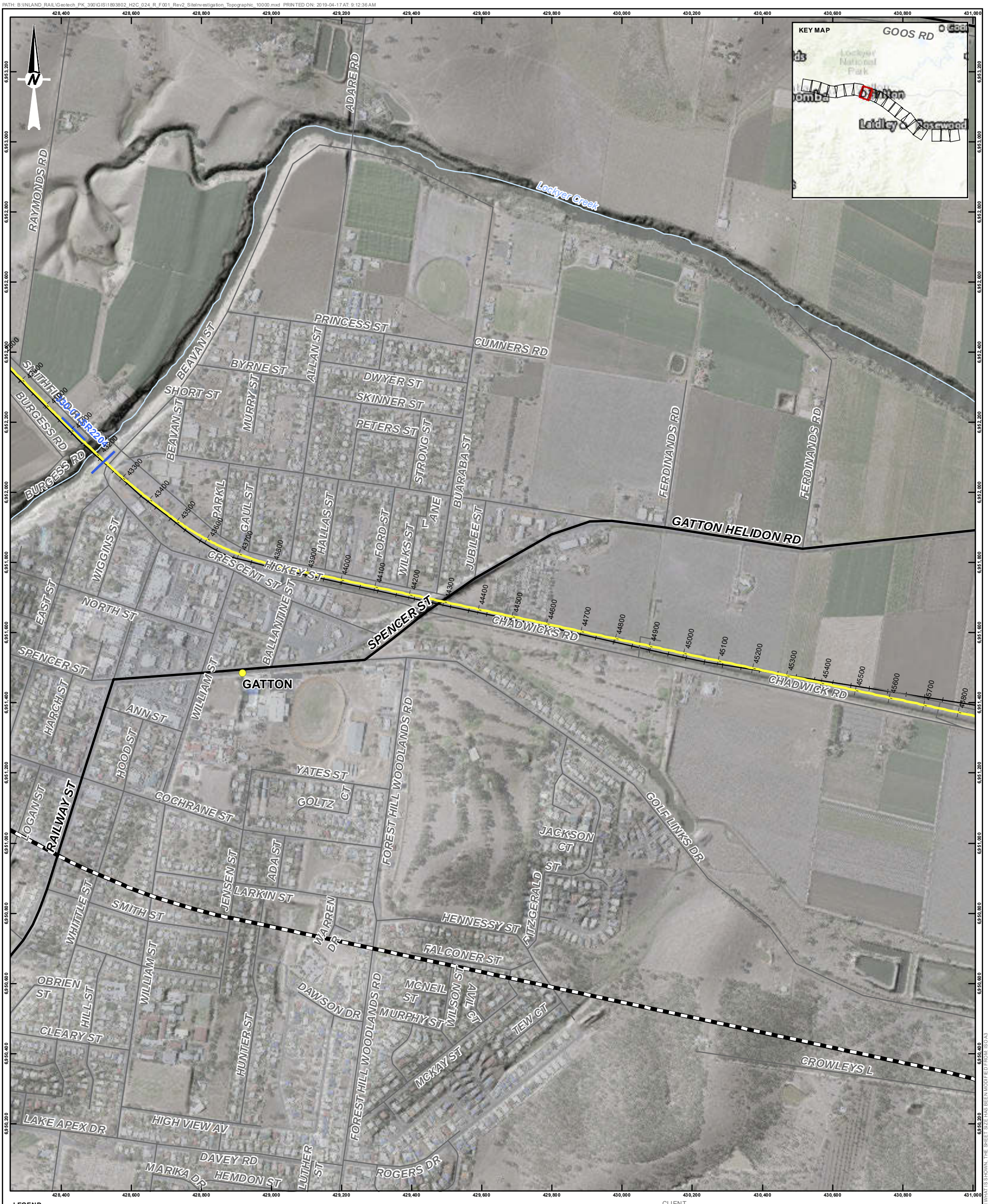
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
0 25mm

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:12:36 AM



LEGEND

- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

0 25mm

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:12:47 AM

LEGEND

- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.9

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:13:00 AM

LEGEND

- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.10

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:13:12 AM

LEGEND

- Bridge Borehole with Monitoring Well
- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
© State of Queensland (Department of Natural Resources and Mines), 2016

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.11

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

0 25mm

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:13:29 AM

LEGEND

- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar.
Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.12

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

LEGEND

- Bridge Borehole with Monitoring Well
- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

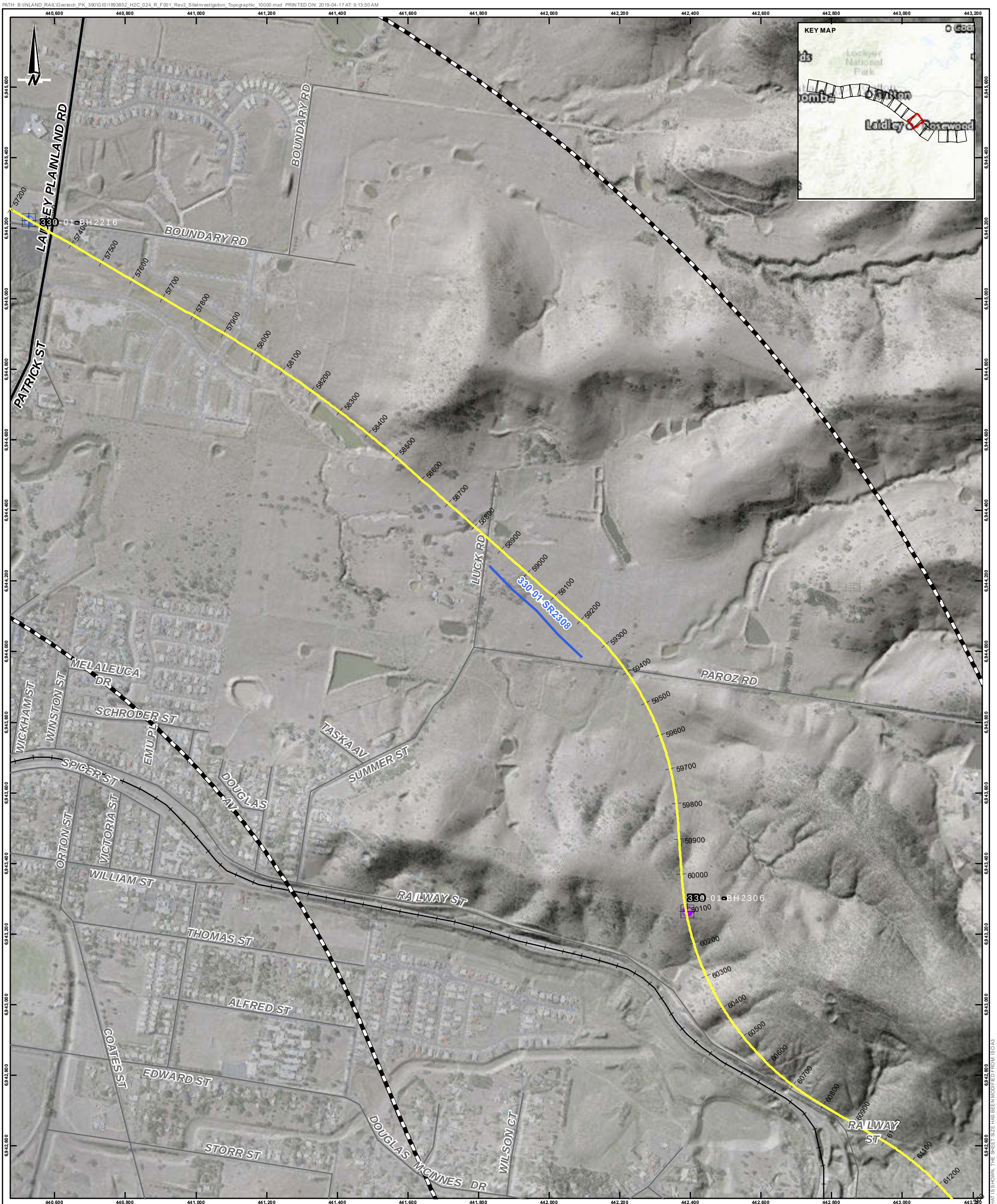
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.13

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:13:50 AM



LEGEND

- Bridge Borehole with Monitoring Well
- Cut Borehole with Monitoring Well
- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
© State of Queensland (Department of Natural Resources and Mines), 2016

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

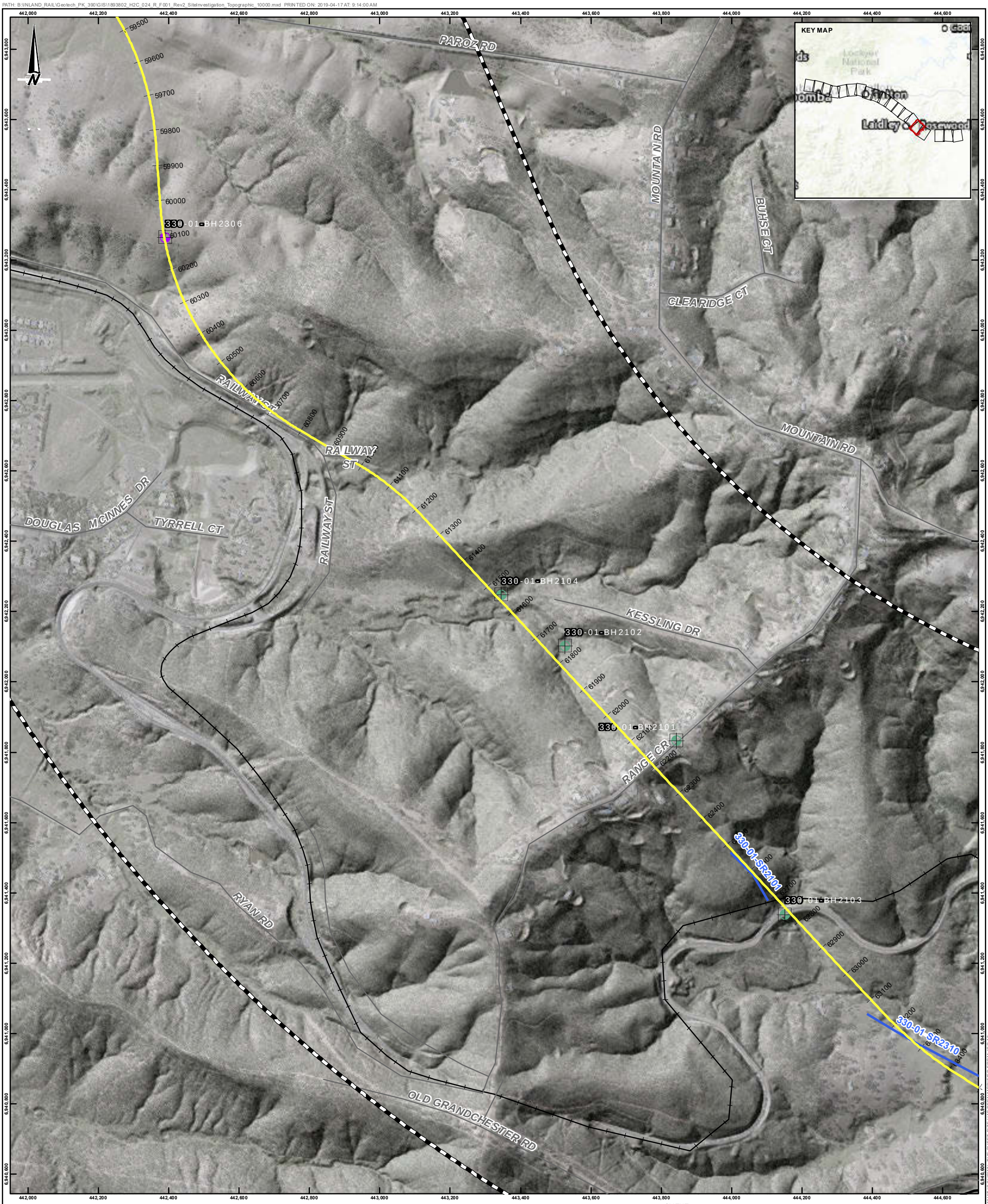
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.14

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:14:00 AM



LEGEND

- Tunnel Borehole with Monitoring Well
- Cut Borehole with Monitoring Well
- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

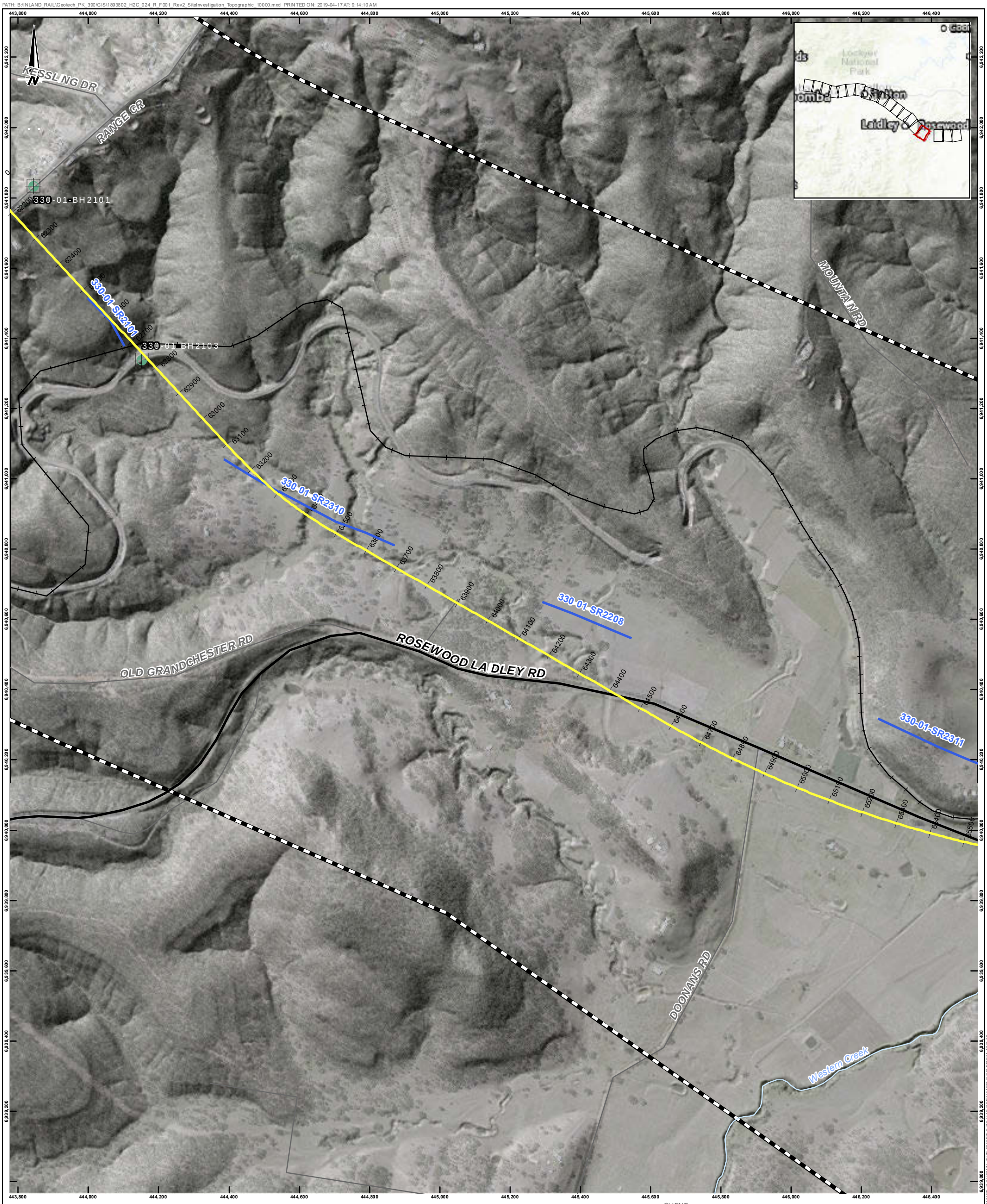
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.15

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:14:10 AM



LEGEND

- Tunnel Borehole with Monitoring Well
- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

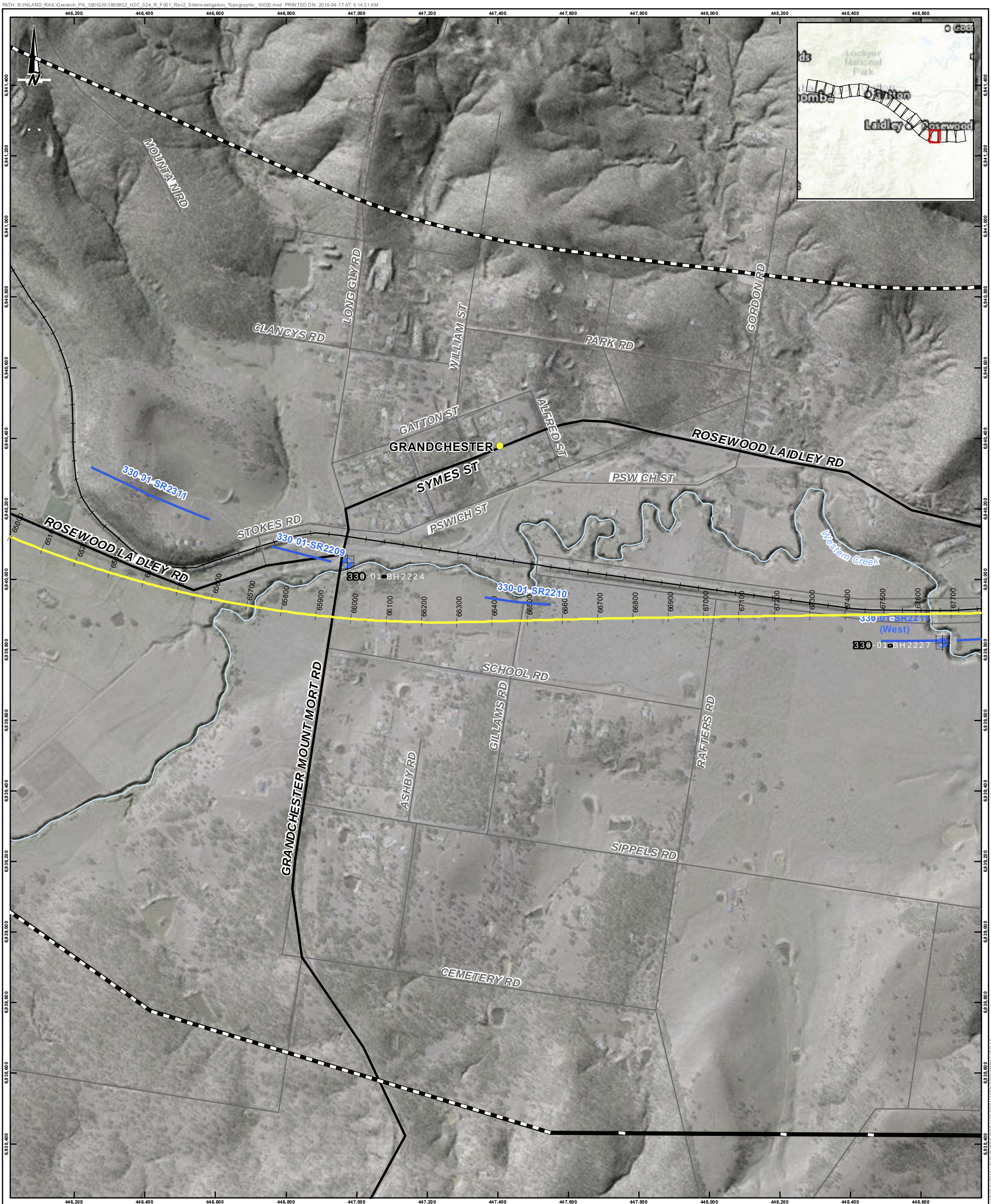
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.16

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:14:21 AM



LEGEND

- Bridge Borehole with Monitoring Well
- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

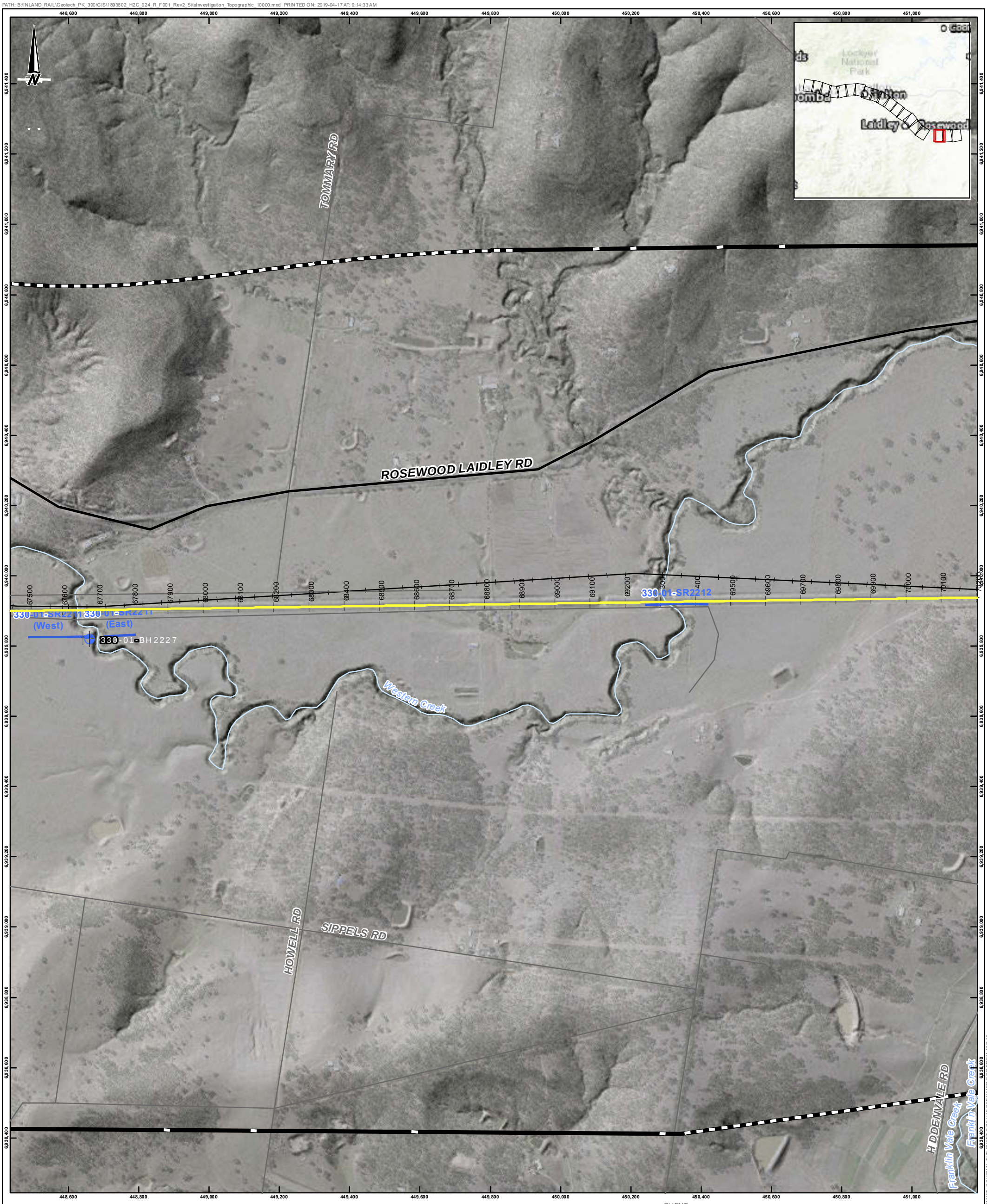
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.17

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:14:33 AM



LEGEND

- Bridge Borehole with Monitoring Well
- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

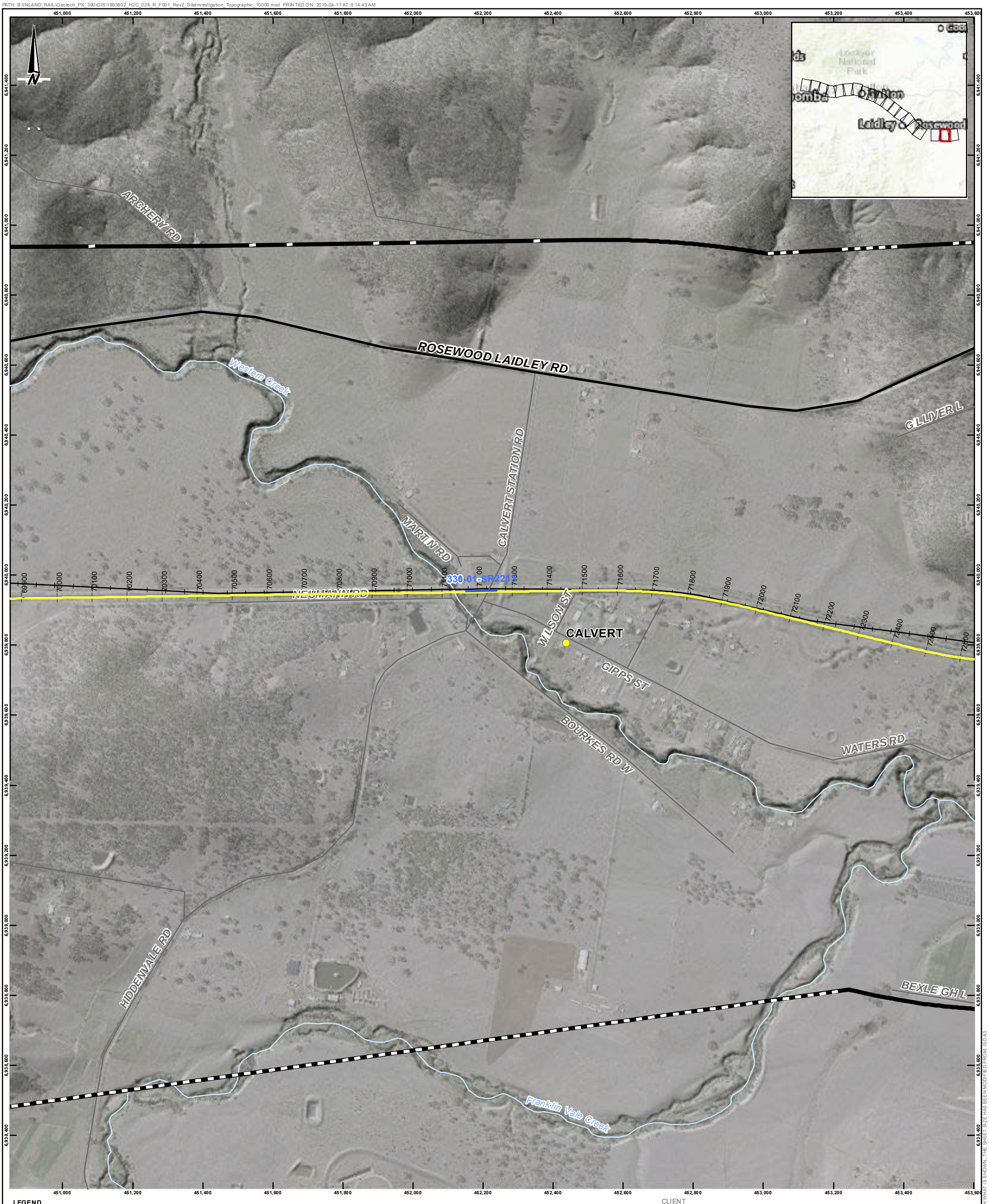
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.18

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:14:43 AM



LEGEND

- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

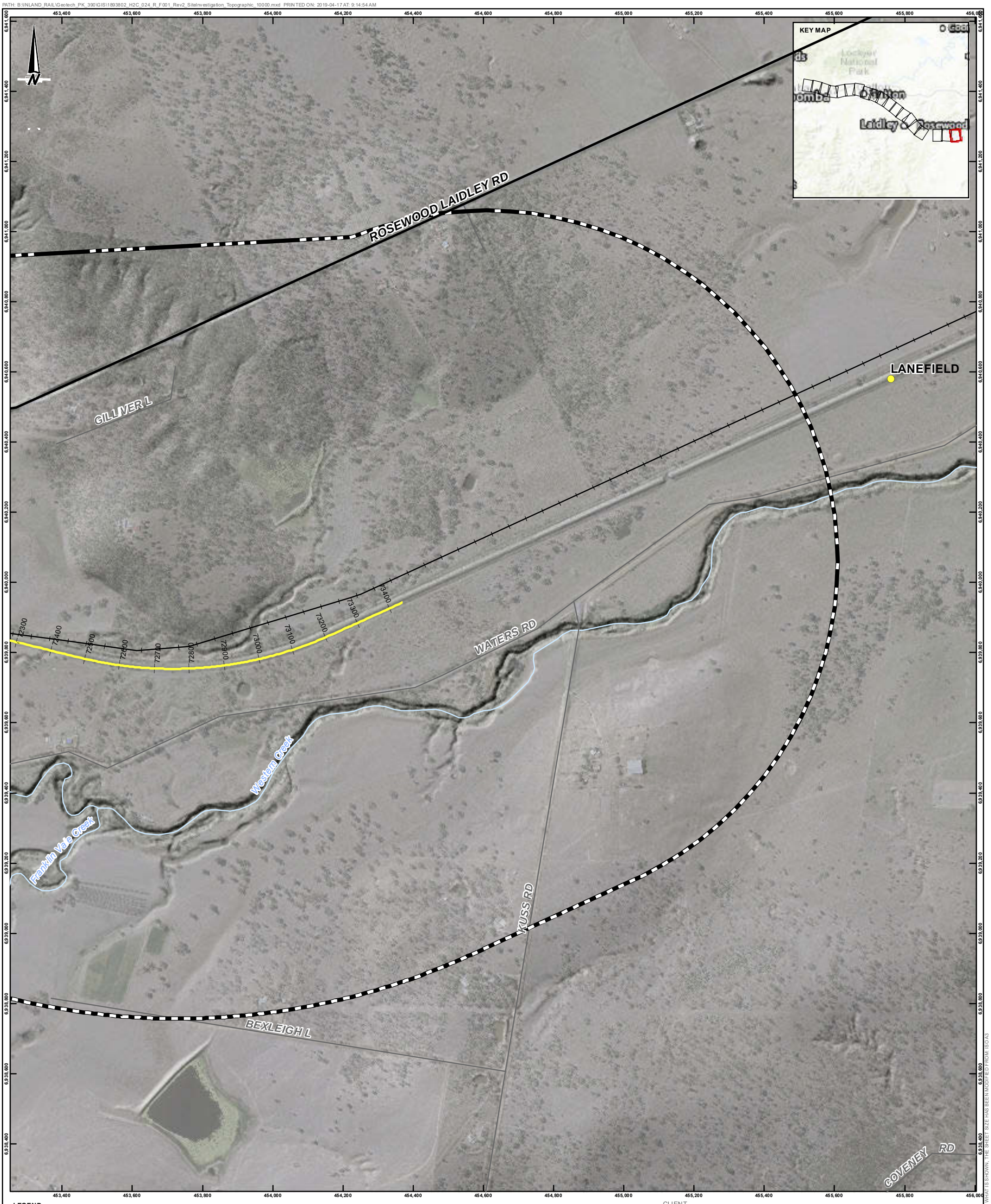
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.19

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F001_Rev2_SiteInvestigation_Topographic_10000.mxd PRINTED ON: 2019-04-17 AT: 9:14:54 AM



453,400 453,600 453,800 454,000 454,200 454,400 454,600 454,800 455,000 455,200 455,400 455,600 455,800 456,000

6,941,600 6,941,400 6,941,200 6,941,000 6,940,800 6,940,600 6,940,400 6,940,200 6,940,000 6,939,800 6,939,600 6,939,400 6,939,200 6,939,000 6,938,800 6,938,600 6,938,400

LEGEND

- H2C Seismic Refraction Lines
- H2C Alignment Centreline
- Major Highway
- Main Road/Street
- Railway
- Water Courses
- H2C 330 Study Area
- Town

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 300 400
Scale: 1:10,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND INVESTIGATION SITE PLAN

CONSULTANT
GOLDER

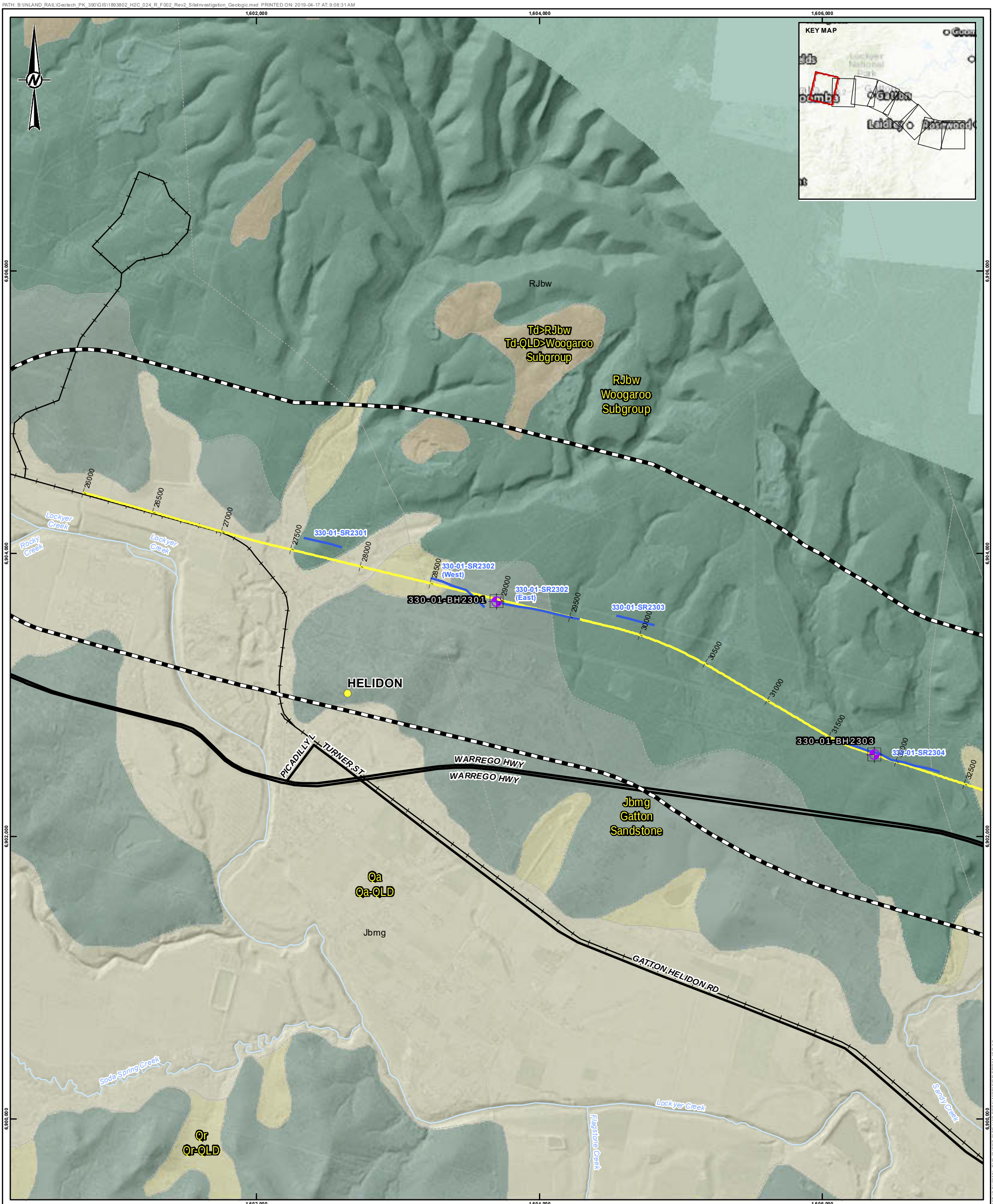
DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
1893803	024	2	1.20

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

0 25mm

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F002_Rev2_SiteInvestigation_Geologic.mxd PRINTED ON: 2019-04-17 AT: 9:08:31 AM



LEGEND

- Cut Borehole with Monitoring Well
- H2C 330 SR Lines (As Acquired)
- H2C Alignment Centreline
- H2C 330 Study Area
- Major Highway
- Railway
- Water Courses
- Solid Geology
- Town

Coordinate System:
GDA 1994 MGA Zone 54
Projection: Transverse Mercator
Datum: GDA 1994

0 500 1,000
Scale: 1:25,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.
Surface & Solid Geology Data:
Qld Government detailed surface geology June 2018.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
© State of Queensland (Department of Natural Resources and Mines), 2016

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND SURFACE GEOLOGY

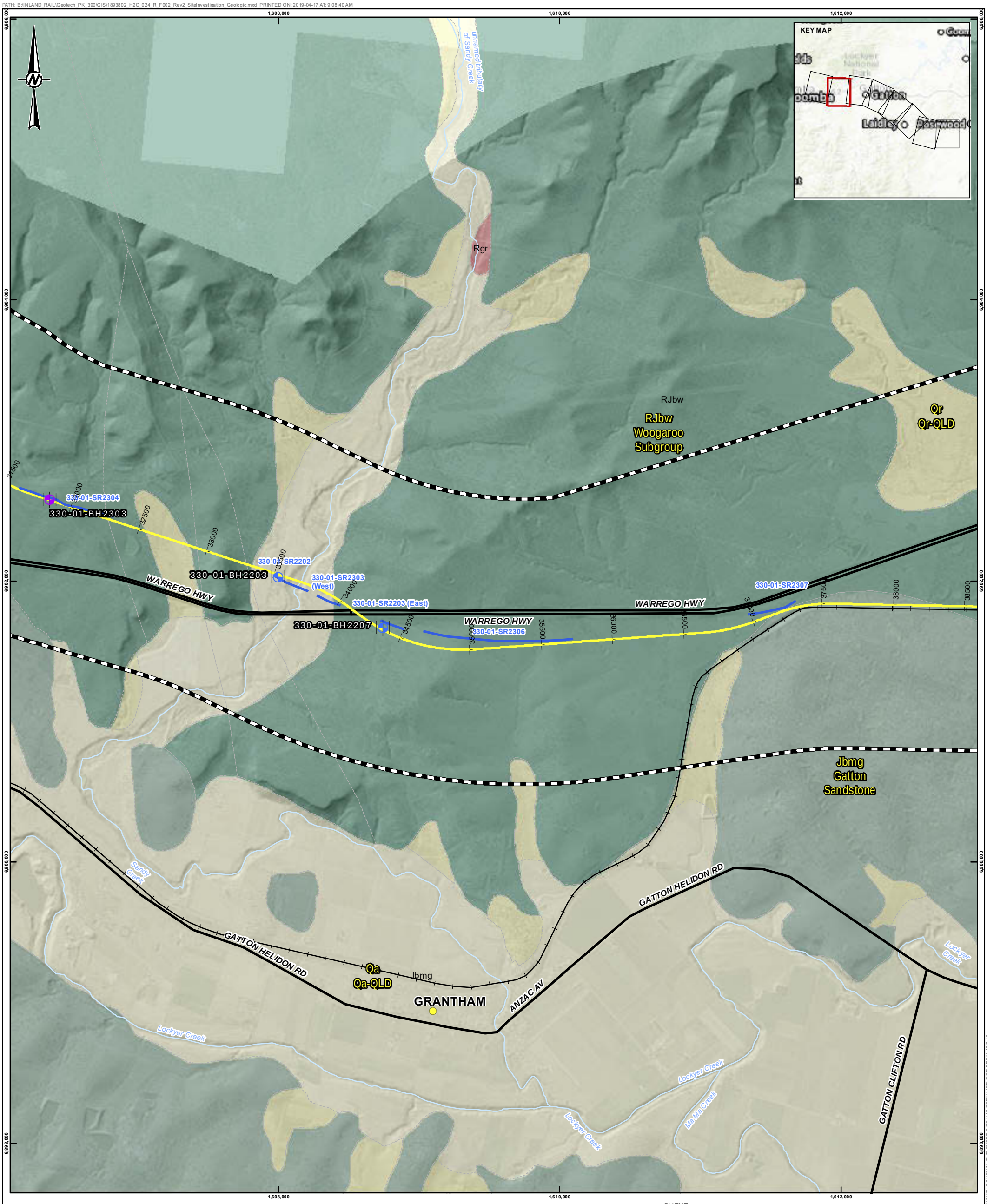
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	SC

PROJECT NO.	CONTROL	REV.	FIGURE
1893802	024	2	2.1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F002_Rev2_SiteInvestigation_Geologic.mxd PRINTED ON: 2019-04-17 AT: 9:08:40 AM



LEGEND

- Bridge Borehole with Monitoring Well
- Cut Borehole with Monitoring Well
- H2C 330 SR Lines (As Acquired)
- H2C Alignment Centreline
- H2C 330 Study Area
- Major Highway
- Railway
- Water Courses
- Solid Geology
- Town

Coordinate System:
GDA 1994 MGA Zone 54
Projection: Transverse Mercator
Datum: GDA 1994

0 500 1,000
Scale: 1:25,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.
Surface & Solid Geology Data:
Qld Government detailed surface geology June 2018.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND SURFACE GEOLOGY

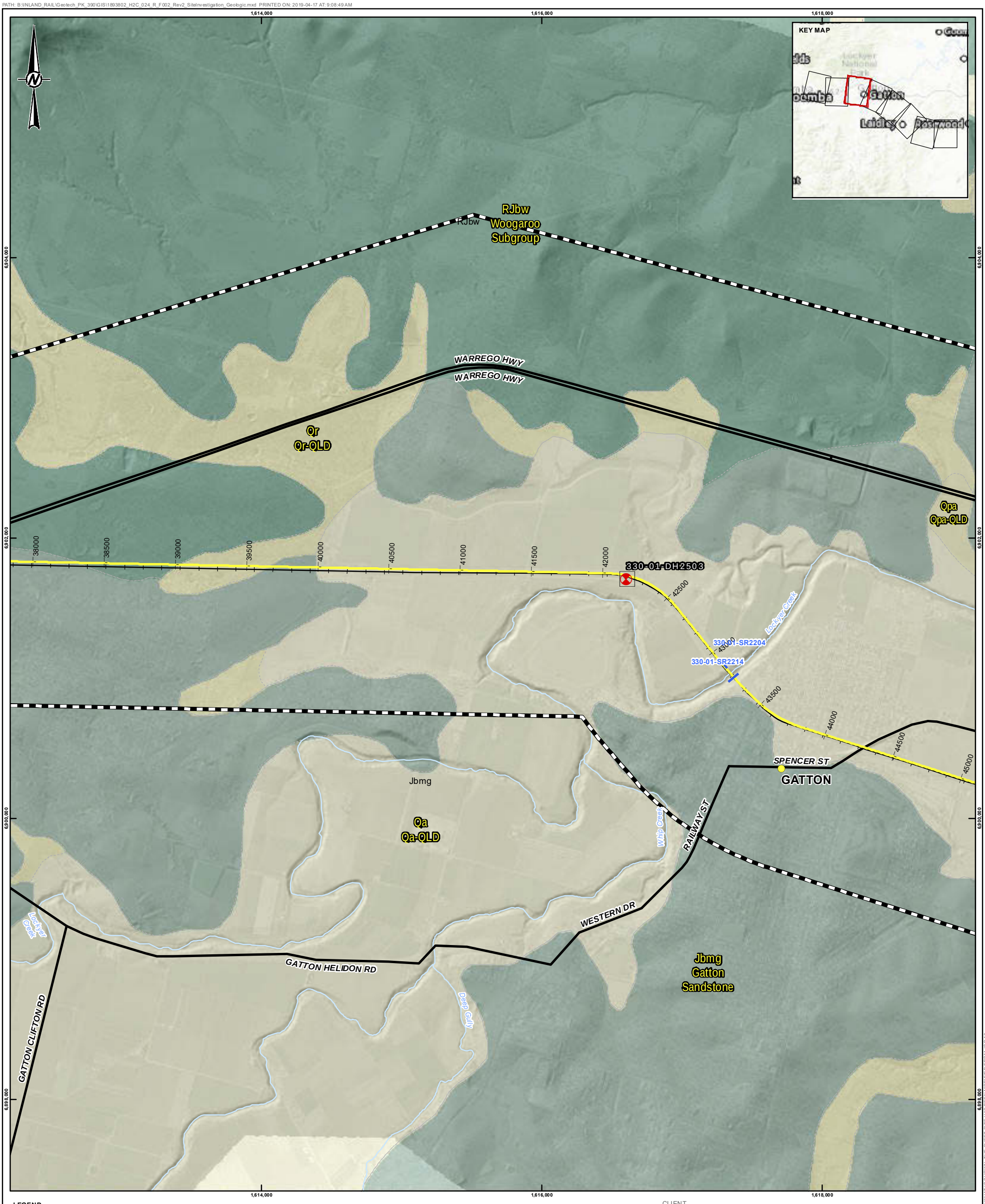
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	SC

PROJECT NO.	CONTROL	REV.	FIGURE
1893802	024	2	2.2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

0 25mm



LEGEND

- Culvert Auger Hole with Monitoring Well
- H2C 330 SR Lines (As Acquired)
- H2C Alignment Centreline
- H2C 330 Study Area
- Major Highway
- Railway
- Water Courses
- Solid Geology
- Town

Coordinate System:
GDA 1994 MGA Zone 54
Projection: Transverse Mercator
Datum: GDA 1994

0 500 1,000
Scale: 1:25,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.
Surface & Solid Geology Data:
Qld Government detailed surface geology June 2018.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND SURFACE GEOLOGY

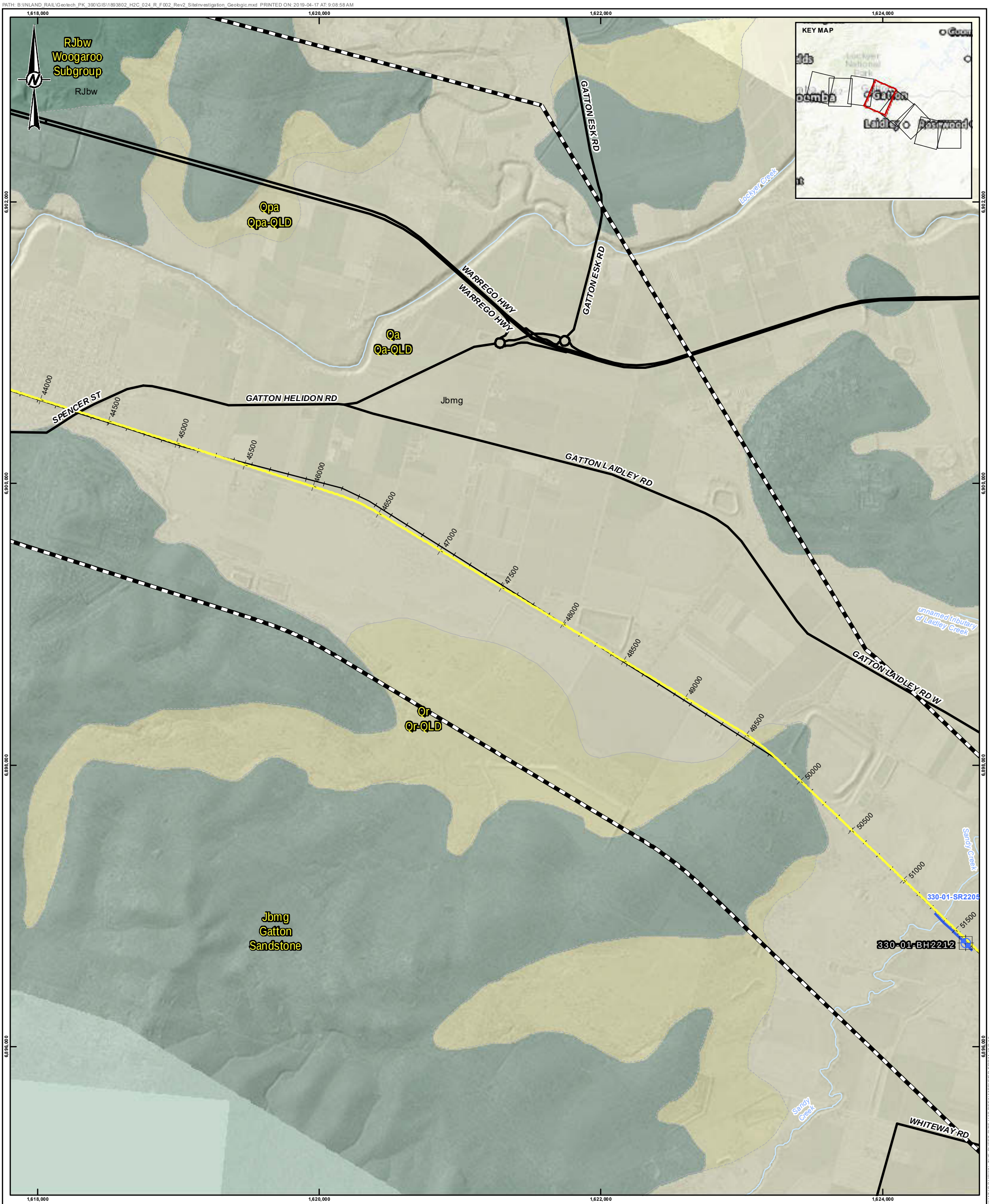
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	SC

PROJECT NO.	CONTROL	REV.	FIGURE
1893802	024	2	2.3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F002_Rev2_SiteInvestigation_Geologic.mxd PRINTED ON: 2019-04-17 AT: 9:08:58 AM



LEGEND

- Bridge Borehole with Monitoring Well
- H2C 330 SR Lines (As Acquired)
- H2C Alignment Centreline
- H2C 330 Study Area
- Major Highway
- Railway
- Water Courses
- Solid Geology
- Town

Coordinate System:
GDA 1994 MGA Zone 54
Projection: Transverse Mercator
Datum: GDA 1994

0 500 1,000
Scale: 1:25,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.
Surface & Solid Geology Data:
Qld Government detailed surface geology June 2018.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

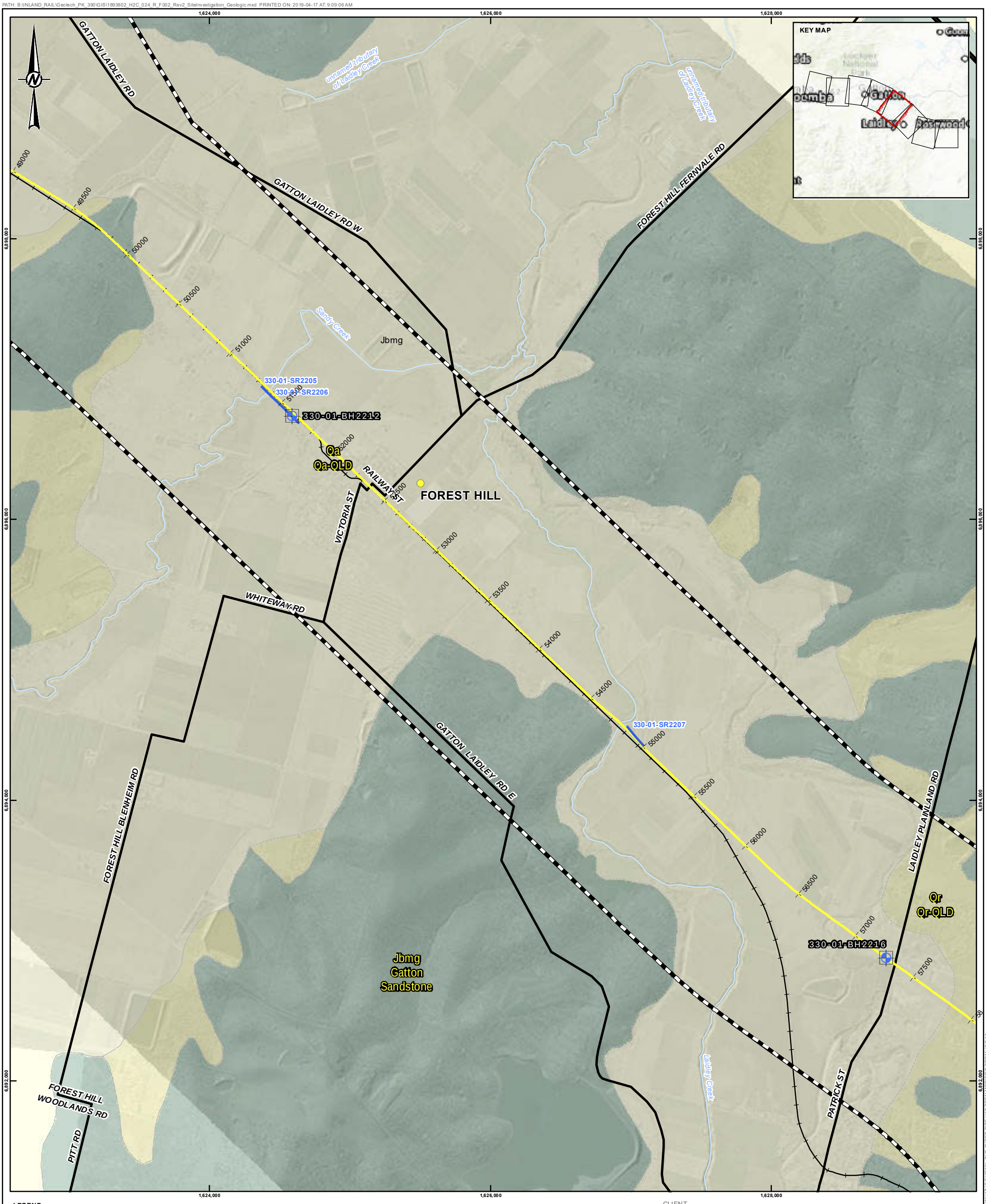
TITLE
H2C ALIGNMENT AND SURFACE GEOLOGY

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	SC

PROJECT NO.	CONTROL	REV.	FIGURE
1893802	024	2	2.4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0



LEGEND

- Bridge Borehole with Monitoring Well
- H2C 330 SR Lines (As Acquired)
- H2C Alignment Centreline
- H2C 330 Study Area
- Major Highway
- Railway
- Water Courses
- Solid Geology
- Town

Coordinate System:
GDA 1994 MGA Zone 54
Projection: Transverse Mercator
Datum: GDA 1994

0 500 1,000
Scale: 1:25,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.
Surface & Solid Geology Data:
Qld Government detailed surface geology June 2018.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

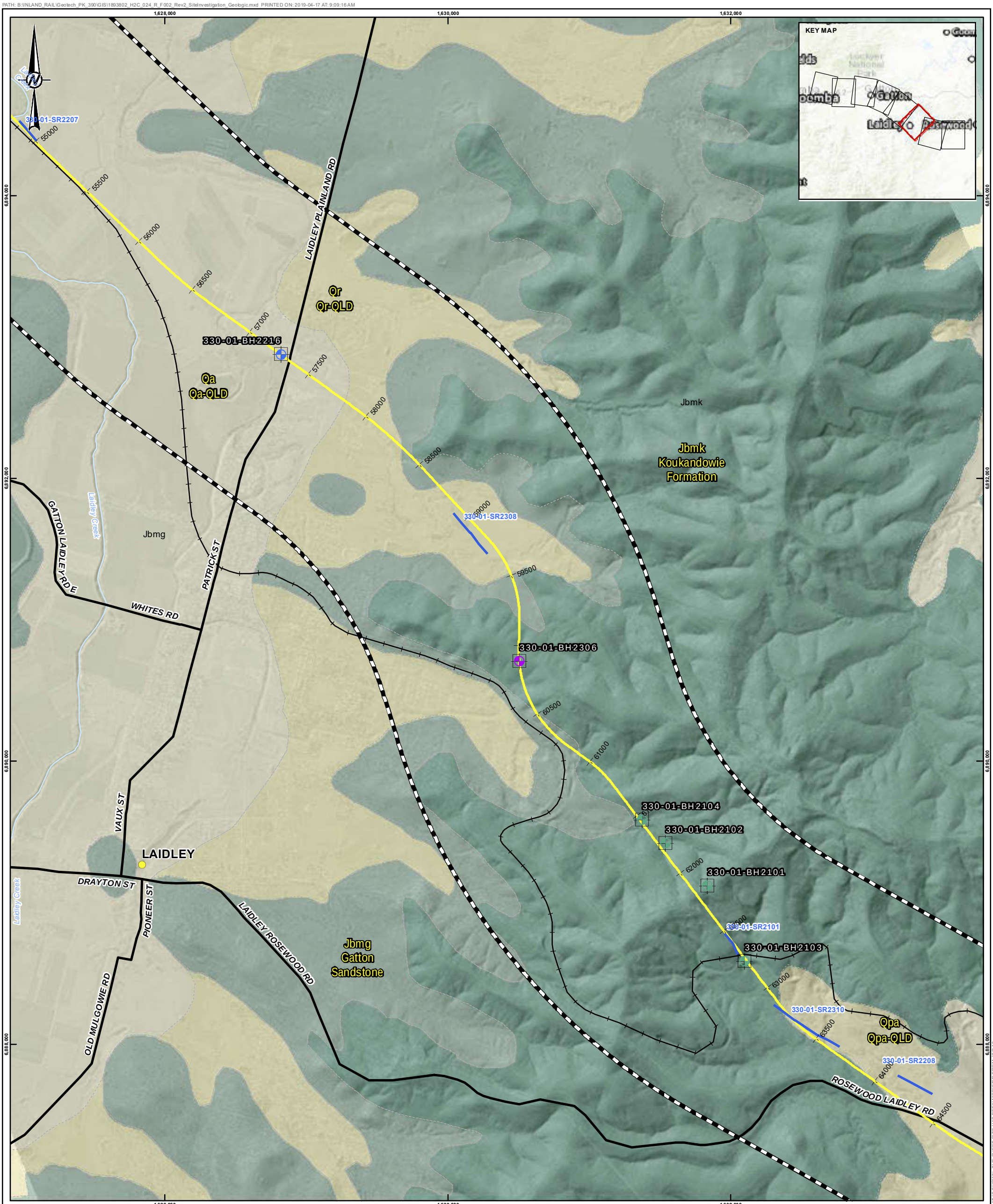
TITLE
H2C ALIGNMENT AND SURFACE GEOLOGY

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	SC

PROJECT NO.	CONTROL	REV.	FIGURE
1893802	024	2	2.5

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F002_Rev2_SiteInvestigation_Geologic.mxd PRINTED ON: 2019-04-17 AT: 9:09:16 AM



LEGEND

- Tunnel Borehole with Monitoring Well
- Bridge Borehole with Monitoring Well
- Cut Borehole with Monitoring Well
- H2C 330 SR Lines (As Acquired)
- H2C Alignment Centreline
- H2C 330 Study Area
- Major Highway
- Railway
- Water Courses
- Solid Geology
- Town

Coordinate System:
GDA 1994 MGA Zone 54
Projection: Transverse Mercator
Datum: GDA 1994

0 500 1,000
Scale: 1:25,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.
Surface & Solid Geology Data:
Qld Government detailed surface geology June 2018.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND SURFACE GEOLOGY

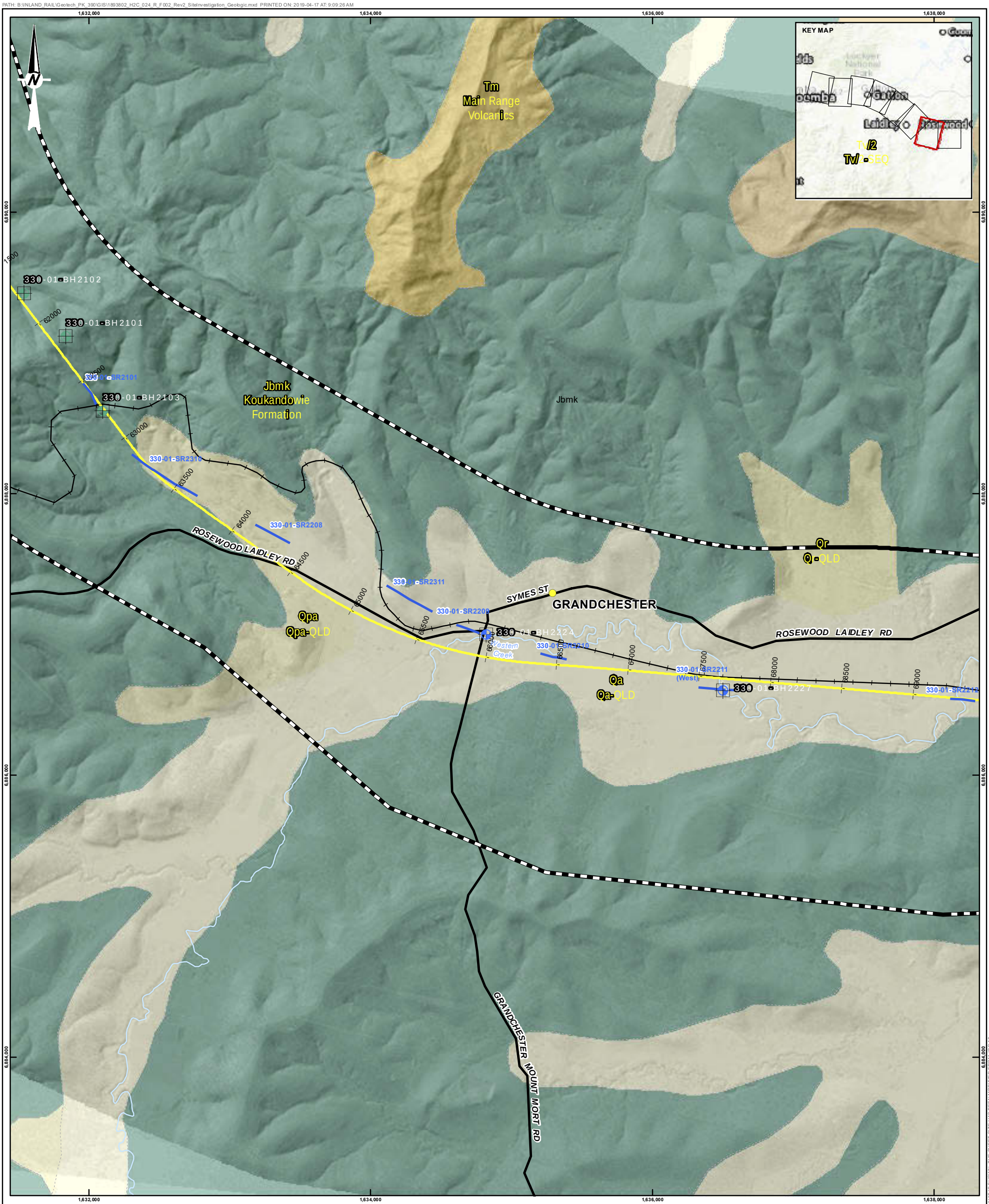
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	SC

PROJECT NO.	CONTROL	REV.	FIGURE
1893802	024	2	2.6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
0 25mm

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F002_Rev2_SiteInvestigation_Geologic.mxd PRINTED ON: 2019-04-17 AT: 9:09:26 AM



LEGEND

- Tunnel Borehole with Monitoring Well
- Bridge Borehole with Monitoring Well
- H2C 330 SR Lines (As Acquired)
- H2C Alignment Centreline
- H2C 330 Study Area
- Major Highway
- Railway
- Water Courses
- Solid Geology
- Town

Coordinate System:
GDA 1994 MGA Zone 54
Projection: Transverse Mercator
Datum: GDA 1994

0 500 1,000
Scale: 1:25,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.
Surface & Solid Geology Data:
Qld Government detailed surface geology June 2018.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND SURFACE GEOLOGY

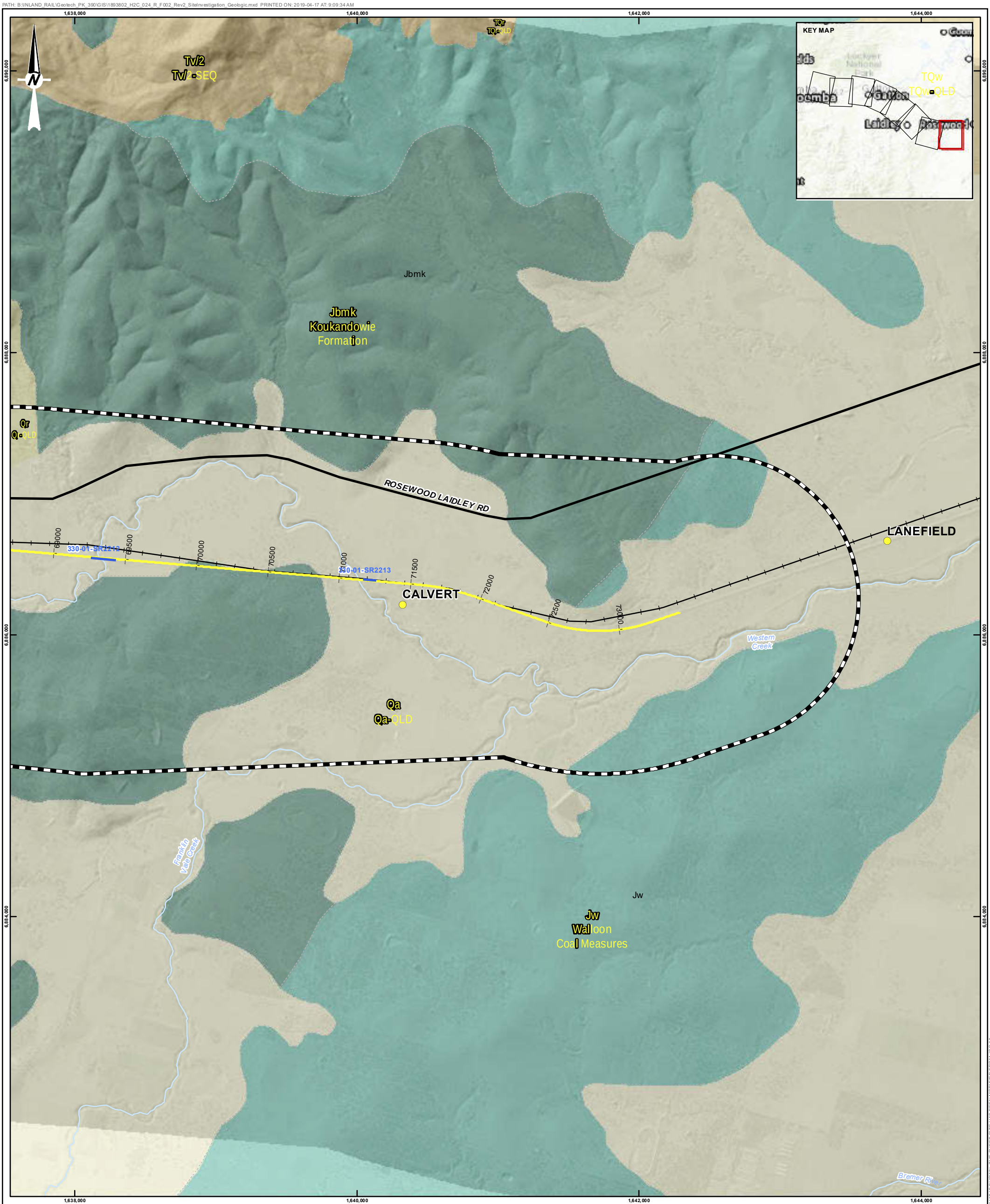
CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	SC

PROJECT NO.	CONTROL	REV.	FIGURE
1893802	024	2	2.7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ISO A3
0 25mm

PATH: B:\INLAND_RAIL\Geotech_PK_390\GIS\1893802_H2C_024_R_F002_Rev2_SiteInvestigation_Geologic.mxd PRINTED ON: 2019-04-17 AT: 9:09:34 AM



LEGEND

- H2C 330 SR Lines (As Acquired)
- H2C Alignment Centreline
- H2C 330 Study Area
- Major Highway
- Railway
- Water Courses
- Solid Geology
- Town

Coordinate System:
GDA 1994 MGA Zone 54
Projection: Transverse Mercator
Datum: GDA 1994

0 500 1,000
Scale: 1:25,000 @ A3 METRES

NOTE(S)

Basemap Data:
1M DEM with x2 vertical exaggeration applied as shaded relief and 30cm Ortho Lidar. Original LiDAR supplied by FFJV.
Surface & Solid Geology Data:
Qld Government detailed surface geology June 2018.

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CLIENT
FUTURE FREIGHT JOINT VENTURE

PROJECT
INLAND RAIL - SECTION 330 (H2C)

TITLE
H2C ALIGNMENT AND SURFACE GEOLOGY

CONSULTANT
GOLDER

DD-MMM-YY	17-APR-19
DESIGNED	MB
PREPARED	MB
REVIEWED	TS
APPROVED	SC

PROJECT NO.	CONTROL	REV.	FIGURE
1893802	024	2	2.8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

Appendix A
H2C Geotechnical Investigation Summary

HELIDON TO CALVERT ENVIRONMENTAL IMPACT STATEMENT

Inland Rail Project - Section 330 Helidon to Calvert: Geotechnical Investigation Details

Investigation Type	Investigation ID	Feature	Approx. As-Drilled Easting ** (MGA '94 Zone 56)	Approx. As-Drilled Northing ** (MGA '94 Zone 56)	Approx. Surface RL (m AHD)*	Final Borehole Depth (m bgl)	Final Monitoring Well Depth (m bgl)	Date Completed
Borehole	330-01-BH2101	Tunnel	443843	6941833	244	130.14	129.00	28 September 2018
Borehole	330-01-BH2102	Tunnel	443525	6942102	165	50.36	50.00	10 September 2018
Borehole	330-01-BH2103	Tunnel	444151	6941339	154	30.8	29.90	19 September 2018
Borehole	330-01-BH2104	Tunnel	443345	6942248	159	31.02	31.00	12 September 2018
Borehole	330-01-BH2203	Bridge	419239	6952190	137	25.18	12.00	24 August 2018
Borehole	330-01-BH2207	Bridge	420000	6951909	141	20.53	20.50	2 September 2018
Borehole	330-01-BH2212	Bridge	436009	6948601	90	27	27.00	20 September 2018
Borehole	330-01-BH2216	Bridge	440527	6945222	97	25.5	25.40	10 October 2018
Borehole	330-01-BH2224	Bridge	446973	6940047	86	26.43	21.40	24 September 2018
Borehole	330-01-BH2227	Bridge	448659	6939820	78	20.09	20.00	30 September 2018
Borehole	330-01-BH2301	Cut	414866	6953376	188	30.99	30.00	16 September 2018
Borehole	330-01-BH2303	Cut	417589	6952572	175	30.91	30.00	3 September 2018
Borehole	330-01-BH2306	Cut	442390	6943263	163	31.06	30.00	5 December 2018
Auger Hole	330-01-DH2503	Culvert	427703	6952700	105	15.07	14.90	24 September 2018

* Surface RL from Data Elevation Model (DEM) derived from LiDAR data, reported to the nearest 1 m. Vertical accuracy is dependent on the accuracy of the horizontal positioning.
** As-drilled coordinates recorded using hand-held GPS.

Appendix B
Geophysics Report

HELIDON TO CALVERT ENVIRONMENTAL IMPACT STATEMENT

IR_1381

APPENDIX B

DATE 9 April 2019 **Reference No.** 1893802-024-R-Rev2

TO Future Freight Joint Venture (FFJV)

FROM Tariq Rahiman **EMAIL** trahiman@golder.com.au

RESULTS OF GEOPHYSICS INVESTIGATIONS COMPLETED AS PART OF THE FEASIBILITY PHASE FOR THE INLAND RAIL PROJECT – SECTION 330, HELIDON TO CALVERT

1.0 INTRODUCTION

This report presents the results of the geophysical investigation for the Section 330, Helidon to Calvert (H2C) component of the feasibility phase of the Inland Rail project for the Future Freight Joint Venture (FFJV). These surveys were completed using the seismic refraction (SR) survey method, which is used to complement the geotechnical intrusive investigations. A total of 26 seismic lines were acquired, located at proposed bridge, cut and tunnel portal sites along the proposed rail alignment between Helidon, QLD and Calvert, QLD. This report also presents the results of the borehole televiewer (TV) surveys completed in boreholes 330-01-BH2101 and 330-01-BH2102 on 24 September 2018 and 7 September 2018, respectively.

The purpose of the SR surveys was to assist in confirming or repositioning proposed intrusive investigation locations, to provide a more continuous record of subsurface conditions and to assess depth to bedrock. The TV surveys were completed for the purpose of measuring in-situ rock fabric and defect properties, particularly their orientations, in the boreholes.

Most of the SR fieldwork was undertaken in two separate mobilisations from 17 to 26 July 2018, and 20 to 23 August 2018, with additional survey days on 11 August 2018 and 11 September 2018.

2.0 SEISMIC REFRACTION METHODOLOGY

The seismic refraction (SR) method utilises the P-wave (first arrival) signal of the seismic record. The P-wave velocity is directly controlled by the parameters of elasticity (moduli) and density of the subsurface strata. The SR method can yield the subsurface P-wave velocity structure, which can be used to help model subsurface stratigraphic and structural characteristics. Where a significant change in P-wave velocity occurs (e.g. soil/rock interface), estimates of the depth to layer interfaces can be made for assessing depth to bedrock and thickness of overburden.

The seismic survey was carried out in accordance with *ASTM Standard D5777: Standard Guide for Using the Seismic Refraction Method for Subsurface Investigation*. Surveying was completed using Geometrics Geode seismographs with 24- or 48-channels and an overlap of two geophones between adjacent spreads. Acquisition was controlled with a laptop computer and Geometrics MGOS software.

Adjacent spreads had an overlap of two geophones to ensure better continuity of the data on the refractors being mapped, and to achieve greater depth coverage along the survey line. Furthermore, additional off-end shots were used at each end of overlapping spreads, resulting in reversed coverage seismic data, in accordance with accepted industry practice.

The following acquisition parameters were used during data acquisition:

- Record interval: 62.5 µs
- Record length: 0.3 s to 0.5 s

In each seismic spread, twenty-four or forty-eight 14 Hz geophones with 75 mm tapered spikes were rigidly coupled with the ground at 4 m intervals and connected via one or two 24-channel multi-core “take out” cables. Seismic energy was provided using a 6 kg sledge hammer striking a metallic plate at shot location spaced 20 m to 24 m along the line. The signal-to-noise ratio was improved by signal stacking (i.e. hitting repeatedly at the same shot location) which sums the amplitude of the coherent seismic signals while reducing the amplitude of the random noise. Five to twenty stacks were typically needed at each shot location to provide adequate signal-to-noise ratio.

3.0 SR FIELD WORK

A total of 26 lines were acquired along Section 330 with the number spreads in a line ranging from 1 to 12, resulting in line lengths of 92 m to 1060 m. A total of 86 spreads and 7788 line-metres were surveyed. Thick vegetation requiring clearing along some lines, and livestock were encountered on some properties. Vehicle access was limited at some sites requiring equipment to be carried onto the investigation alignment.

Details of the seismic lines are provided in Table 1. Line 330-01-SR2302 was split into two lines due to intersection of Seventeen Mile Road. Line 330-01-SR2304 had slight kinks due to bends in the proposed rail alignment and obstructions. Line 330-01-SR2204 and 330-01-SR2214 are separated by a creek and are oriented orthogonal to each other. Line 330-01-SR2211 is split into two lines parallel to alignment due to a creek.

All coordinates were recorded with a Trimble Geo7x handheld GPS. The coordinate system used is GDA94, MGA Zone 56.

Table 1: Seismic Refraction Survey Lines Summary

Seismic Line Name	Proposed Structure	Line Orientation (Approx.)	Start of Line (Approx.)		End of Line (Approx.)		Survey Length (m)	Number of spreads (24 channel equivalent)
			Easting	Northing	Easting	Northing		
330-01-SR2301	Cut	W-E	413486	6953688	413757	6953647	276	3
330-01-SR2302	Cut	W-E	414390	6953495	414787	6953327	444	5
330-01-SR2302_2	Cut	W-E	414844	6953381	415452	6953307	620	7
330-01-SR2303	Cut	W-E	415702	6953359	415975	6953319	276	3
330-01-SR2304	Cut	W-E	417370	6952634	418050	6952496	708	8
330-01-SR2202	Bridge	W-E	419212	6952194	419458	6952108	268	3
330-01-SR2203	Bridge	W-E	419520	6952085	419692	6952031	180	2
330-01-SR2203_2	Bridge	W-E	419979	6951956	420153	6951909	180	2
330-01-SR2306	Cut	W-E	420287	6951909	421339	6951961	1060	12
330-01-SR2307	Cut	W-E	422536	6952250	422864	6952378	356	4
330-01-SR2204	Bridge	NW-SE	428468	6952149	428403	6952213	92	1

Seismic Line Name	Proposed Structure	Line Orientation (Approx.)	Start of Line (Approx.)		End of Line (Approx.)		Survey Length (m)	Number of spreads (24 channel equivalent)
			Easting	Northing	Easting	Northing		
330-01-SR2214	Bridge	SW-NE	428487	6952053	428552	6952117	92	1
330-01-SR2205	Bridge	NW-SE	435773	6948787	435919	6948669	188	2
330-01-SR2206	Bridge	NW-SE	435916	6948671	436062	6948551	188	2
330-01-SR2207	Bridge	NW-SE	438692	6946534	438558	6946664	188	2
330-01-SR2308	Cut	NW-SE	441830	6944243	442094	6943984	372	4
330-01-SR2101	Tunnel Portal	NW-SE	443997	6941515	444103	6941378	180	2
330-01-SR2310	Cut	W-E	444385	6941055	444872	6940810	556	6
330-01-SR2208	Bridge	W-E	445291	6940650	445546	6940546	276	3
330-01-SR2311	Cut	W-E	446246	6940317	446584	6940168	372	4
330-01-SR2209	Bridge	W-E	446758	6940092	446928	6940049	176	2
330-01-SR2210	Bridge	W-E	447363	6939949	447549	6939928	188	2
330-01-SR2211	Bridge	W-E	448485	6939825	448673	6939827	188	2
330-01-SR2211_2	Bridge	W-E	448700	6939827	448791	6939831	92	1
330-01-SR2212	Bridge	W-E	450241	6939917	450419	6939919	180	2
330-01-SR2213	Bridge	W-E	452149	6939954	452241	6939955	92	1
Total							**7788**	**86**

4.0 SR ANALYSIS

The digitally acquired seismic data was initially processed using the commercially available SeisImager 2D software package by Geometrics. The spread geometries were set up and the first arrival picks of individual shot records were selected manually using the Pickwin module. The reciprocal travel times for all reciprocal shots were checked and corrected by rechecking picks.

First arrivals from all individual shots within each specific seismic spread were saved to create travel time curves for further analysis. Surface elevations along the seismic lines were extracted from the 1 m digital elevation model (DEM) received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey). The surface elevation data for all geophones were appended to the traveltime data prior to modelling.

The travel time curves were analysed in Rayfract (v3.34) using the tomographic inversion method. Rayfract is based upon the wavepath eikonal travel time (WET) inversion method. Rather than modelling the earth as distinct velocity layers, as is done in traditional seismic refraction analysis, the tomographic inversion module models the earth as discrete model blocks, or cells, of a chosen size where seismic velocity can be different for each model cell. During computation of the tomographic inversion model cell velocities are adjusted, through iterative ray tracings using a seismic velocity model, to optimise the least-squares misfit between model-calculated travel-times and actual data travel-times.

5.0 RESULTS AND INTERPRETATION

5.1 SR Results

The processed seismic refraction P-wave velocity (V_P) sections are shown in Figures A01 to A48 in Attachment A. The sections are presented at a natural scale with no vertical exaggeration. The distance shown (on the x-axis) refers to the plan distance from the beginning of the line. The elevation values (on the y-axis) are the reduced levels (RL) relative to the Australian Height Datum (AHD), as extracted from the DEM.

In general, the recorded seismic data quality was fair to excellent and generally allowed good to high confidence with the picking of the first break picks. Depth of penetration was generally between 30 m to 40 m, although reduced penetration depths were encountered in some locations due to ground conditions and/or background noise. Modelled P-wave velocities ranged from 300 m/s to greater than 3000 m/s.

In general, an increase in seismic velocity in sediment or soil layers indicates an increase in density and/or stiffness. Increases in seismic velocity within rock can indicate a decrease in weathering, a decrease in the degree of fracturing, or an increase in material strength. However, it should be noted that a given seismic velocity cannot uniquely define engineering properties of soil or rock. For example, the same seismic velocity can be derived from (a) sparsely fractured medium strength rock, (b) highly fractured, high strength rock, or (c) from interlayered extremely low and high strength rock.

5.2 SR Interpretation

An interpretation of the seismic sections has been made based on an understanding of the site geology, borehole data, and previous experience on the relationship between P-wave velocity and properties of soil and rock. This interpretation provides an indication of what the seismic P-wave velocities may represent in terms of soil and rock properties along the survey lines.

Six boreholes in Section 330 were drilled along or near a seismic line and these are presented as graphical logs overlaid on the seismic refraction sections in the figures as listed in Table 2 below.

Table 2: List of Figures Showing Borehole Logs Overlain on Seismic Sections.

Figure	Seismic Line	Borehole
A06	330-01-SR2302_2	330-01-BH2301
A13	330-01-SR2304	330-01-BH2303
A16	330-01-SR2202	330-01-BH2203
A19	330-01-SR2203_2	330-01-BH2207
A31	330-01-SR2206	330-01-BH2212
A44	330-01-SR2211	330-01-BH2227

Correlation of the modelled seismic velocities with the available borehole data was found to be variable. The borehole data generally showed a 3-layer geological model, comprising dry soils overlying saturated soils/weathered rock, underlain by less weathered medium strength rock. Using data from boreholes the top of the saturated soils/weathered rock was generally found to correlate with seismic velocities of between 900 to 1200 m/s, whilst the top of medium strength or better rock was found to correlate with seismic velocities of between 1900 m/s and 2300 m/s.

This assessment of the V_P modelled values against the materials encountered in the boreholes has allowed a generalised site-specific correlation of the V_P values to subsurface material properties to be defined. The inferred top of saturated firm to very stiff/very dense residual soils or distinctly weathered, low strength rock on the seismic velocity sections is represented by the 1200 m/s contour. The inferred base of weathering (i.e. saturated very stiff/very dense residual soils to distinctly weathered rock) or top of medium strength rock is represented by the 2100 m/s contour. The 1200 m/s and 2100 m/s velocity contours have been shown on Figures A01 to A48 as thickened dashed lines (narrow dash for 1200 m/s and wide dash for 2100 m/s).

Table 3 is provided as a guide for interpreting the seismic P-wave velocities along Section 330.

Table 3: Inferred P-wave Velocity Range of Summarised Units along Section 330.

Unit	Material and Properties	P wave Velocity Interval (m/s)
1	Dry Tops Soils, Loose to Very Dense Alluvium or Residual Soil	300 to 1200
2	Saturated Firm to Very Stiff / Very Dense Residual Soils or Distinctly Weathered, Low Strength Rock	1200 to 2100
3	Distinctly Weathered to Fresh, Low to High Strength or better Rock	>2100

Table 4 summaries the interpretation for each seismic line using the interpretation guide defined above.

Table 4: Interpretation Summary

Line Name	Figure(s)	Penetration Depth (m)	Interpretation
330-01-SR2301	A01, A02	>40	Depth to top of Unit 2 ranges from 2 m to 4 m. Depth to top of Unit 3 ranges from 7.5 m at 40 m distance along line, to 19 m at 120 m distance along line, averaging about 12 m deep. The inferred top of Unit 3 is relatively flat to gently undulating along the length of the line.
330-01-SR2302	A03 – A05	20 – 40	Depth to top of Unit 2 ranges from 1 m to 2.5 m. Depth to top of Unit 3 ranges from 3.5 m at 360 m distance along line, to 16 m at 225 m distance along line. The inferred top of Unit 3 increases in depth from 4.5 m at the western end of the line (88 m distance) to 16 m depth at 225 m distance. Unit 3 is relatively shallow for the remainder of the seismic profile.
330-01-SR2302_2	A06 – A09	10 – 40	Borehole 330-01-BH2301 is located at 22 m distance along the seismic line. Unit 1 is 1.5 m thick and comprises clayey sand at this location. Unit 2 is 3.5 m thick and was logged as extremely to highly weathered sandstone. The interpreted top of Unit 3, which is logged

Line Name	Figure(s)	Penetration Depth (m)	Interpretation
			as medium inferred strength sandstone, coincides with the 2000 m/s velocity contour at this location. Rock is interpreted to be very shallow along most of the seismic line. From 530 m distance to the end of the line, Unit 3 is interpreted to increase in depth from about 3 m to 15 m.
330-01-SR2303	A10 – A11	15 – 40	Depth to top of Unit 2 ranges from 1 m to 3 m. Depth to top of Unit 3 ranges from 2.5 m at 240 m distance along line, to 6.5 m at 110 m distance along line, and averages about 4 m depth. The inferred top of Unit 3 is relatively flat to gently undulating along the length of the line which indicates a relatively uniform rock elevation.
330-01-SR2304	A12 – A15	10 – 40	Borehole 330-01-BH2303 is located at 228 m distance along the seismic line and is offset 13 m to the south. Shallow rock (sandstone) was encountered in this borehole and the seismic section indicates very shallow rock from 0 m to 470 m distance along line. Rock was noted to be outcropping on the eastern slope of the hill with some geophones placed directly in rock. Unit 2 increases in thickness towards each end of the line which is interpreted so show an increasingly thick weathered rock layer above higher strength rock. This line was extended from the planned length towards Line 330-01-SR2201, which could not be fully surveyed due to access constraints.
330-01-SR2202	A16, A17	20 – 30	Borehole 330-01-BH2203 is located at a distance of 27 m along the seismic line and is offset 7 m to the north. Unit 1 is comprised of variable alluvium and is 9 m thick. The top of Unit 2 is at the top of a very dense gravelly SAND. Rock was logged from a depth of 14 m, with the top 1 m logged as highly weathered and a low inferred strength. The top of Unit 3 is interpreted at 15 m depth which coincides with a transition to slightly weathered to fresh rock (sandstone and conglomerate) and medium inferred strength. The top of Unit 3 at this location corresponds approximately with the 2200 m/s contour. The interpreted 1200 m/s and 2100 m/s contours, which correspond to the top of Unit 2 and Unit 3 respectively,

Line Name	Figure(s)	Penetration Depth (m)	Interpretation
			are relatively flat along the length of the line. The thickness of Unit 1 varies with the surface topography, being thickest at each end of the line and thinnest in the central topographic low.
330-01-SR2203	A18	20 – 30	Depth to top of Unit 2 ranges from 5.5 m to 9.5 m. Depth to top of Unit 3 ranges from 11 m at 40 m distance along line, to 15 m at 145 m distance along line. The inferred top of Unit 3 is relatively flat to gently undulating along the length of the line.
330-01-SR2203_2	A19	15 – >20	Borehole 330-01-BH2207 is located at a projected distance of 33 m along the seismic line and is offset 40 m to the south. The borehole log shows a thin layer of sand overlying extremely to highly weathered sandstone at a depth of 2 m. This unit presents properties of residual soil. The top of Unit 2 is interpreted at a depth of 6.6 m, which corresponds with a transition to higher SPT blow counts (N=R) and a colour change in the sandstone. The top of Unit 3 corresponds with the transition to rock, which is logged as medium strength sandstone. The interpreted tops of Unit 2 and Unit 3 are flat to undulating and gradually increase in elevation to the east.
330-01-SR2306	A20 – A25	20 – 40	Depth to top of Unit 2 ranges from 1.5 m to 5.5 m. Depth to top of Unit 3 ranges from 4.5 m at 640 m distance along line, to 19 m at 335 m distance along line. The inferred top of Unit 3 is relatively flat in the western most section of the line (0 m to 300 m), then begins dipping to its maximum depth (310 m to 410 m) before shallowing in the centre of the line (560 m to 700 m) and then deepens again and gently undulates along the remaining length of the line.
330-01-SR2307	A26, A27	10 – 40	Depth to top of Unit 2 ranges from 3 m to 5 m. Depth to top of Unit 3 ranges from 5.5 m at 270 m distance along line, to 9 m at 320 m distance along line. The inferred top of Unit 3 is gently undulating along the length of the line.
330-01-SR2204	A28	>30	This line was located adjacent to the existing railway on the west side of Lockyer Creek. Depth to top of Unit 2 ranges from 20 m to 23 m. Depth to top of Unit 3 ranges

Line Name	Figure(s)	Penetration Depth (m)	Interpretation
			from 28.5 m to 31.5 m. The inferred top of Unit 3 gently undulates along the length of the line. This seismic section displays a thick soil/weathered rock profile.
330-01-SR2214	A29	>30	This line was located on the east side of Lockyer Creek and runs perpendicular to the alignment. It was acquired underneath the existing rail bridge. Depth to top of Unit 2 ranges from 1 m to 4 m. Depth to top of Unit 3 ranges from 5 m to 13 m. The inferred top of Unit 3 is highly undulating which may indicate a variable rock profile.
330-01-SR2205	A30	>40	Depth to top of Unit 2 ranges from 7.5 m to 9 m. Depth to top of Unit 3 ranges from 12.5 m at 70 m distance along line, to 24 m at 140 m distance along line. The inferred top of Unit 3 is relatively flat from 0 m to 100 m (RL 78 m), before dipping to 24 m depth (RL 67 m) at 140 m distance along line. Using Borehole 330-01-SR2212 and the adjacent seismic line 330-01-SR2206 as reference, at this location the transition to Unit 2 may be related more to saturation effects than a change in lithology.
330-01-SR2206	A31	>40	Borehole 330-01-SR2212 is located at 116 m distance along the seismic line and is approximately 6 m to the NE of the line. The borehole log shows a thick clay unit(s), overlying sand and sandstone. There are apparent saturation effects along this line with the inferred top of Unit 2 corresponding with the 1500 m/s contour. The 1200 m/s contour at this location does not correlate with a distinct lithological transition in comparison with the boreholes at other locations along the alignment. The transition to Unit 3 corresponds with the top of medium inferred strength sandstone at a depth of 24.6 m, and a seismic velocity of 2250 m/s.
330-01-SR2207	A32	>30	Depth to top of Unit 2 ranges from 8.5 m to 15.5 m. Depth to top of Unit 3 ranges from 20 m at 155 m distance along line, to 29 m at 50 m distance along line. The inferred top of Unit 3 is gently undulating along the length of the line.
330-01-SR2308	A33 – A34	>40	This line displays a relatively uniform increase in velocity with increasing depth. Depth to top of Unit 2 ranges from

Line Name	Figure(s)	Penetration Depth (m)	Interpretation
			5.5 m to 8 m. Depth to top of Unit 3 ranges from 16 m at 325 m distance along line, to 22 m at 220 m distance along line. The inferred top of Unit 3 is relatively flat to gently undulating along the length of the line.
330-01-SR2101	A35	7 - >40	The western half of Line 330-01-SR2101 (proposed tunnel portal site) was located over an area with a cover of boulders and cobbles at surface. This part of the model is characterised by a shallow layer with moderate velocities. Limited penetration was achieved on this part of the line, likely to be resulting from the near-surface conditions. The eastern part of the model along the steep slope indicates a much deeper soil / weathered rock profile, with the top of Unit 3 up to 40 m deep. Exposed rock was observed in the field 2 m from the eastern end of the seismic line.
330-01-SR2310	A36 – A38	30 – >40	Depth to top of Unit 2 ranges from 5 m to 11 m. Depth to top Unit 3 ranges from 10.5 m at 340 m distance along line, to 18.5 m at 210 m distance along line. The inferred top of Unit 3 is relatively flat to gently undulating along the length of the line.
330-01-SR2208	A39, A40	20 – >30	Depth to top of Unit 2 ranges from 7.5 m to 12 m. Depth to top of Unit 3 ranges from 14.5 m at 155 m distance along line, to 19.5 m at 50 m distance along line. The inferred top of Unit 3 is relatively flat to gently undulating along the length of the line.
330-01-SR2311	A41, A42	>40	Depth to top of Unit 2 ranges from 2.5 m to 21 m. Depth to top of Unit 3 ranges from 21 m at 270 m distance along line, to 40 m at 90 m distance along line. The inferred top of Unit 3 is relatively flat to gently undulating along the length of the line.
330-01-SR2209	A43	>40	Depth to top of Unit 2 ranges from 4.5 m to 6 m. Depth to top of Unit 3 ranges from 12.5 m at 150 m distance along line, to 19.5 m at 40 m distance along line. The inferred top of Unit 3 is relatively flat to gently undulating along the length of the line. Dips in the velocity contours at the ends of the line may be edge effects of the model.
330-01-SR2210	A44	>40	Depth to top of Unit 2 ranges from 6 m to 9 m. Depth to top of Unit 3 ranges from 12.5 at 20 m distance along line, to 17.5 m at 70 m distance along line. The inferred top of Unit 3 is relatively flat to gently undulating along the length of the line.

Line Name	Figure(s)	Penetration Depth (m)	Interpretation
330-01-SR2211	A45	>40	Borehole 330-01-BH2227 is located at a distance of 174 m along the seismic line. The borehole does not indicate a lithological or hydrogeological boundary which coincides with the 1200 m/s contour, which is elsewhere interpreted as the top of Unit 2. Although the 1200 m/s contour is presented as a dashed line this may not be related to a specific material boundary at this location. The top of Unit 2 has not be shown in the graphical borehole log overlaid on the seismic profile. The top of Unit 3 has been inferred where there was refusal during the SPT test. This unit was logged as sand (extremely weathered sandstone). It should be noted that the dipping contours at the edges of the model may be an edge effect of the modelling process.
330-01-SR2211_2	A46	20	The west and east sections of Line 330-01-SR2211 were separated by Western Creek. Depth to top of Unit 2 ranges from 9 m to 11.5 m. Depth to top of Unit 3 ranges from 14 m at 20 m distance along line, to 17.5 m at 75 m distance along line. The inferred top of Unit 3 is relatively flat to gently undulating along the length of the line.
330-01-SR2212	A47	20 – 30	Line 330-01-SR2212 was acquired adjacent to an existing rail bridge and crosses a dry creek (Western Creek). Rock outcrop was encountered at 76 m distance along line. Depth to top of Unit 2 ranges from 2 m to 10 m. Unit 2 is shallowest at the centre of the creek. Depth to top of Unit 3 ranges from 11 m at 40 m distance along line, to 20 m at 100 m distance along line. The inferred top of Unit 3 is relatively flat to gently undulating along the length of the line.
330-01-SR2213	A48	>20	Depth to top of Unit 2 ranges from 8.5 m to 9.5 m. Depth to Unit 3 ranges from 17 m at 20 m distance along line, to 21.5 m at 40 m distance along line. The inferred top of Unit 3 is relatively flat along the length of the line but dips between 30 m and 50 m distance along line. The 2100 m/s contour does present as an abrupt transition on this line and it may not necessarily indicate the top of rock at this location.

6.0 BOREHOLE TV METHODOLOGY

Downhole televiewer logging was carried out by an experienced Golder geophysicist using the Acoustic Televiewer (ATV) below the water level and the Optical Televiewer (OTV) above the water level to provide a continuous log of the entire borehole.

The downhole logging was conducted using a Mt Sopris 4MXB-1000 winch with a Scout data logging system. A field laptop running ALT Logger software v 12.1 (Build 2024) was used to control the downhole tools. Power was supplied by a generator.

The three downhole probes that were utilised at the site were:

- ALT QL40 Caliper (CAL)
- ALT 2G OBI40 Optical Televiewer (OTV)
- ALT 2G ABI40 Acoustic Televiewer (ATV)

7.0 TV FIELDWORK

The depth reference used for logging was the ground surface. A dummy tool was run in each borehole to check for any obstructions and to check their total depths in case of any fall ins or sediment build-up at the bottom from drilling. The caliper and televiewer probes were run after the dummy tool and were fitted with centralisers prior to logging to achieve good data quality and avoid damage to the tools. The winch was checked for depth calibration at the beginning of the work. Tools were run in the same order in each borehole:

- Dummy tool
- CAL
- ATV
- OTV

Logging was performed while the tool was raised up the boreholes. This approach is taken to give more reliable depth control than logging downwards. The acquisition parameters used on site are listed in

Table 5.These parameters were selected to give high resolution results, maximising the capabilities of the tools on site. Logging speeds are restricted by the rate of data transfer to the logger.

Table 5: Downhole Logging Acquisition Parameters

Tool	Approximate Sample interval (mm)	Azimuthal resolution (pt/turn)	Approximate Logging speed (m/min)
CAL	2.0 to 3.0		5.0
ATV	1.6	144	3.0
OTV	1.2	360	3.0

A summary of the borehole locations and logging runs are summarised in Table 6.

Table 6: Summary of Borehole Televiewer Data

Borehole ID	Date Acquired	Easting (GDA94, MGA Zone 56)	Northing (GDA94, MGA Zone 56)	Collar RL (AHD)	Borehole Orientation[1]		Logging Interval (m)		
					Tilt	Azimuth[2]	CAL	ATV	OTV
330-01-BH2101	24/09/2018	443843	6941833	244	90	-	63.0 – 129.0	63.0-129.0	-
330-01-BH2102	7/07/2018	443525	6942102	165	90	-	10.6-49.5	16.5-49.5	10.6-17.4

[1] Average values, [2] Magnetic North

Imaging was stopped at the base of casing

8.0 TV DATA PROCESSING

8.1 Data Conversion and Depth Shift

All downhole geophysical data was processed, interpreted and presented using WellCAD® (vers. 5.2), an industry standard software package supplied by Advanced Logic Technology. The ATV and OTV data was analysed using the Image Module in WellCAD.

In the first stage of the processing, all datasets were imported into WellCAD. This required conversions of the.tfd files from the Mt Sophris Data Logger into .wcl format. Bad traces in the televiewer datasets were filtered out by interpolation. Centralisation of the ATV in the borehole was checked by looking at the travel time data. Normalisation of the of the ATV image colour palette was also applied to improve the presentation of the image. Gravity and magnetic recordings from the televiewers were used to assess the quality of the borehole deviation data and bumps of the probe.

8.2 Defect Picking

Structure logs were superimposed over the televiewer images and defects were picked interactively by fitting sine curves. Sine curves in the televiewer images are 2-dimensional (2D) representations of 3-dimensional (3D) features. The definition of the defects depends on the defect nature and on the confidence level at the time of picking.

The following defect categories were used:

- Bedding Fabric
- Bedding Parting
- Joint
- Extremely Weathered Seam/Zone
- Crushed Seam /Zone
- Sheared Seam/Zone

For the purposes of this report, a seam is defined as a defect that has a thickness greater than 2 mm and a zone has a thickness greater than 100 mm.

The defect type was selected by carefully examining the ATV/OTV Image logs, using the ATV travel time data for assessing the openness of joints, and cross correlating with geotechnical logging data and core photos.

In addition, a qualitative confidence rating was assigned to the defect defined as follows:

- Low confidence level (grey): a partial sine curve in the televiewer log and/or the defect is not mentioned in the geotechnical log.
- Medium confidence level (black): a weak sine curve in the televiewer log and/or the defect may or may not be mentioned in the geotechnical log.
- High confidence level (red): a strong sine curve in the televiewer log and/or the defect may or may not be mentioned in the geotechnical log.

8.3 Borehole Caliper and Deviation Correction

All televiewer images were referenced to Magnetic North using calibrated readings from magnetometer / inclinometer sensor input channels. No account is made for susceptibility of magnetic minerals, for example pyrrhotite, that may occur within the rock mass materials. The mechanical caliper data was used to correct for borehole caliper variations on the dip angles. The defects still referenced to the borehole hole axis at this point were adjusted to true dip and dip direction referenced to Magnetic North. The borehole deviation data recorded from the televiewers were used in the conversion. The defects orientations values were converted to True North by using a declination value of 11 degrees.

8.4 Breakout Analysis

A breakout analysis was done using the breakout module in Wellcad to identify borehole wall breakouts and interactively from the televiewer image. The recorded data contained the azimuth, tilt, length and opening angle of the breakouts. The breakout orientations values were converted to True North by using a declination value of 11 degrees.

8.5 TV Results

The televiewer and interpreted structures are presented as strip logs at 1:30 vertical scale in Attachment B. Legends explaining the strip logs and data are also provided in Attachment B. The structure orientations are all referenced to True North.

Also shown in Attachment B are the lower hemisphere and equal angle polar plots for bedding and defects for each of the boreholes and rosettes to that indicate the orientation of the maximum stress (arrows).

9.0 GEOPHYSICS LIMITATIONS

Golder Associates geophysical services are conducted in a manner consistent with the level of care and skill ordinarily exercised by other members of the geophysical community currently practicing under similar conditions and subject to the time limits, financial and physical constraints applicable to the services. Seismic refraction is a remote sensing geophysical method that may not detect all subsurface features. Depth of penetration is dependent on the nature of the subsurface. Furthermore, it is possible that interpreted features such as stratigraphic boundaries, top of bedrock, faults, voids, other geologic hazards and utilities may, upon intrusive sampling, prove to have been misinterpreted. Accurate interpretation of remote sensing data relies on the site-specific correlation of information with that obtained from borehole drilling, digging or other direct observation methods.

Golder Associates Pty Ltd

Brodie Klue
Senior Geophysicist

Tariq Rahiman
Associate, Principal Geologist/Geophysicist

BK/TR/lw

https://golderassociates.sharepoint.com/sites/23163g/deliverables/024 geotechnical factual report/rev2/appendix b - geophysics/1893802-024-r-rev2_appendixb_geophysics report.docx

Attachments:
Attachment A – Seismic Refraction Figures
Attachment B – Borehole Televiewer Results

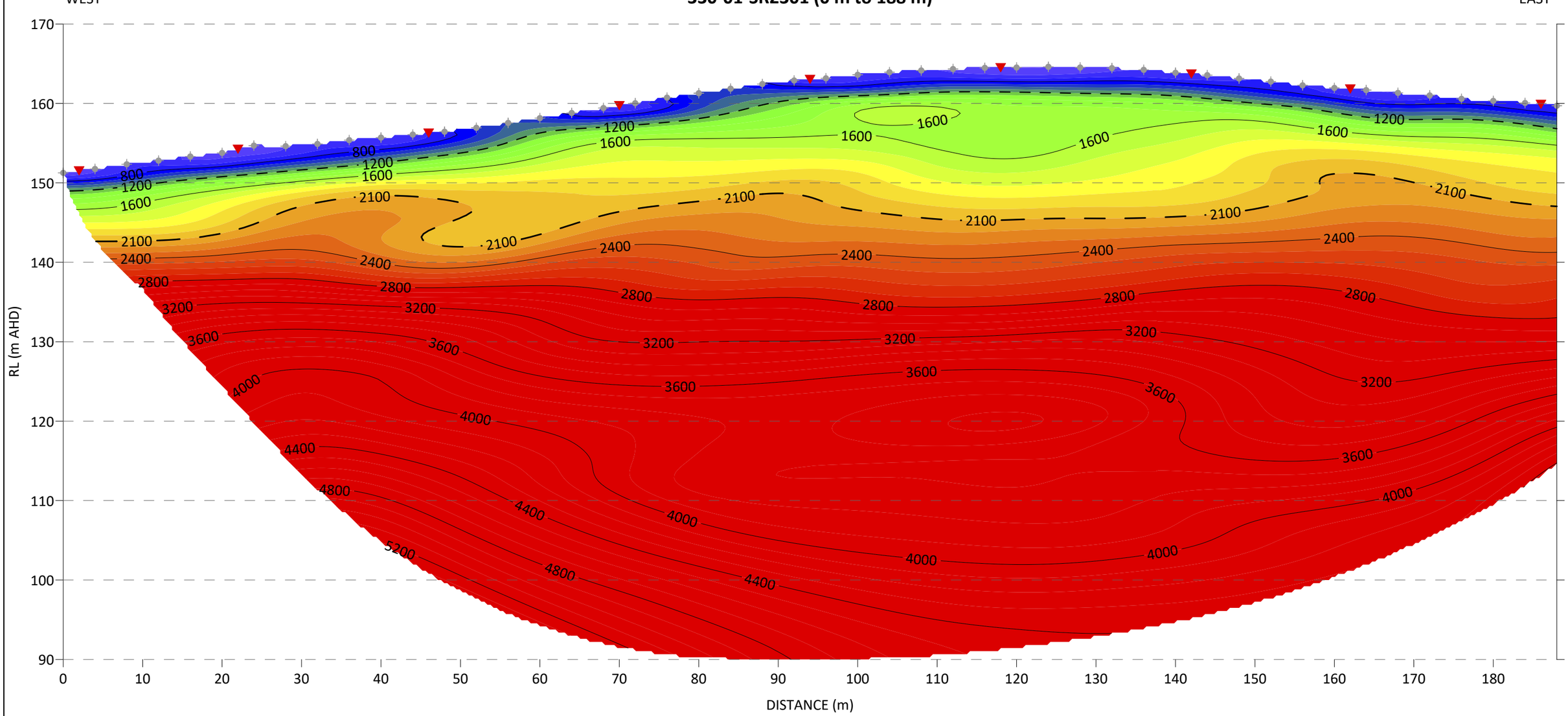
ATTACHMENT A

Seismic Refraction Figures

WEST

330-01-SR2301 (0 m to 188 m)

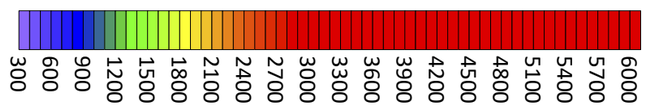
EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)



NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

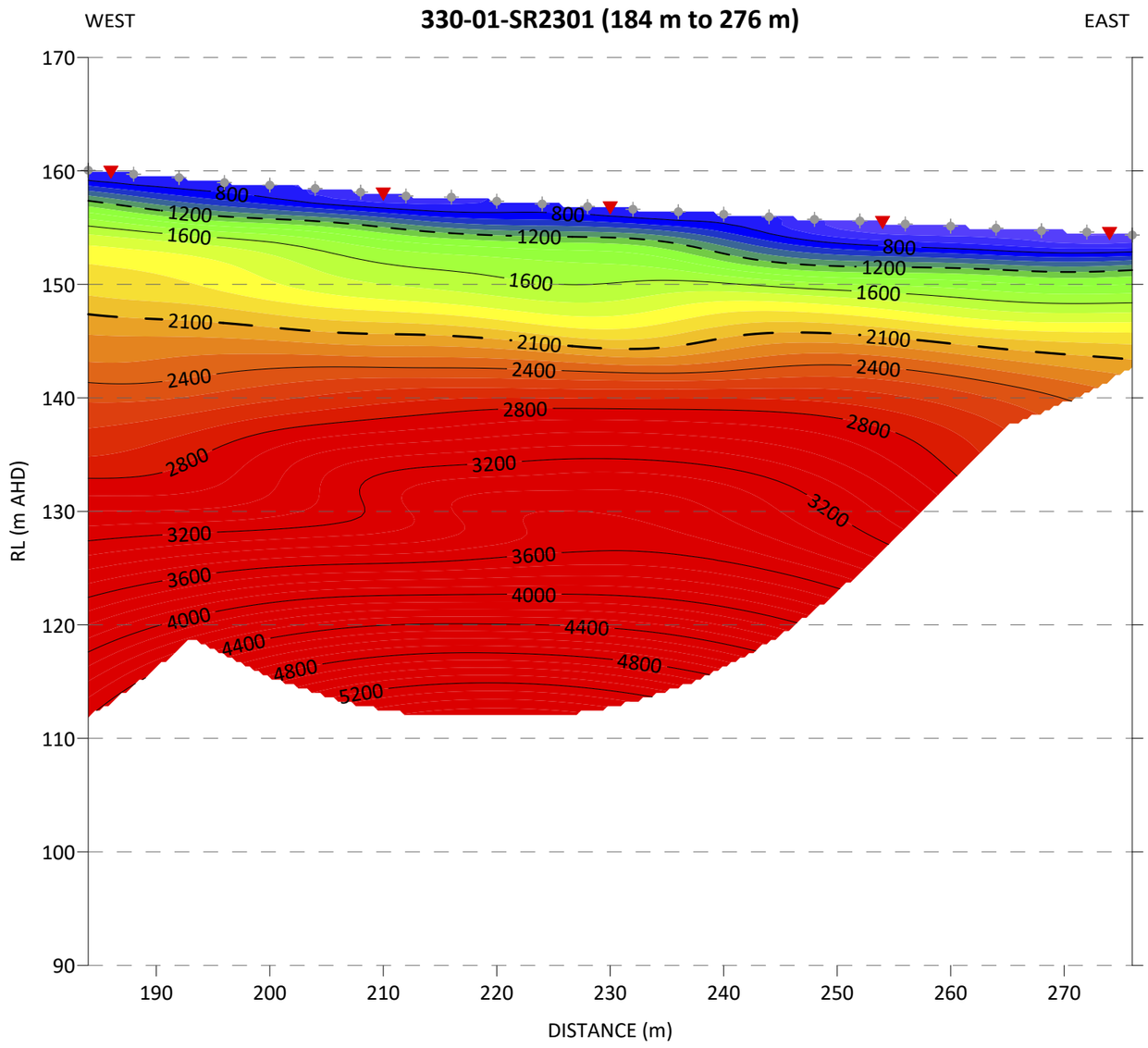
CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2301 (0 m to 188 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A01



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

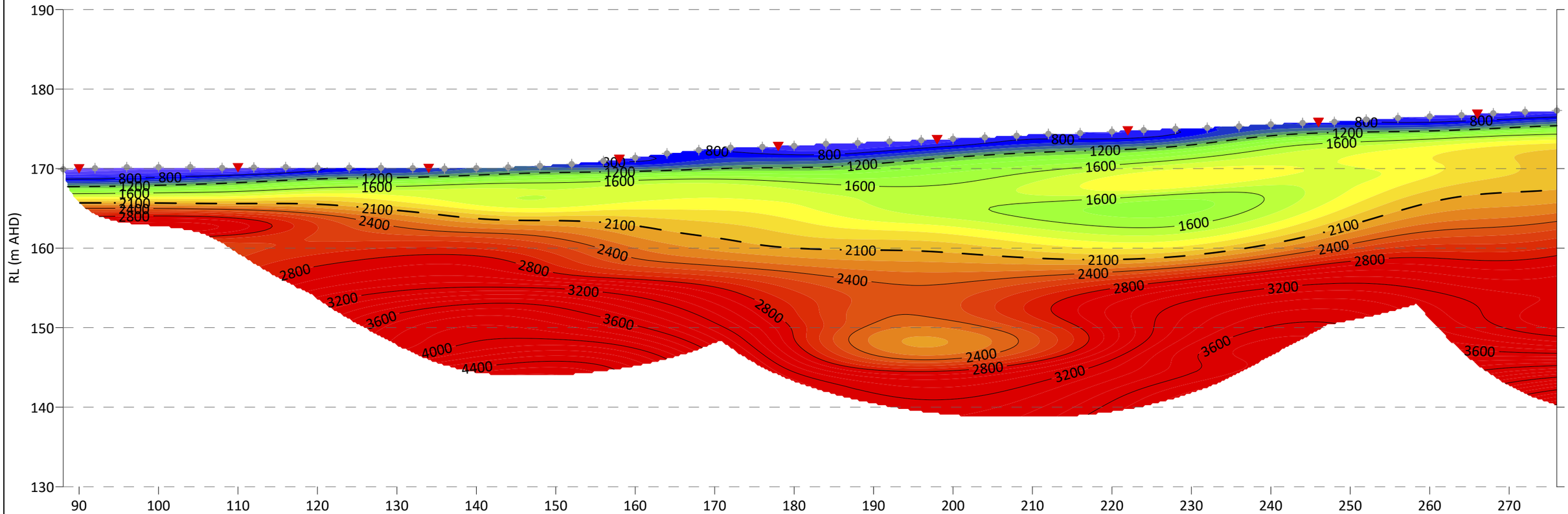
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2301 (184 m to 276 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A02

WEST

330-01-SR2302 (88 m to 276 m)

EAST

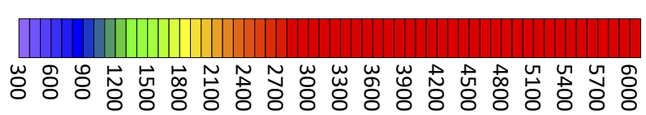


LINE STARTS AT 88 m - WESTERN END OF PROPOSED LINE WAS UNABLE TO BE ACQUIRED.

LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)



NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2302 (88 m to 276 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A03

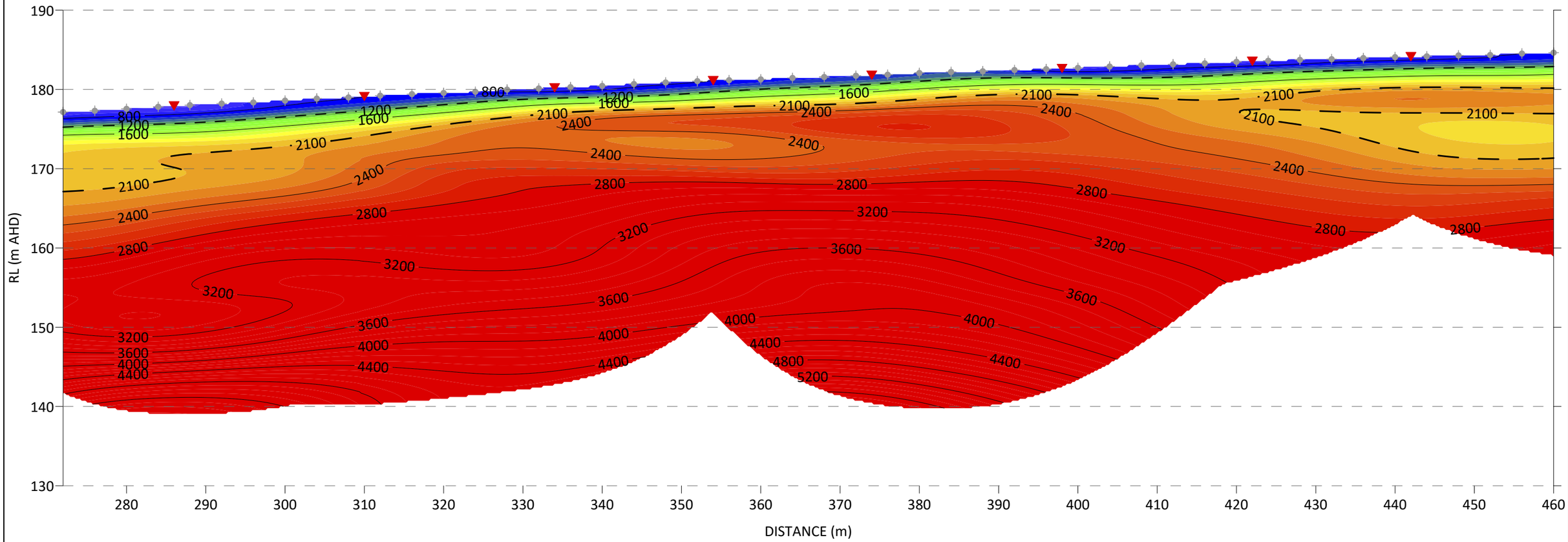
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

25 mm
0

WEST

330-01-SR2302 (272 m to 460 m)

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

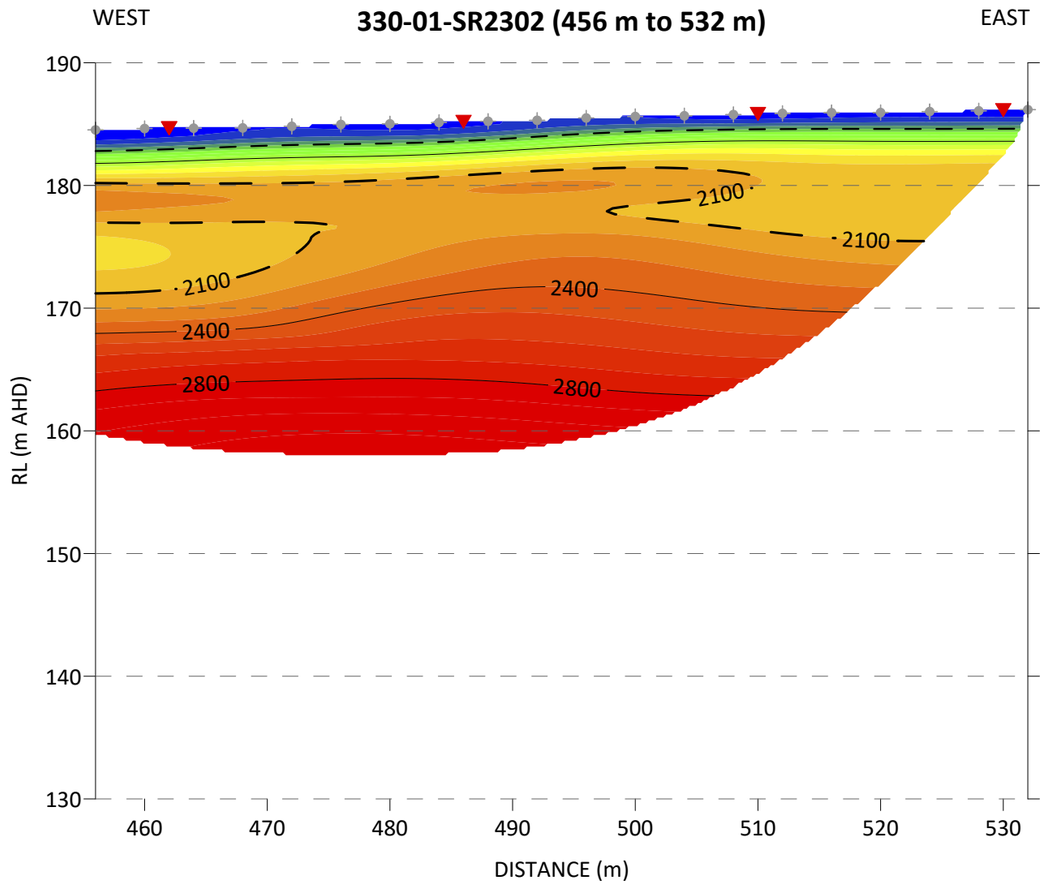
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2302 (272 m to 460 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A04

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

25 mm

0



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

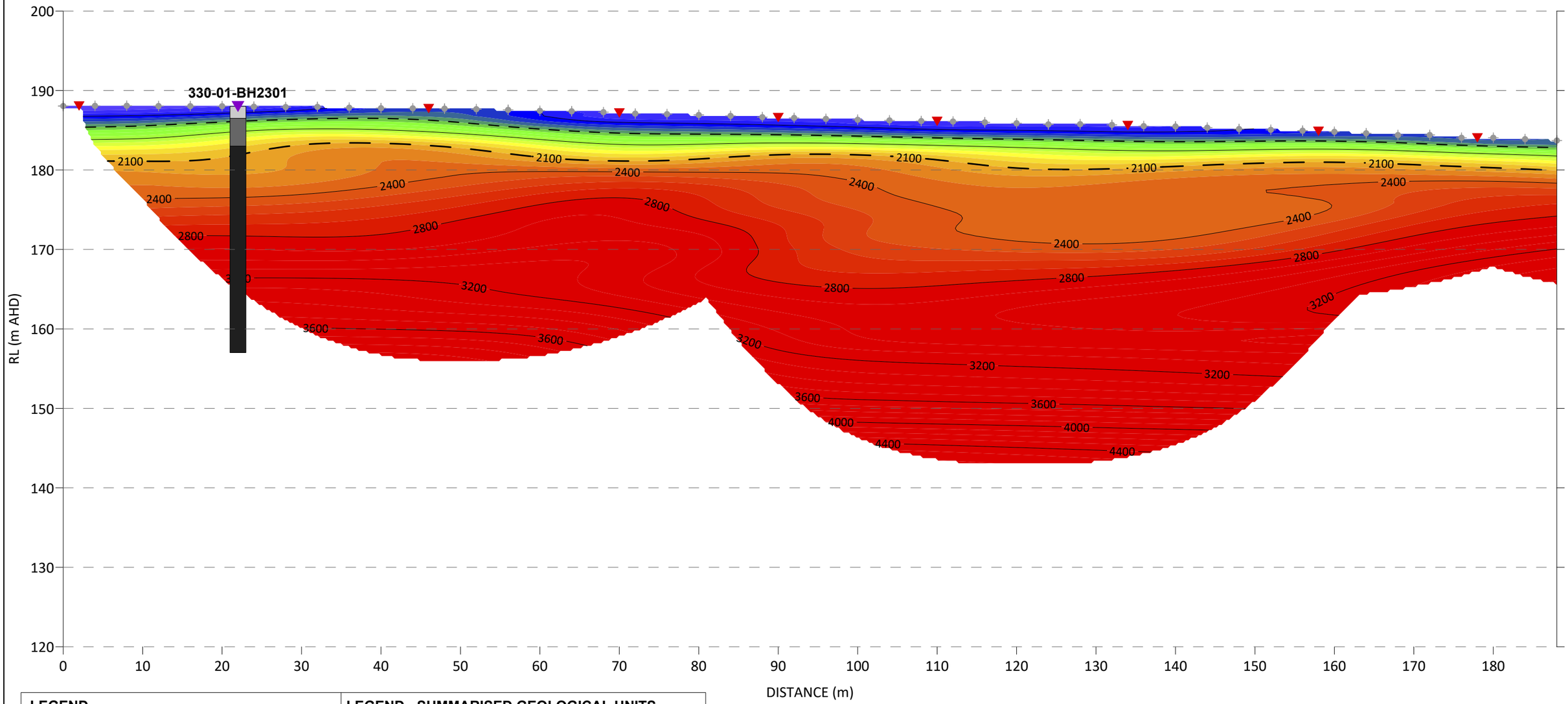
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2302 (456 m to 532 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A05

WEST

330-01-SR2302_2 (0 m to 188 m)

EAST



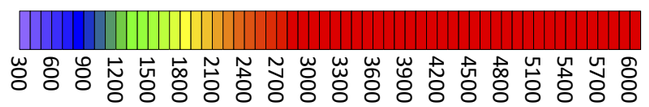
LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- BOREHOLE LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

LEGEND - SUMMARISED GEOLOGICAL UNITS

- UNIT 1 - DRY TOP SOILS, LOOSE TO VERY DENSE ALLUVIUM OR RESIDUAL SOIL
- UNIT 2 - SATURATED FIRM TO VERY STIFF, VERY DENSE RESIDUAL SOILS / DISTINCTLY WEATHERED, LOW STRENGTH ROCK
- UNIT 3 - DISTINCTLY WEATHERED TO FRESH, LOW TO HIGH STRENGTH OR BETTER ROCK

SEISMIC P-WAVE VELOCITY, V_P (m/s)



NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-09-07
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

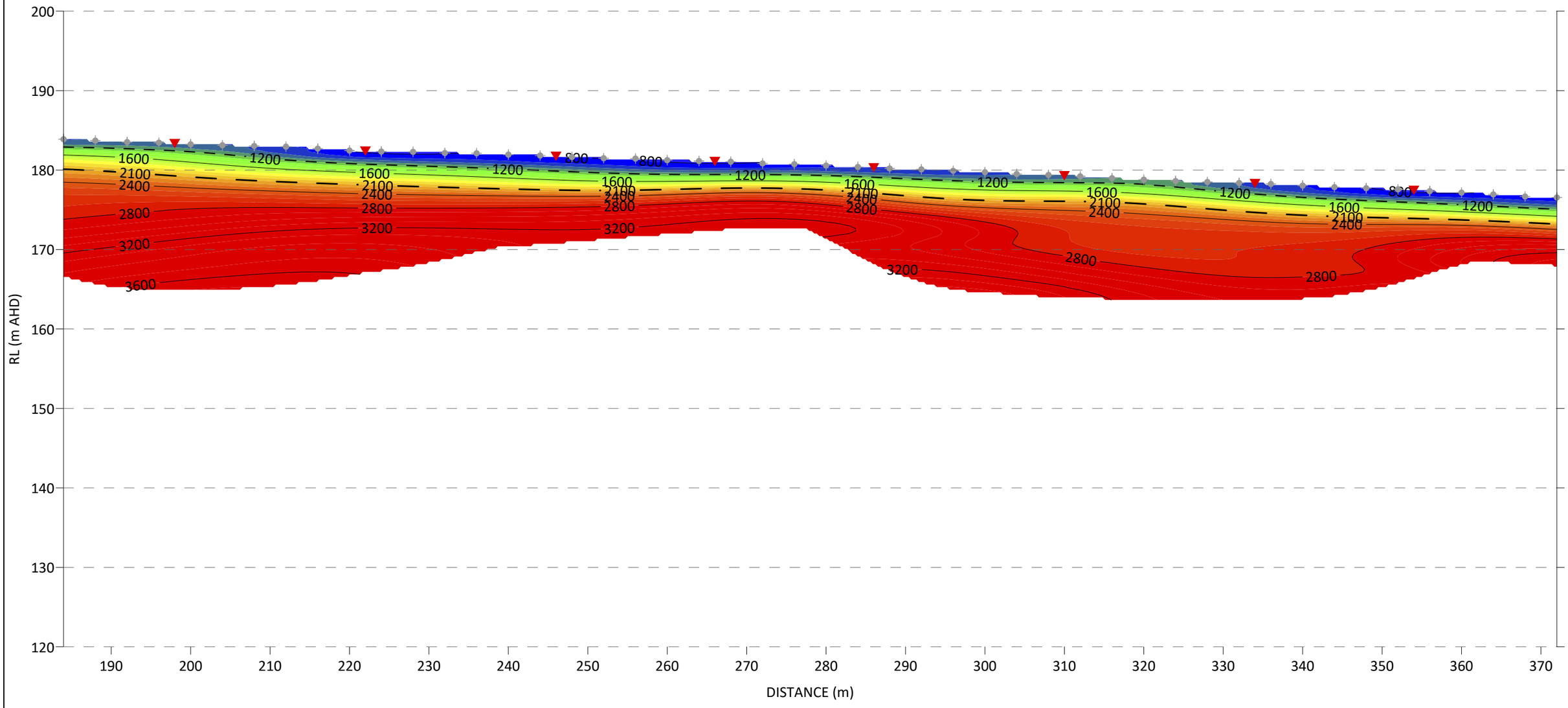
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2302_2 (0 m to 188 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A06

WEST

330-01-SR2302_2 (184 m to 372 m)

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

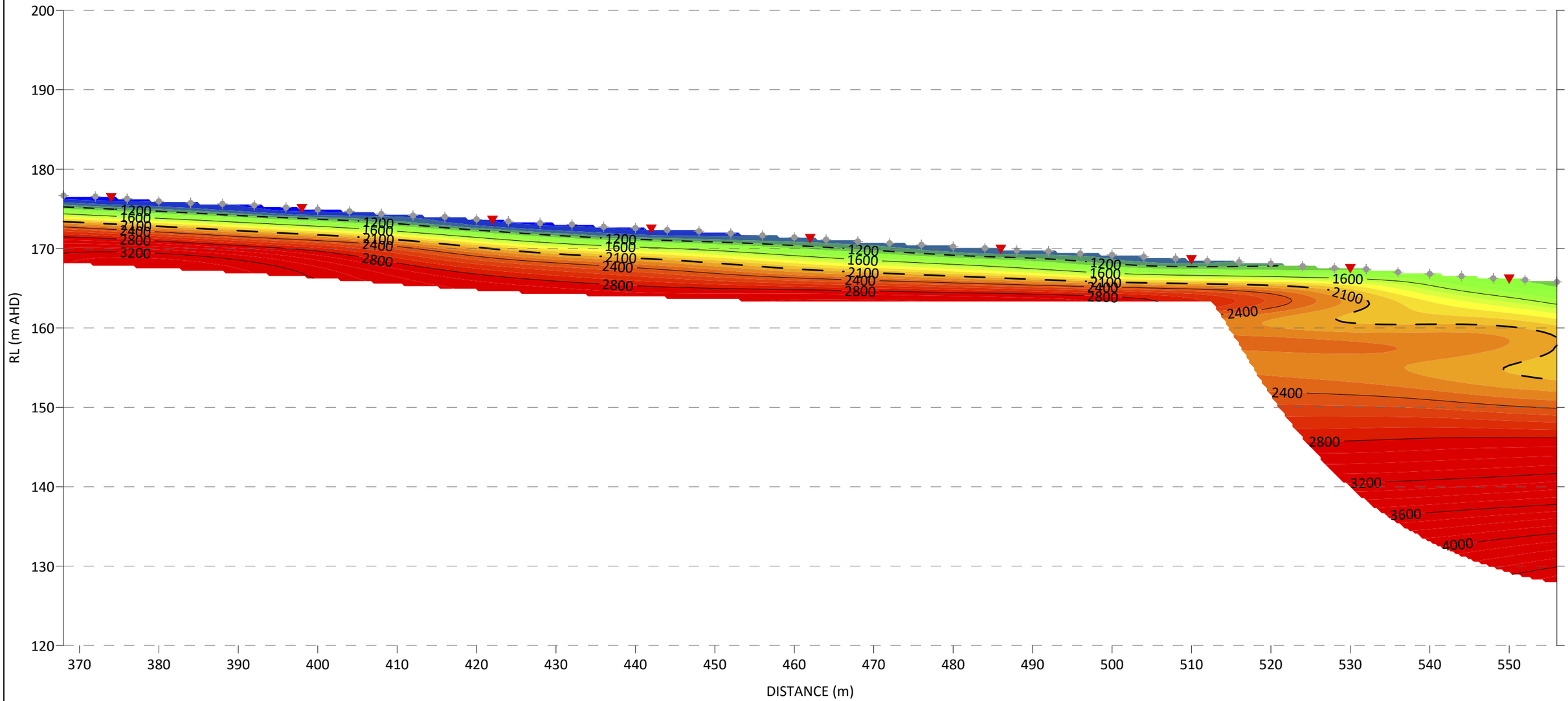
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2302_2 (184 m to 372 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A07

WEST

330-01-SR2302_2 (368 m to 556 m)

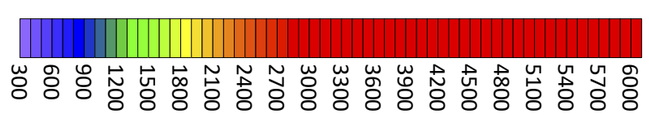
EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)



NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

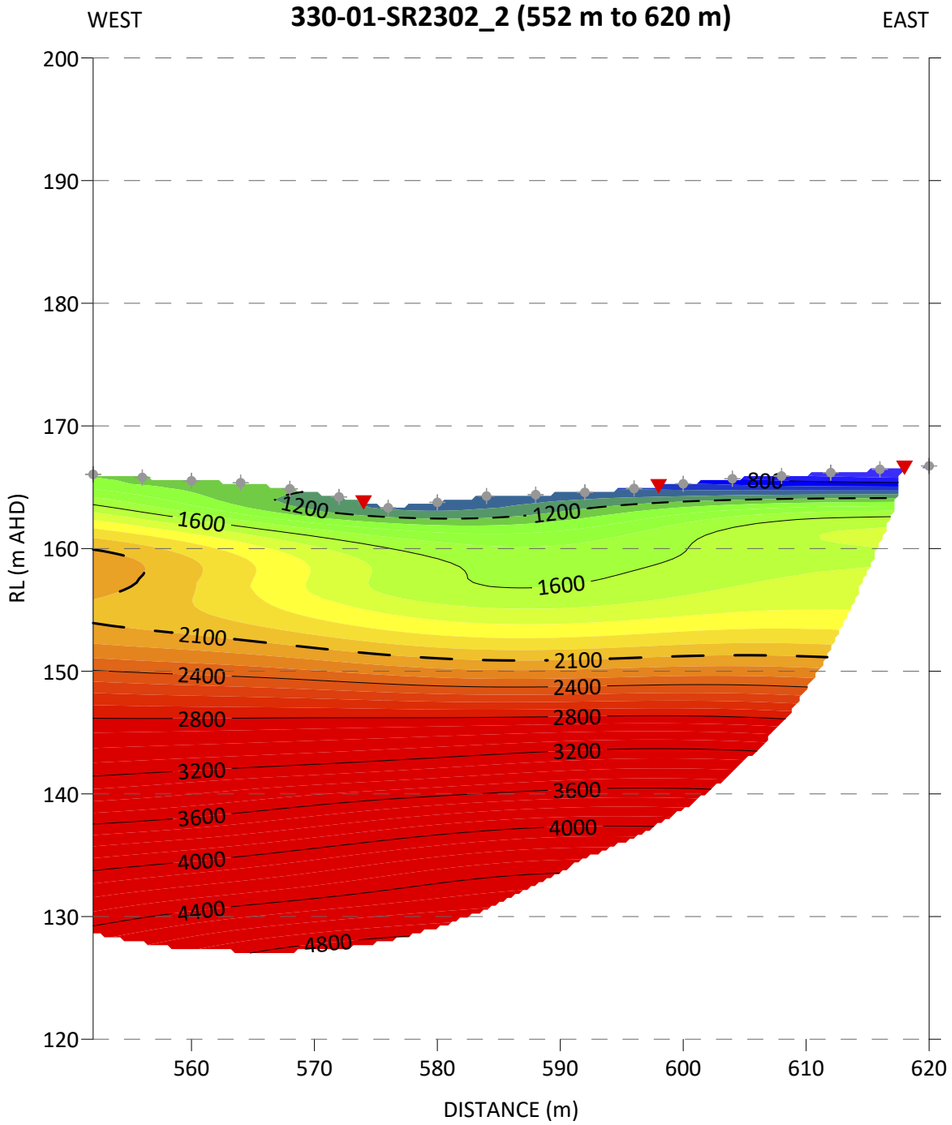
CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2302_2 (368 m to 556 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A08



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

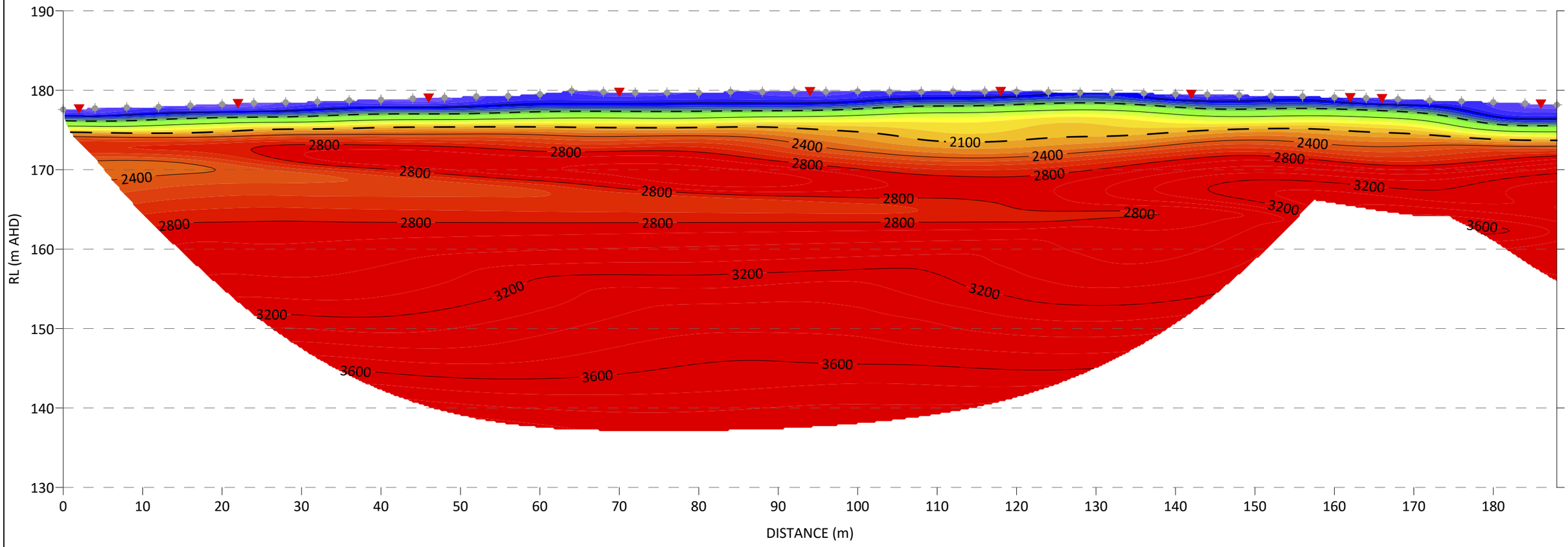
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2302_2 (552 m to 620 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A09

WEST

330-01-SR2303 (0 m to 188 m)

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

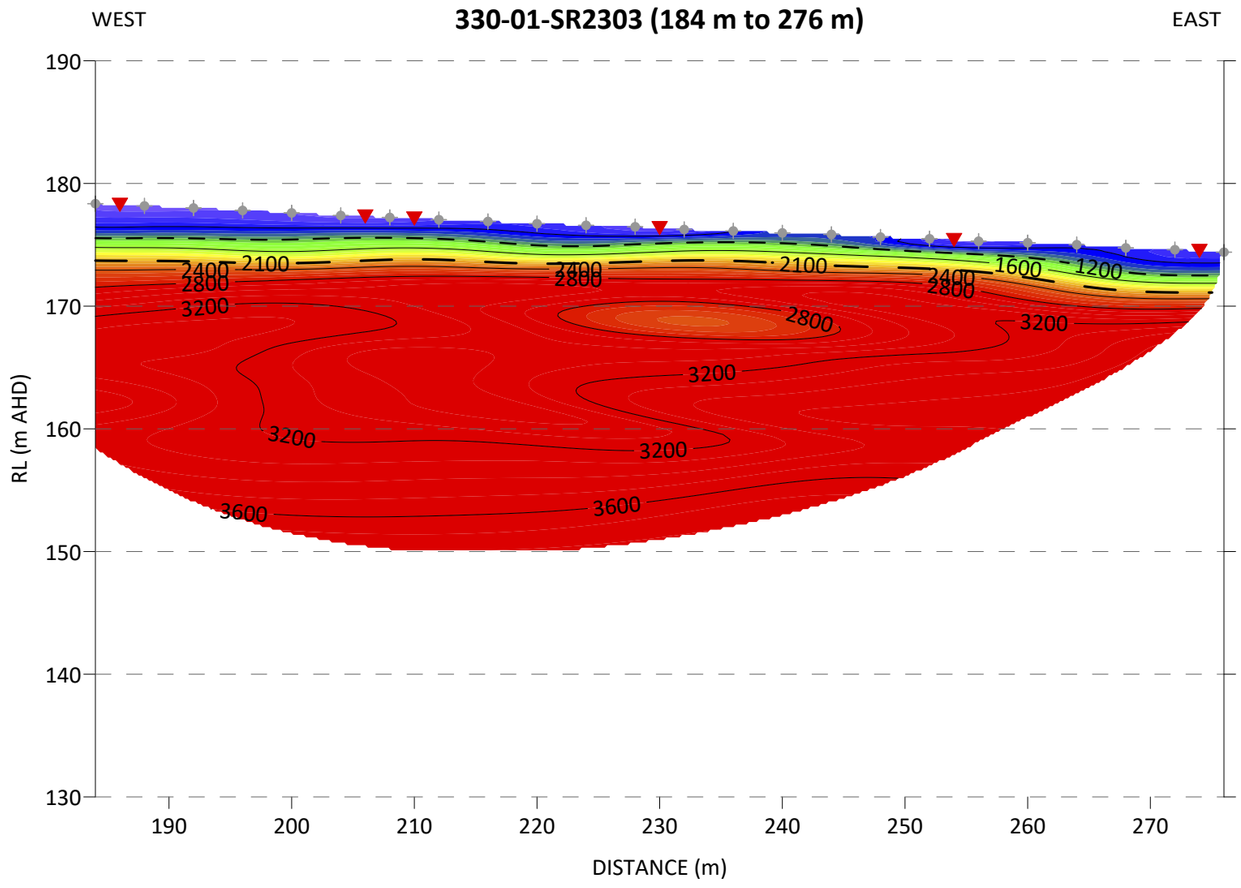
PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2303 (0 m to 188 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A10

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

25mm
0



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

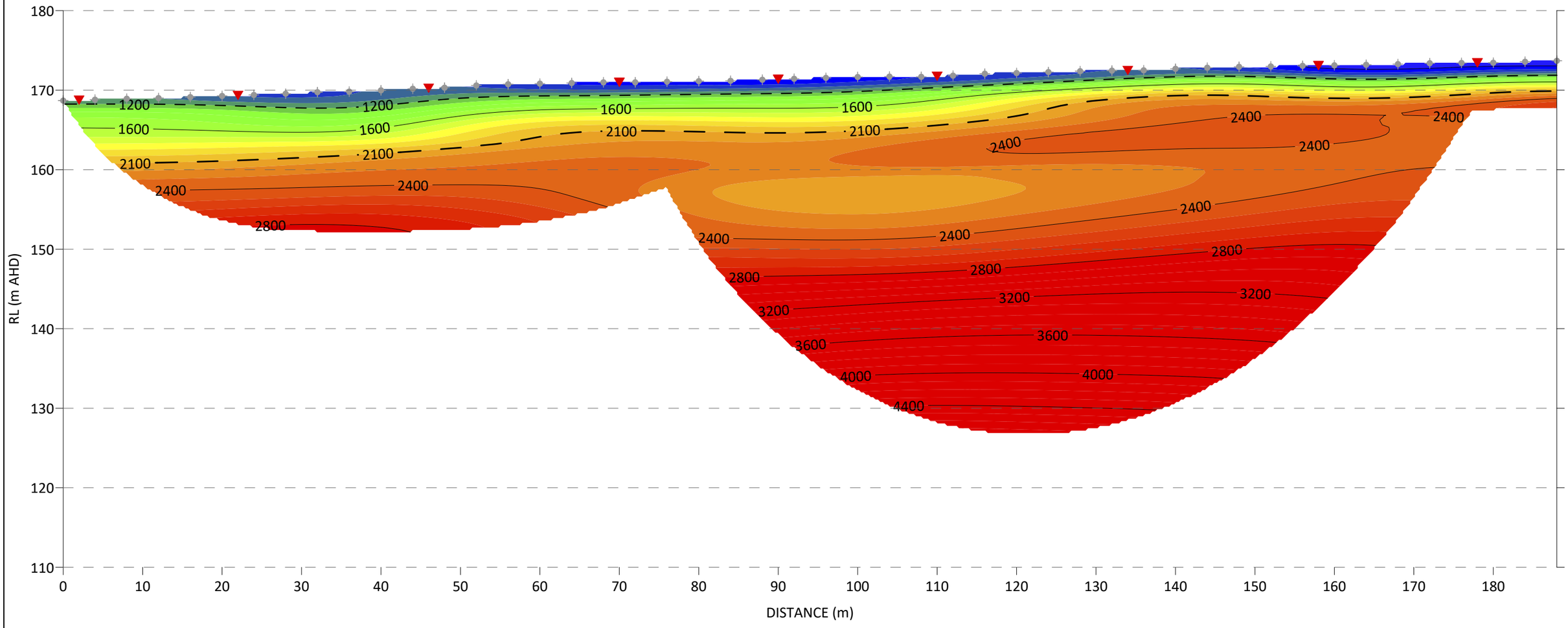
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2303 (184 m to 276 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A11

WEST

330-01-SR2304 (0 m to 188 m)

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

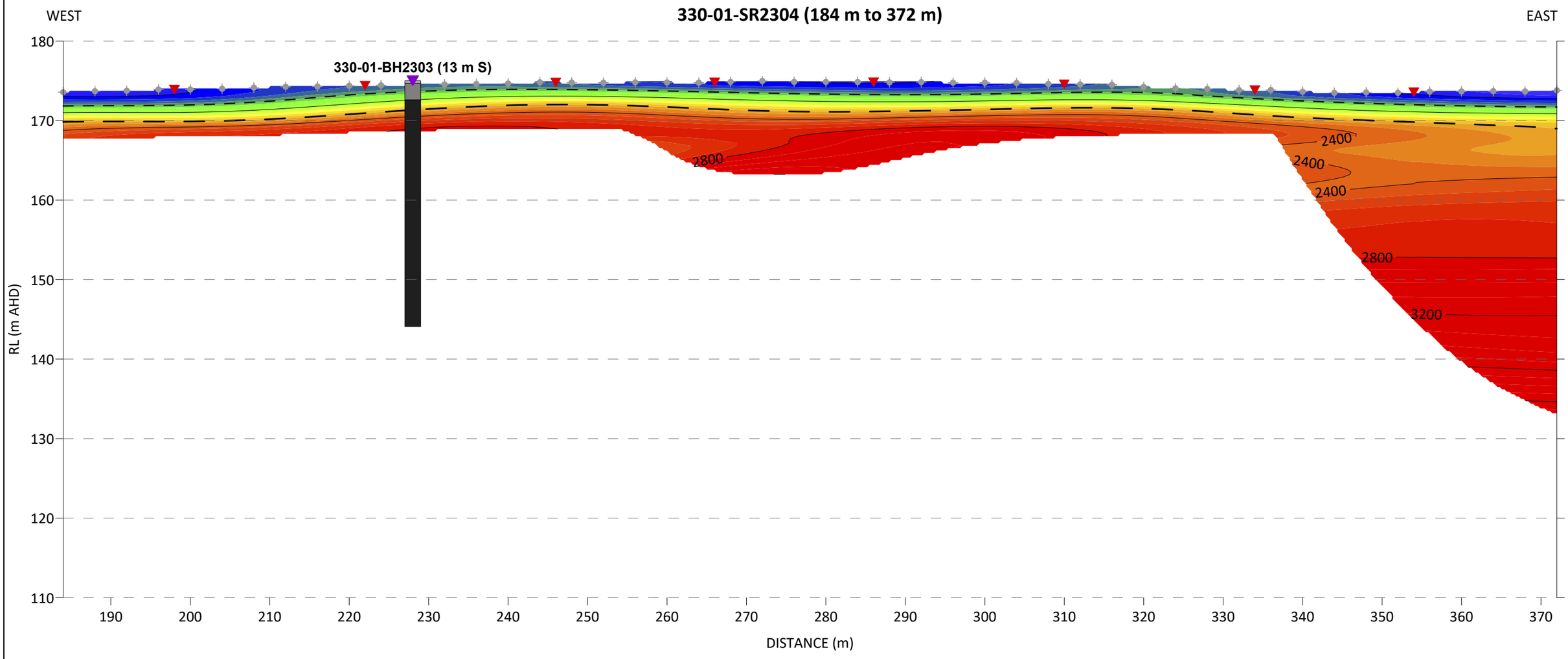
CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2304 (0 m to 188 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A12



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- BOREHOLE LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

LEGEND - SUMMARISED GEOLOGICAL UNITS

- UNIT 1 - DRY TOP SOILS, LOOSE TO VERY DENSE ALLUVIUM OR RESIDUAL SOIL
- UNIT 2 - SATURATED FIRM TO VERY STIFF, VERY DENSE RESIDUAL SOILS / DISTINCTLY WEATHERED, LOW STRENGTH ROCK
- UNIT 3 - DISTINCTLY WEATHERED TO FRESH, LOW TO HIGH STRENGTH OR BETTER ROCK

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2304 (184 m to 372 m)

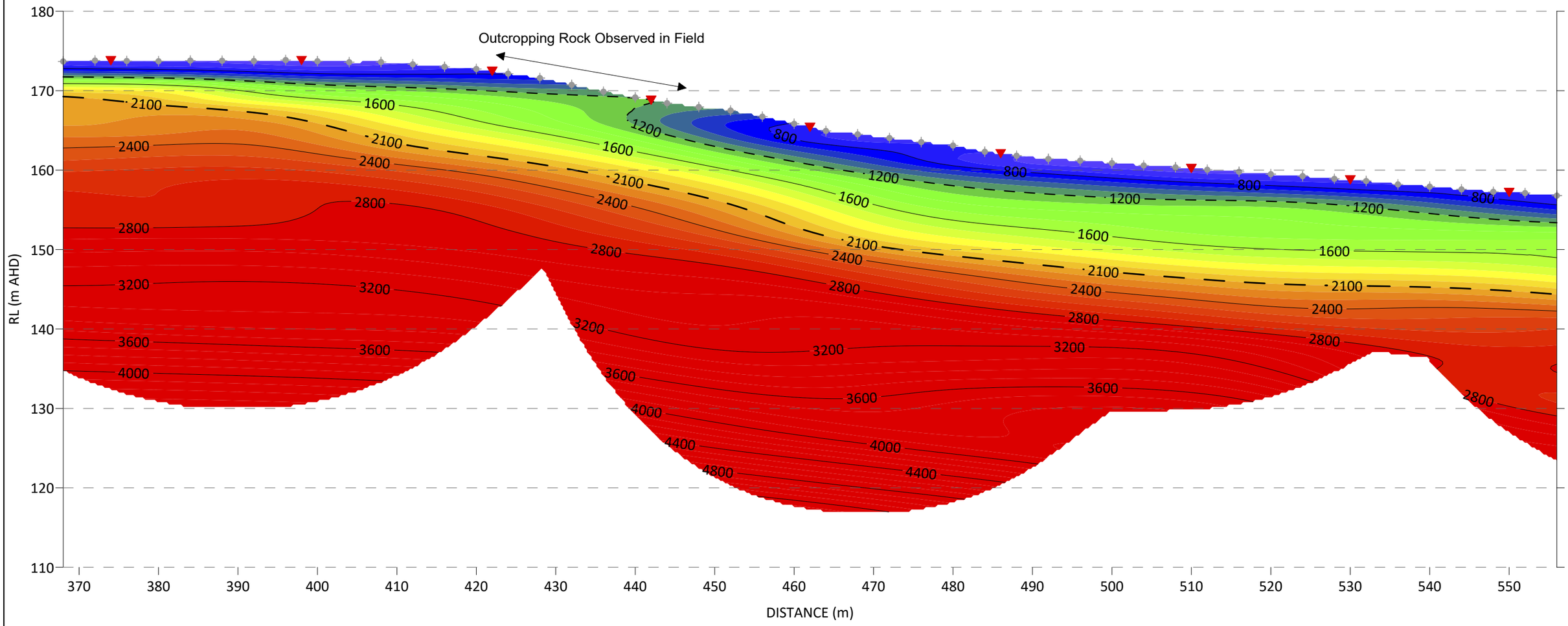
PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A13

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25 mm
0

WEST

330-01-SR2304 (368 m to 556 m)

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

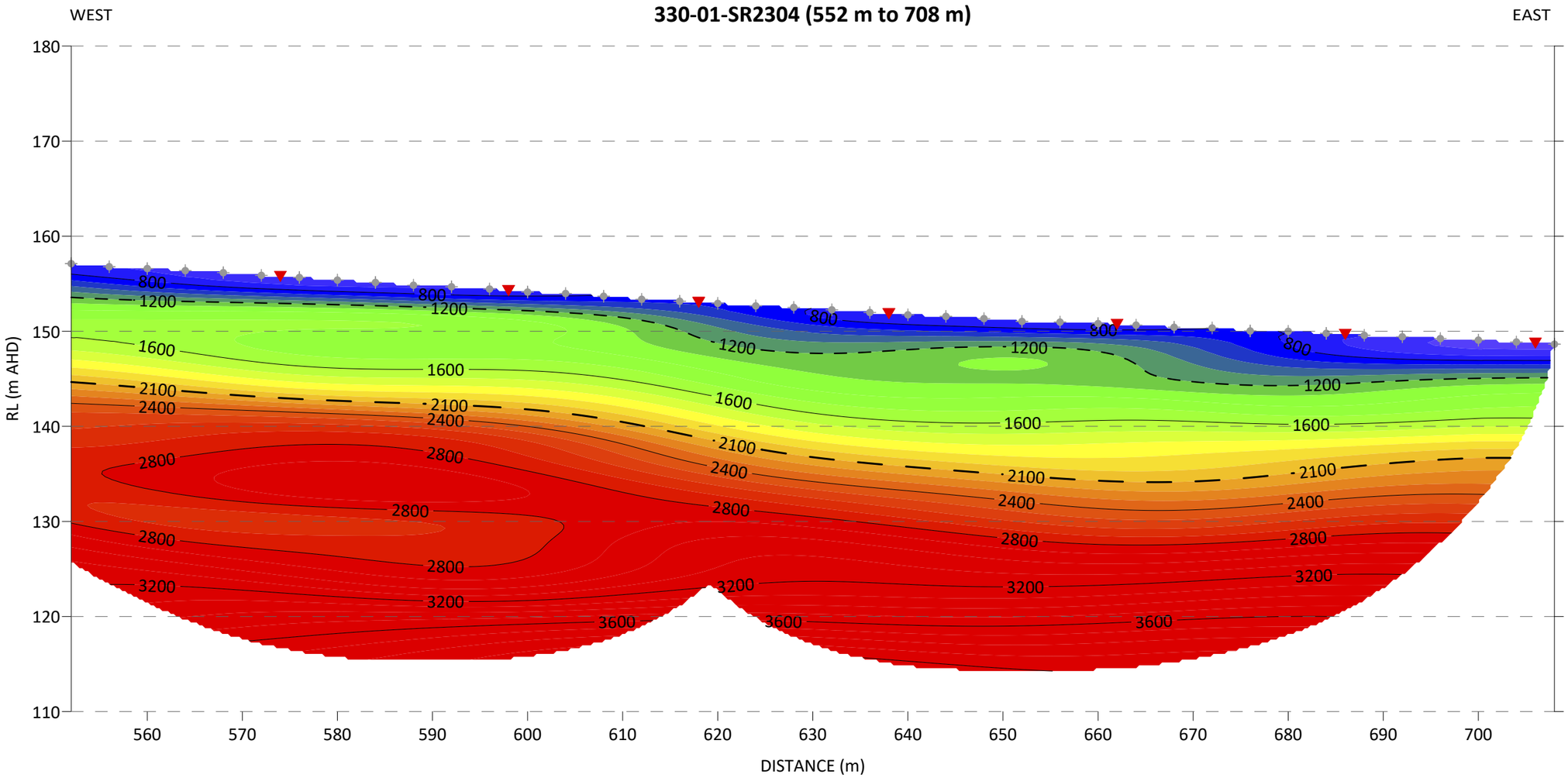
CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2304 (368 m to 556 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A14



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

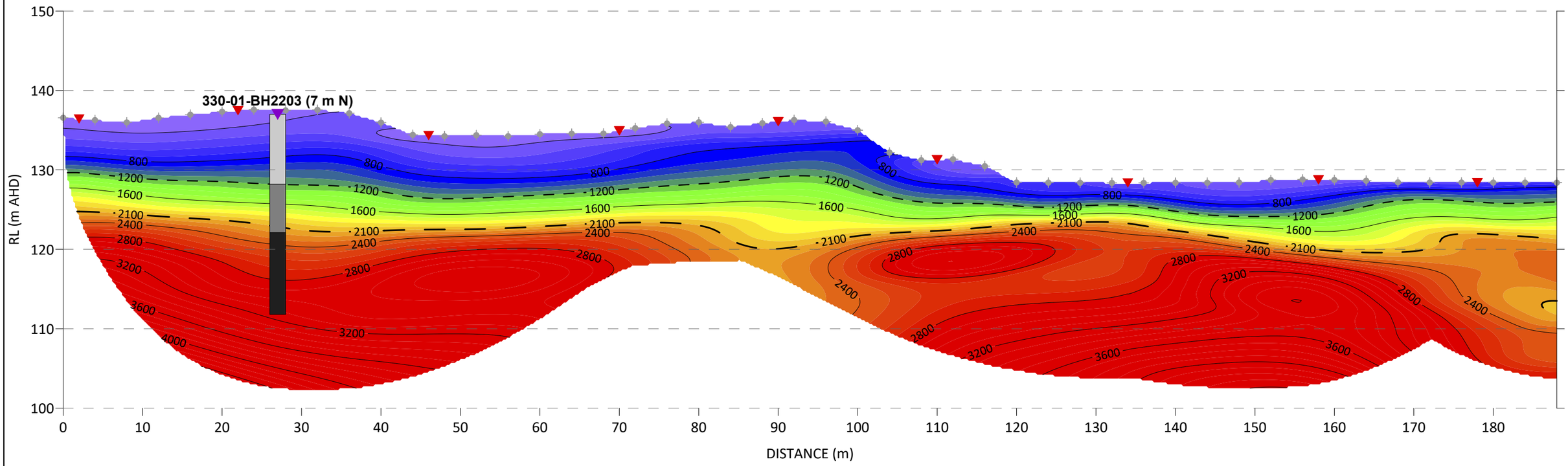
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2304 (552 m to 708 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A15

WEST

330-01-SR2202 (0 m to 188 m)

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- BOREHOLE LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

LEGEND - SUMMARISED GEOLOGICAL UNITS

- UNIT 1 - DRY TOP SOILS, LOOSE TO VERY DENSE ALLUVIUM OR RESIDUAL SOIL
- UNIT 2 - SATURATED FIRM TO VERY STIFF, VERY DENSE RESIDUAL SOILS / DISTINCTLY WEATHERED, LOW STRENGTH ROCK
- UNIT 3 - DISTINCTLY WEATHERED TO FRESH, LOW TO HIGH STRENGTH OR BETTER ROCK

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

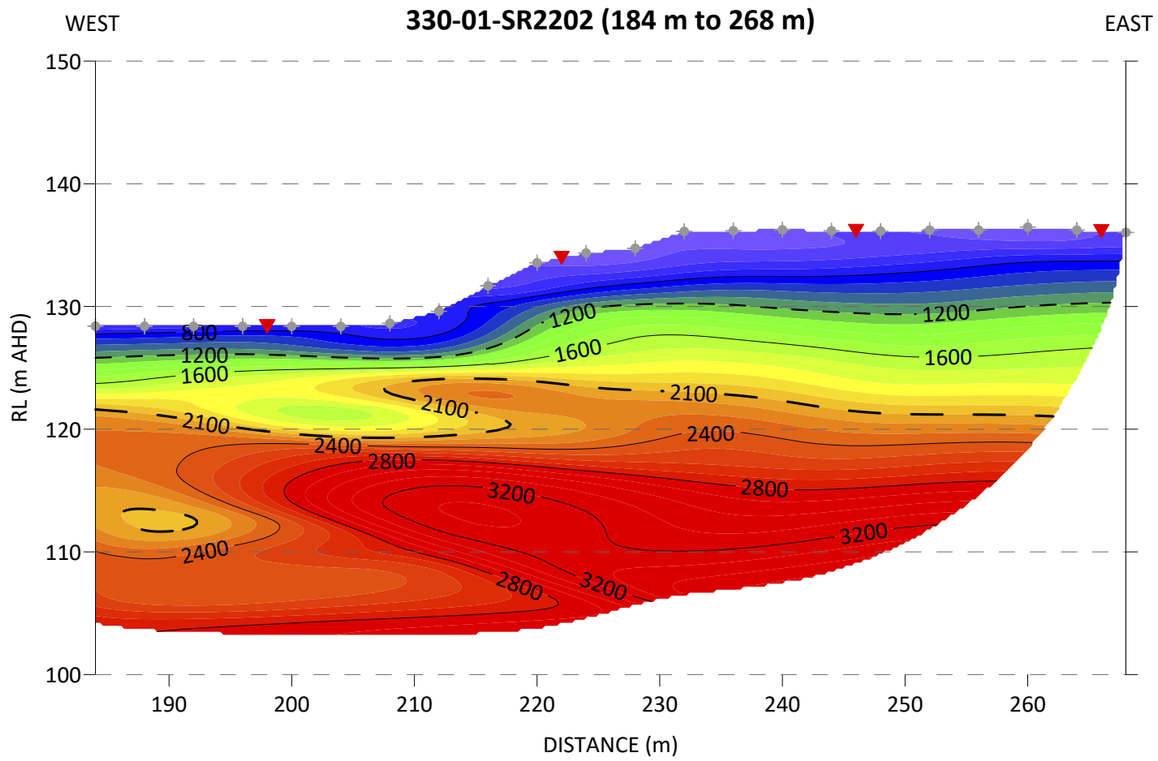
CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2202 (0 m to 188 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A16



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

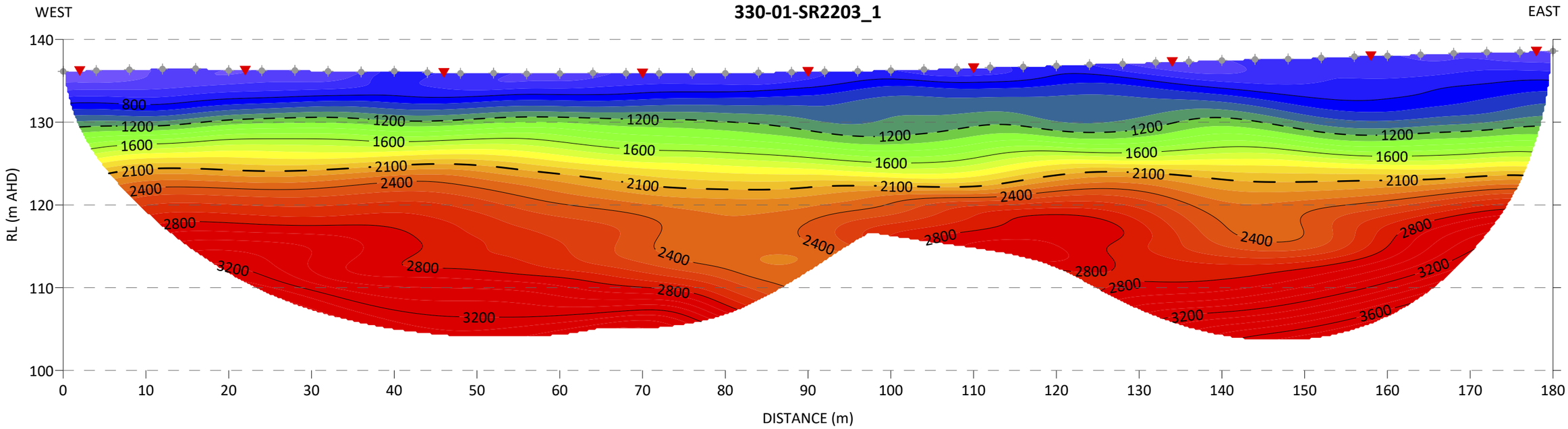
CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2202 (184 m to 268 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A17



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

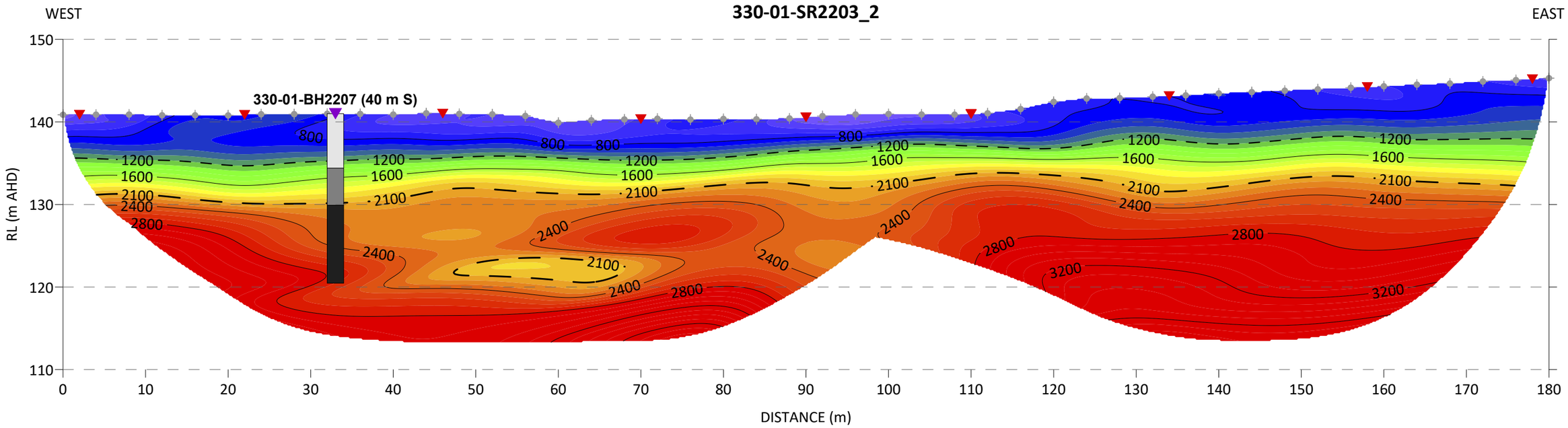
YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2203_1

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A18

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25 mm
0



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- BOREHOLE LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

LEGEND - SUMMARISED GEOLOGICAL UNITS

- UNIT 1 - DRY TOP SOILS, LOOSE TO VERY DENSE ALLUVIUM OR RESIDUAL SOIL
- UNIT 2 - SATURATED FIRM TO VERY STIFF, VERY DENSE RESIDUAL SOILS / DISTINCTLY WEATHERED, LOW STRENGTH ROCK
- UNIT 3 - DISTINCTLY WEATHERED TO FRESH, LOW TO HIGH STRENGTH OR BETTER ROCK

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

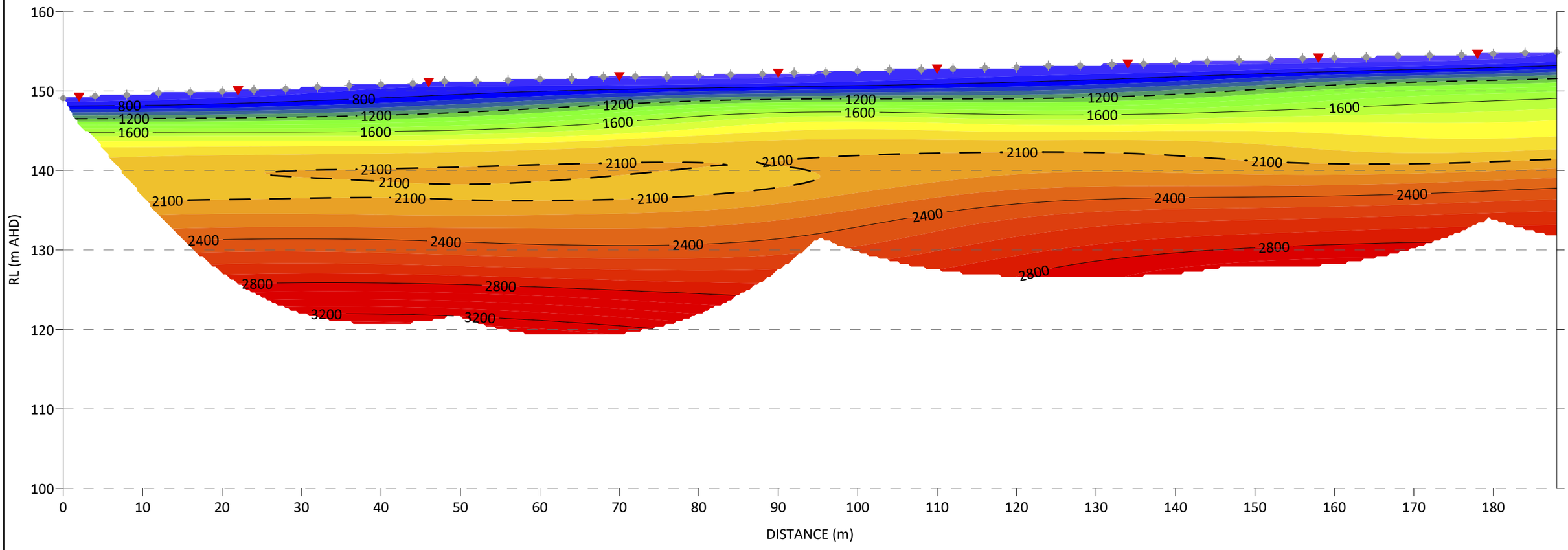
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2203_2

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A19

WEST

330-01-SR2306 (0 m to 188 m)

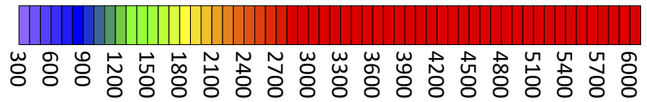
EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)



NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

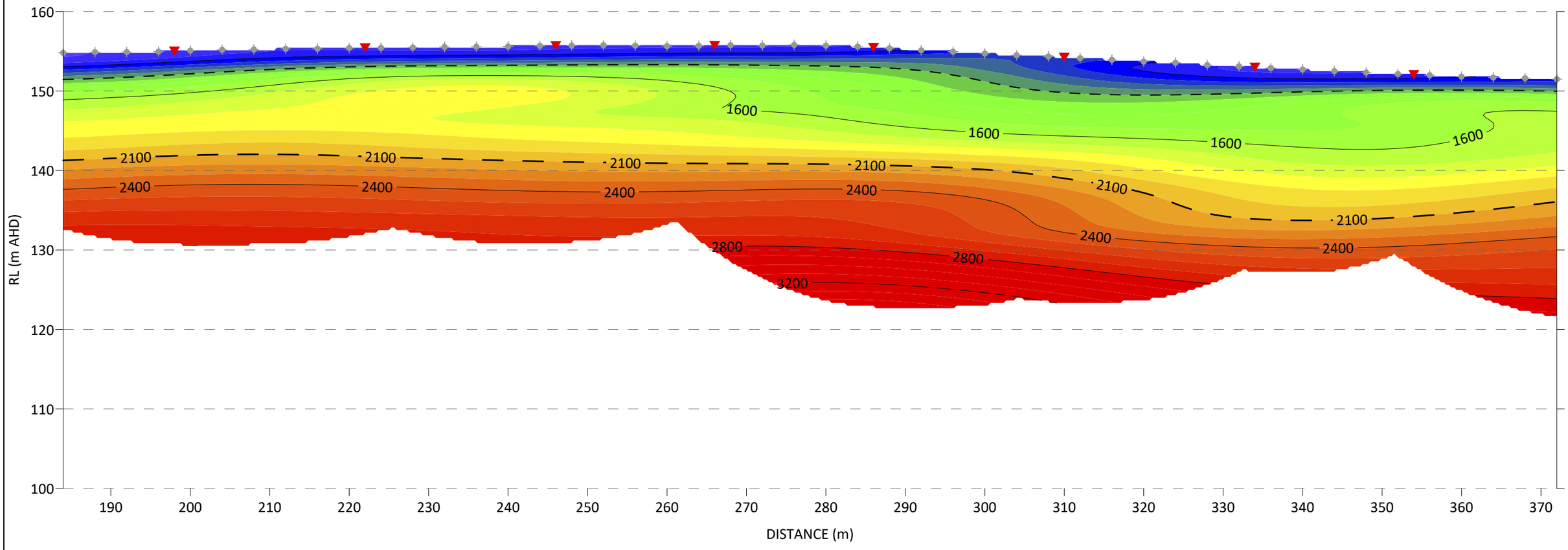
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2306 (0 m to 188 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A20

WEST

330-01-SR2306 (184 m to 372 m)

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2306 (184 m to 372 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A21

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

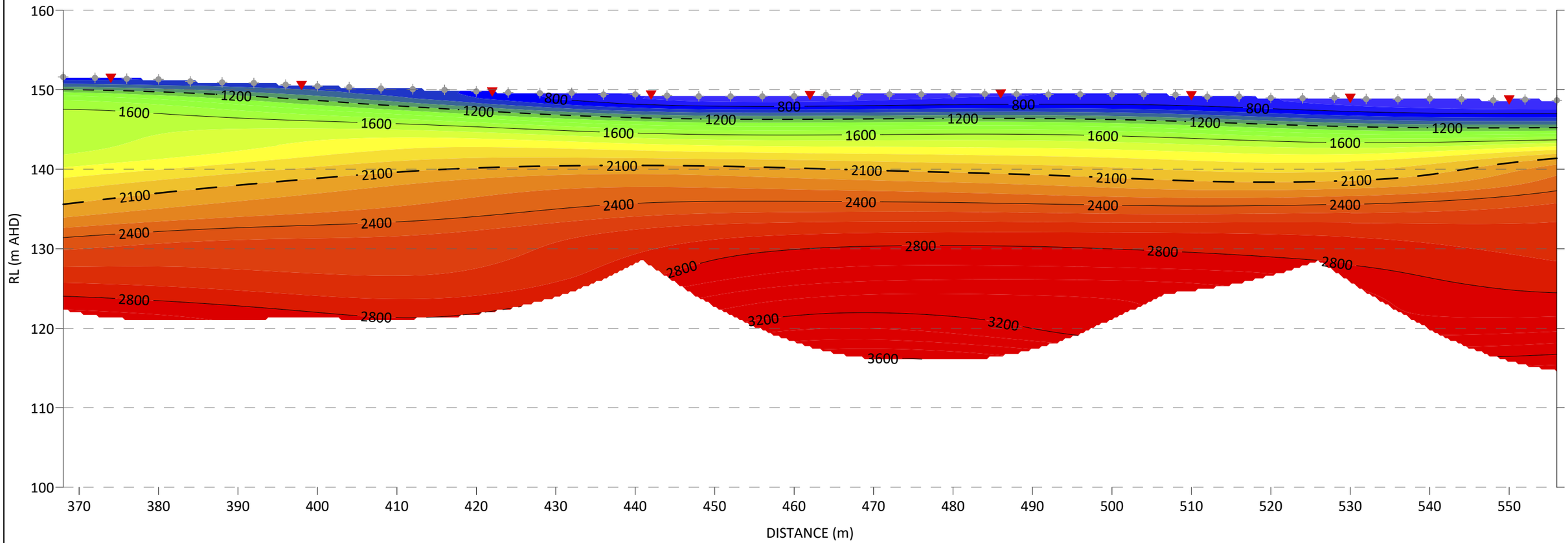
25 mm

0

WEST

330-01-SR2306 (368 m to 556 m)

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

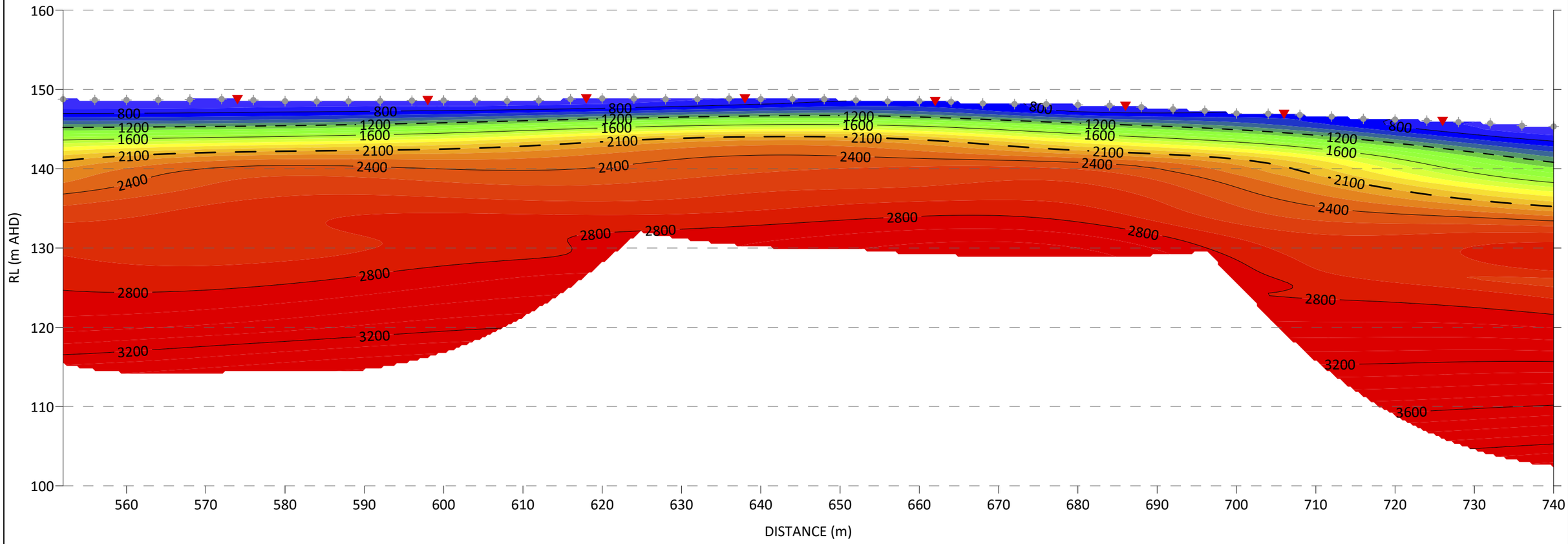
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2306 (368 m to 556 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A22

WEST

330-01-SR2306 (552 m to 740 m)

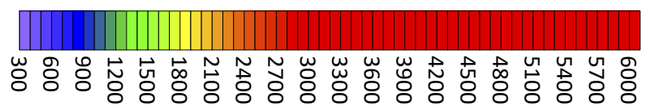
EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)



NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

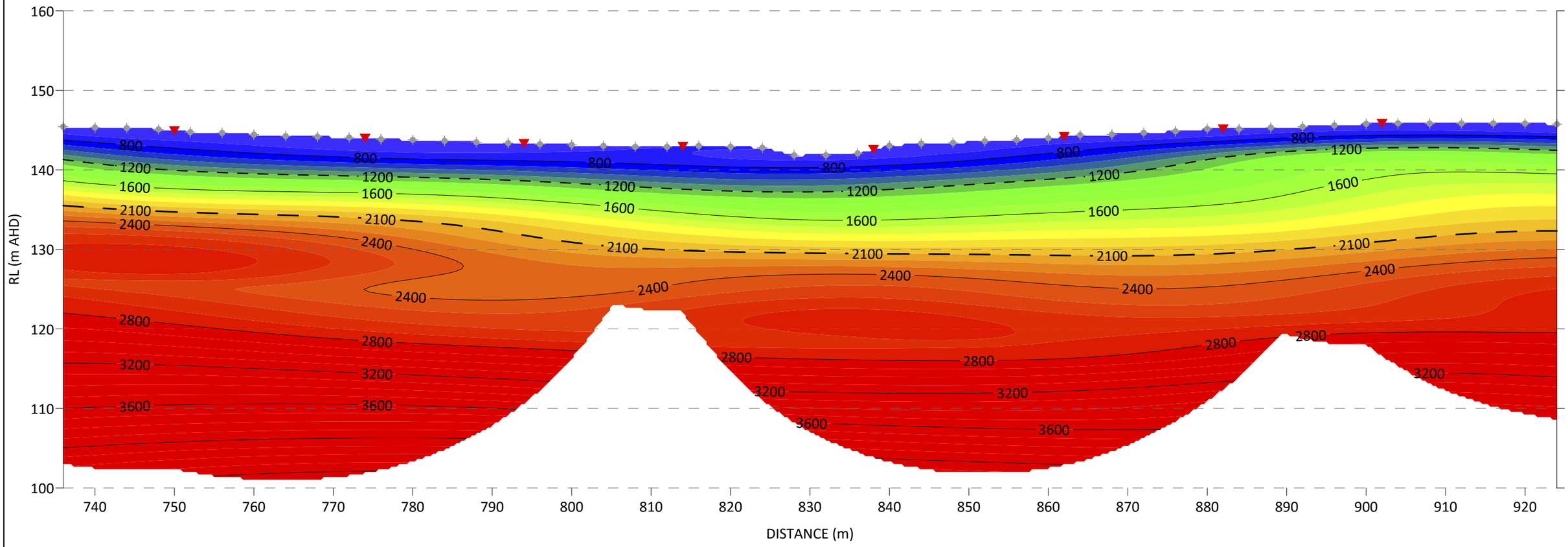
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2306 (552 m to 740 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A23

WEST

330-01-SR2306 (736 m to 924 m)

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

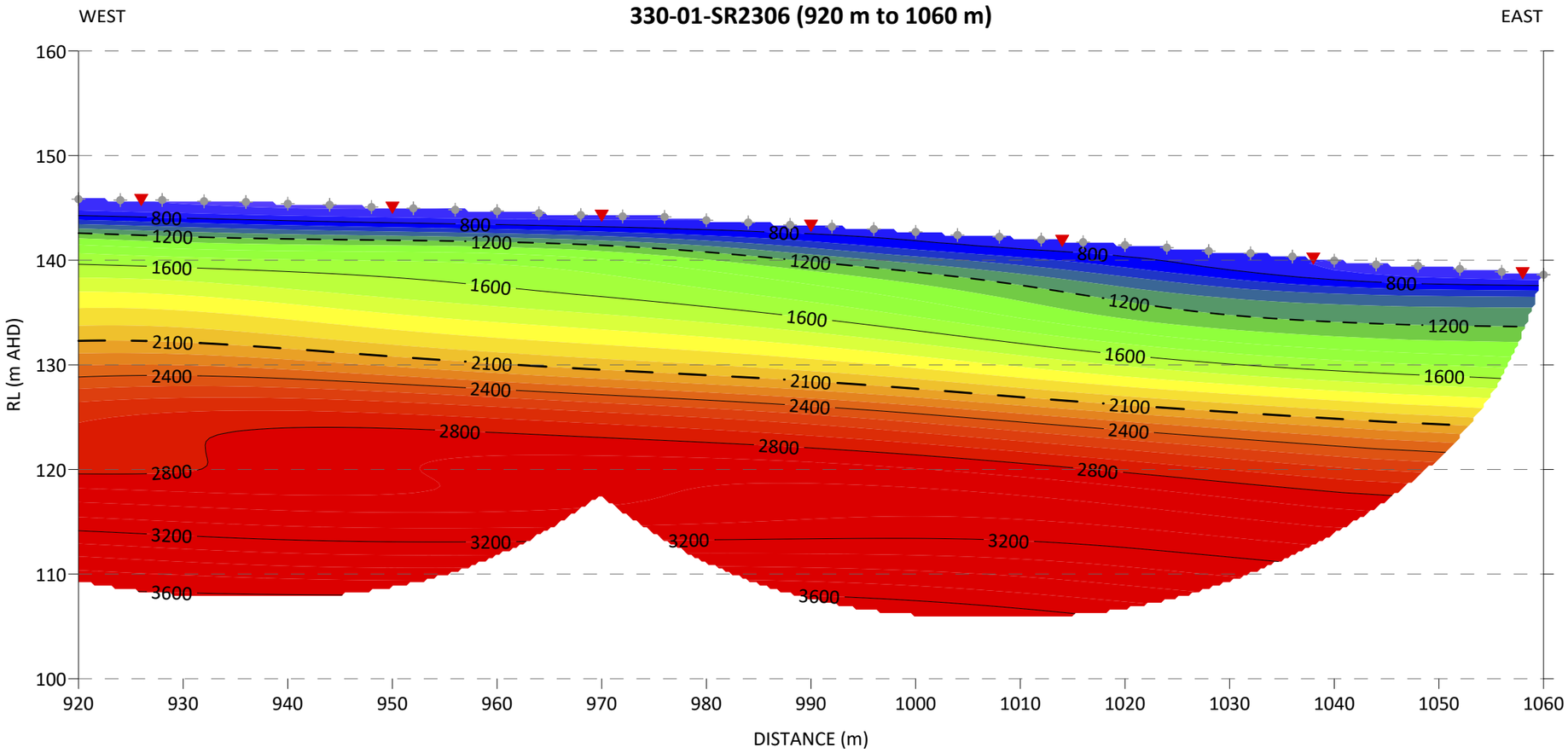
CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2306 (736 m to 924 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A24



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

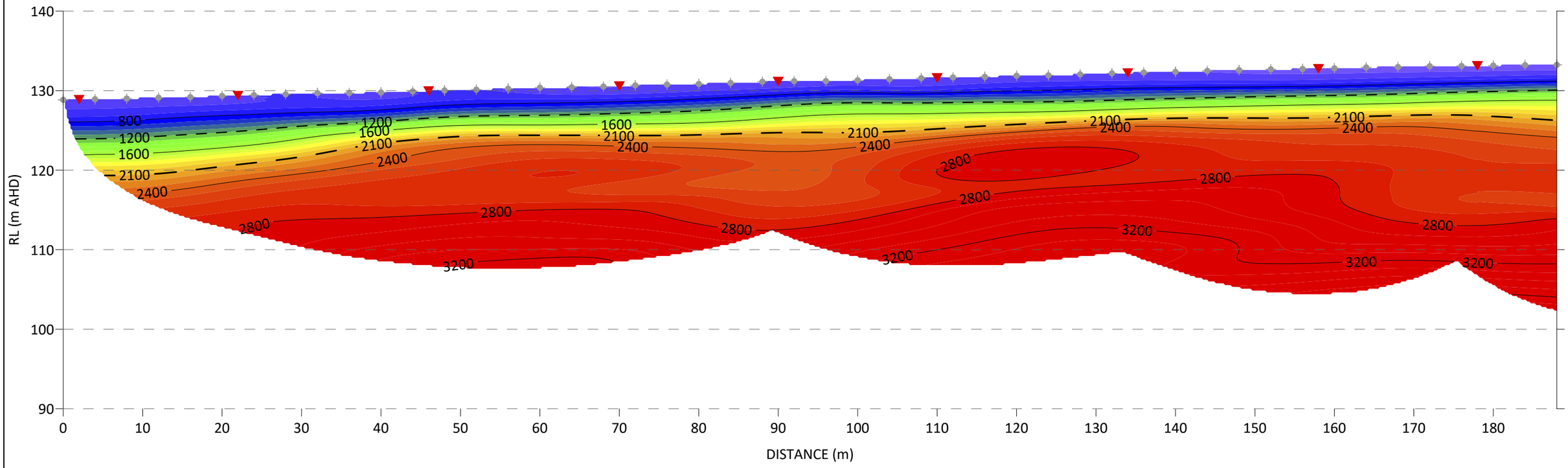
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2306 (920 m to 1060 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A25

WEST

330-01-SR2307 (0 m to 188 m)

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

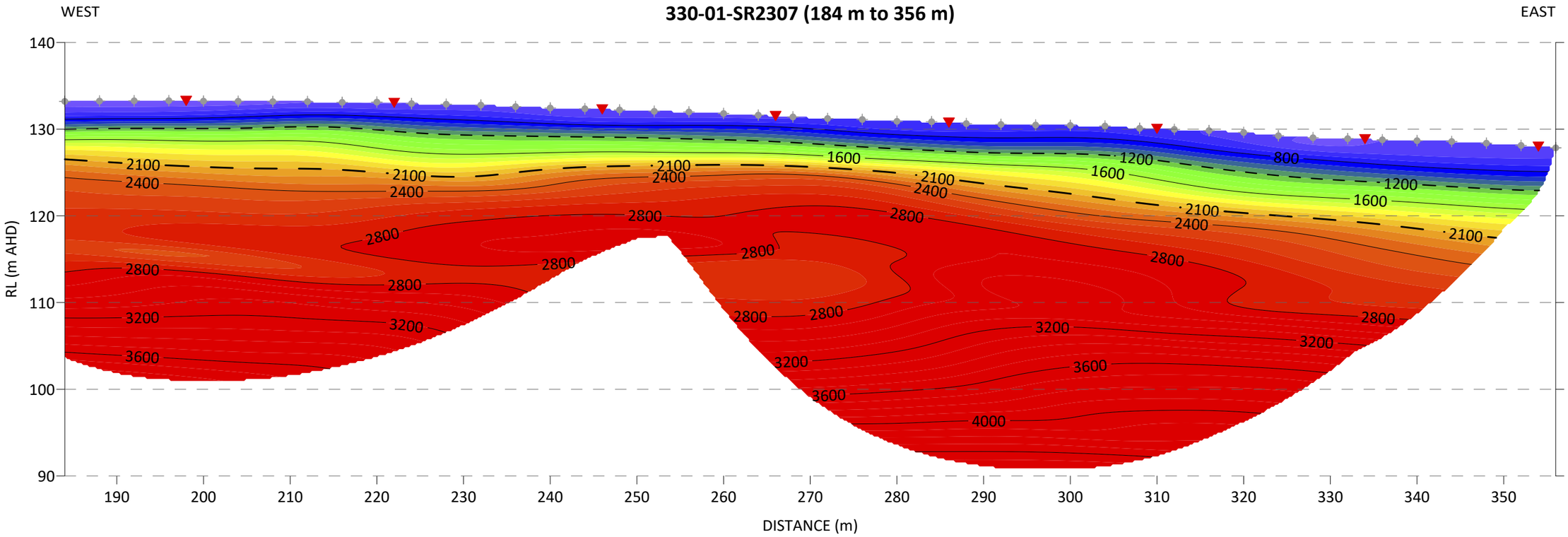
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2307 (0 m to 188 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A26

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

25 mm

0



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

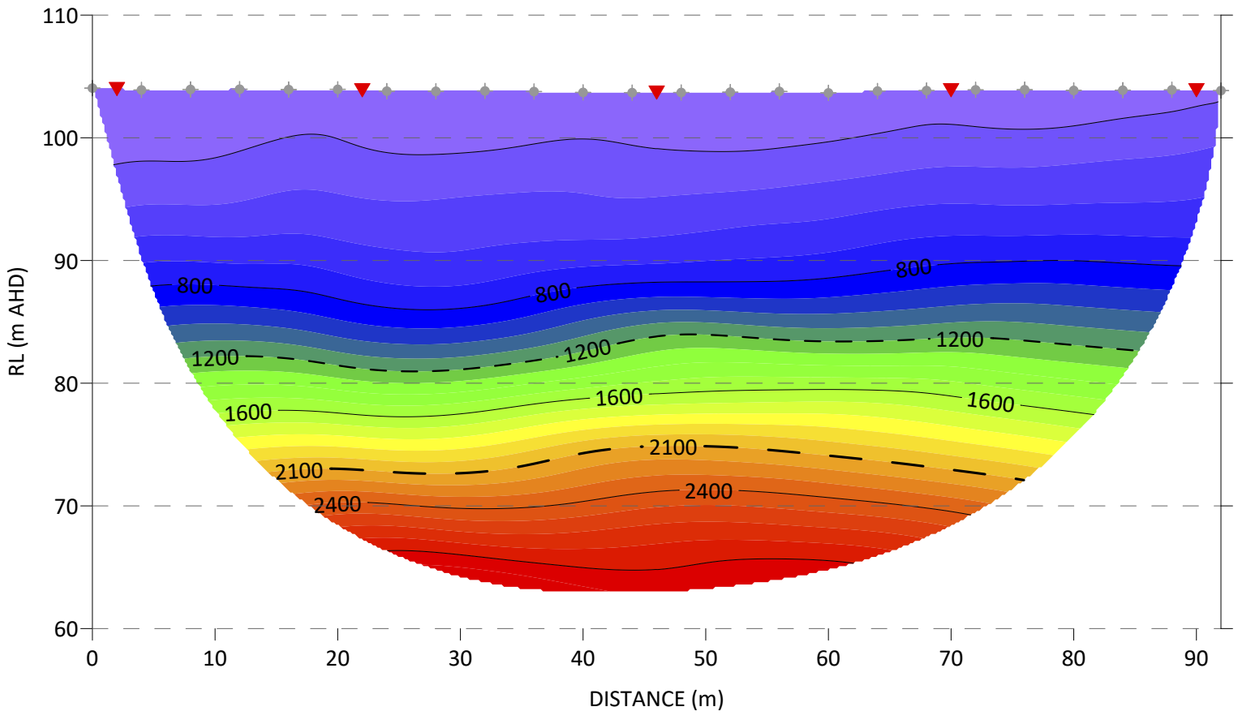
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2307 (184 m to 356 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A27

NORTHWEST

330-01-SR2204

SOUTHEAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-19
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

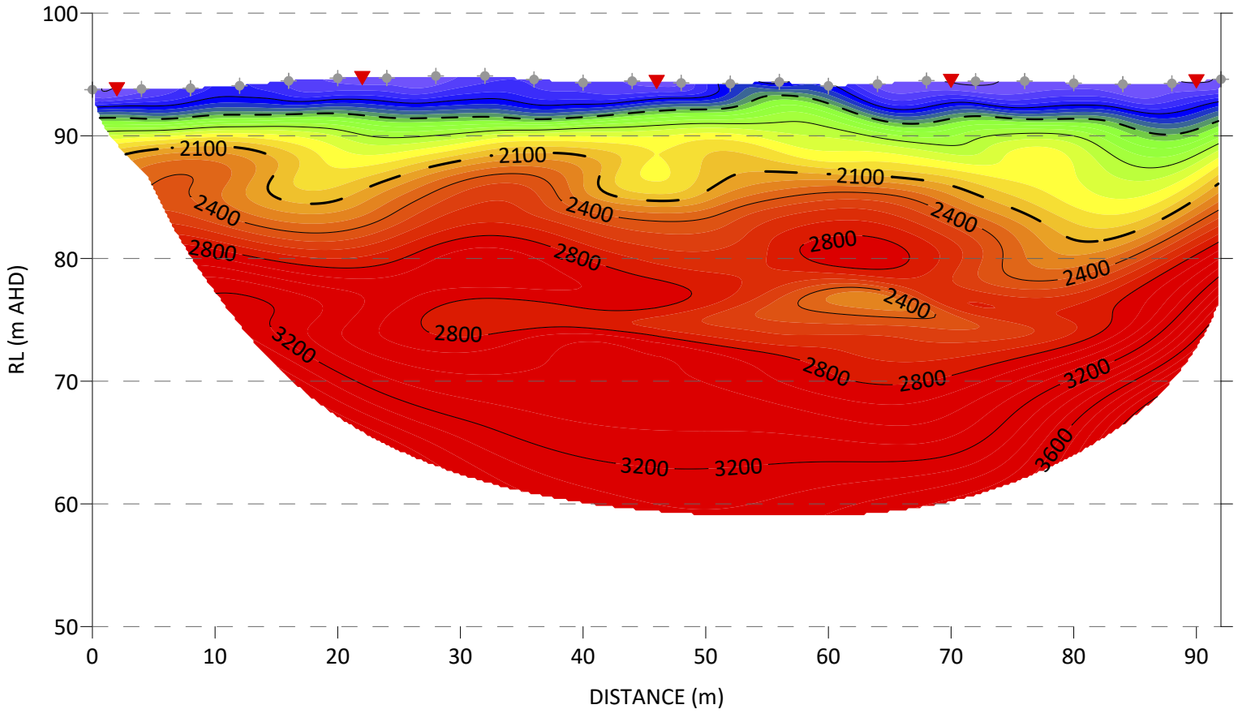
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2204

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A28

SOUTHWEST

330-01-SR2214

NORTHEAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-19
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

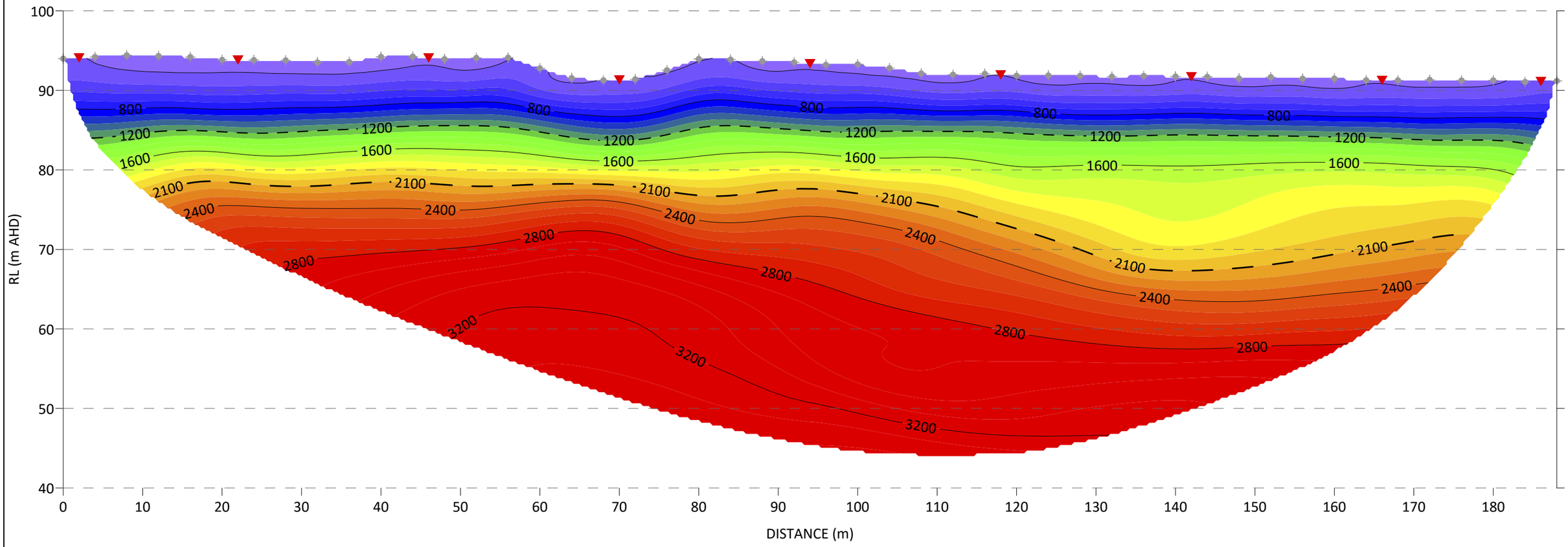
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2214

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A29

NORTHWEST

330-01-SR2205

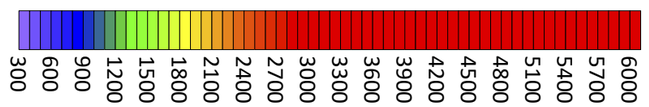
SOUTHEAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)



NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-19
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

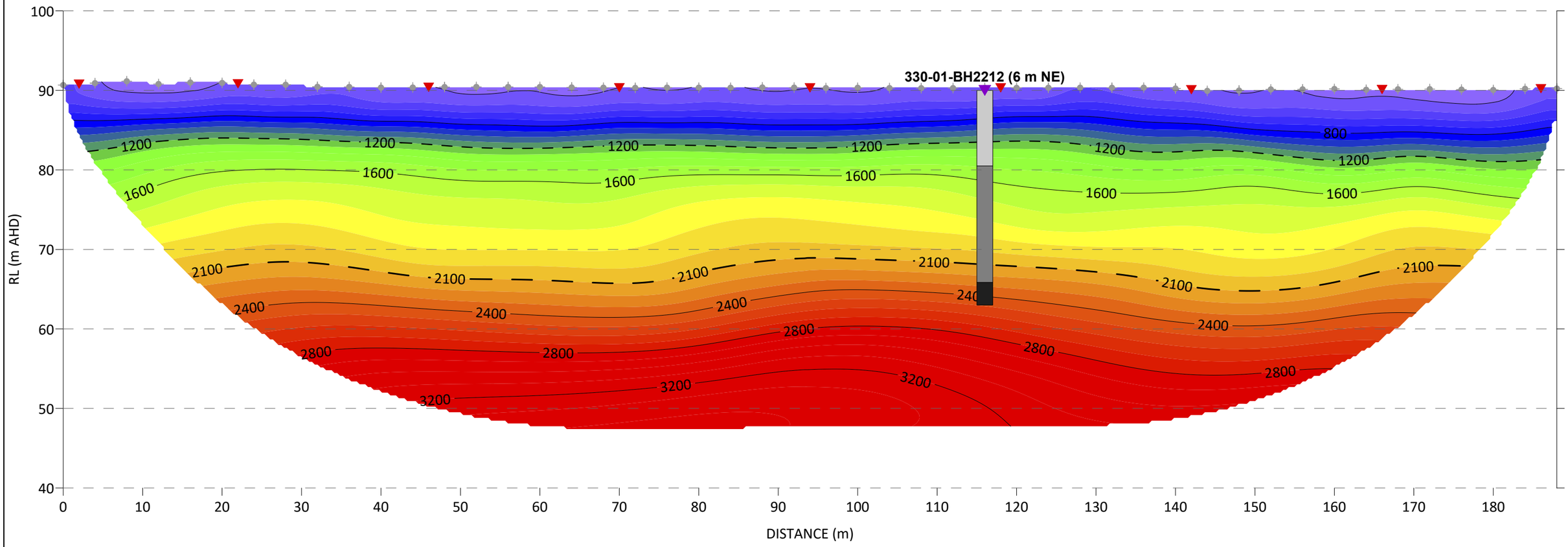
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2205

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A30

NORTHWEST

330-01-SR2206

SOUTHEAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- BOREHOLE LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

LEGEND - SUMMARISED GEOLOGICAL UNITS

- UNIT 1 - DRY TOP SOILS, LOOSE TO VERY DENSE ALLUVIUM OR RESIDUAL SOIL
- UNIT 2 - SATURATED FIRM TO VERY STIFF, VERY DENSE RESIDUAL SOILS / DISTINCTLY WEATHERED, LOW STRENGTH ROCK
- UNIT 3 - DISTINCTLY WEATHERED TO FRESH, LOW TO HIGH STRENGTH OR BETTER ROCK

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-18
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2206

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A31

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

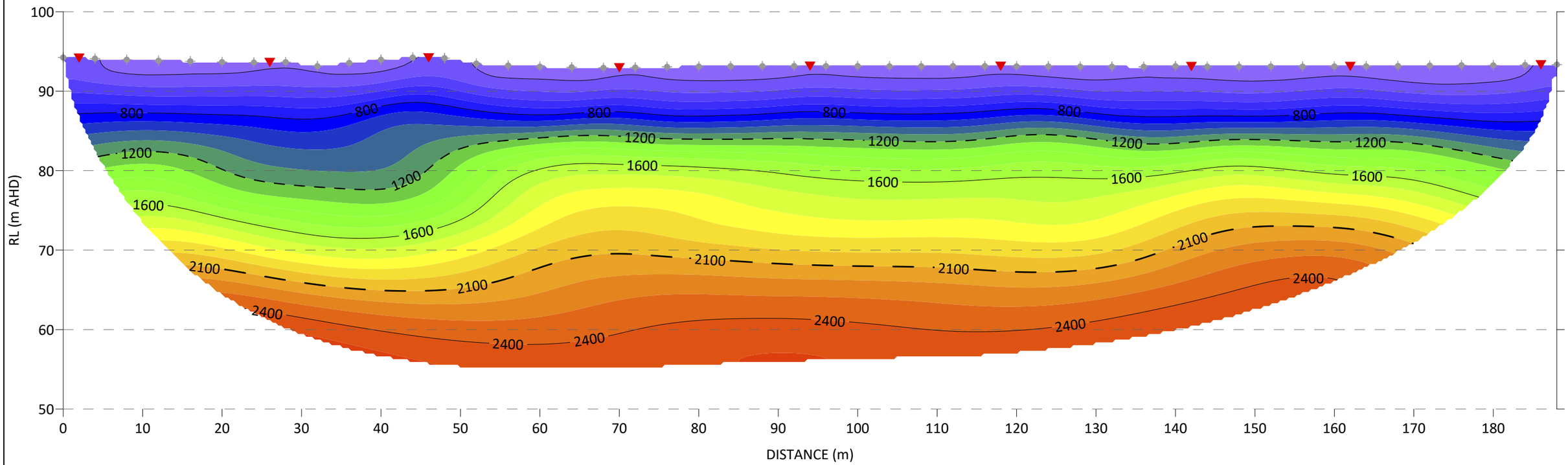
25mm

0

NORTHWEST

330-01-SR2207

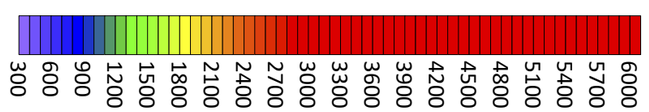
SOUTHEAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)



NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-19
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

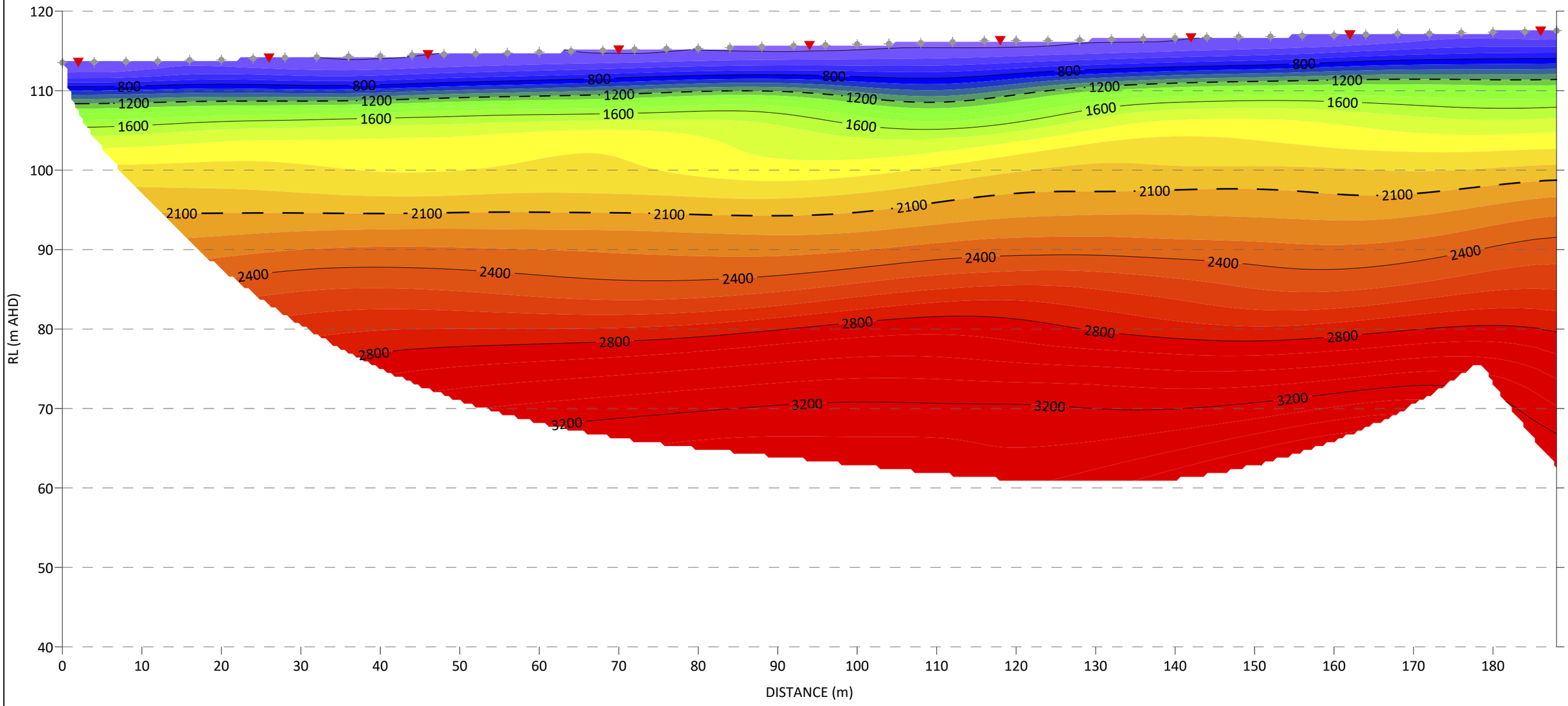
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2207

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A32

NORTHWEST

330-01-SR2308 (0 m to 188 m)

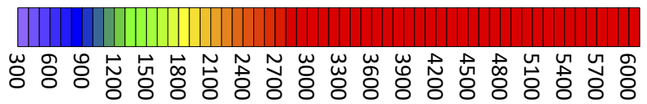
SOUTHEAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)



NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-19
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

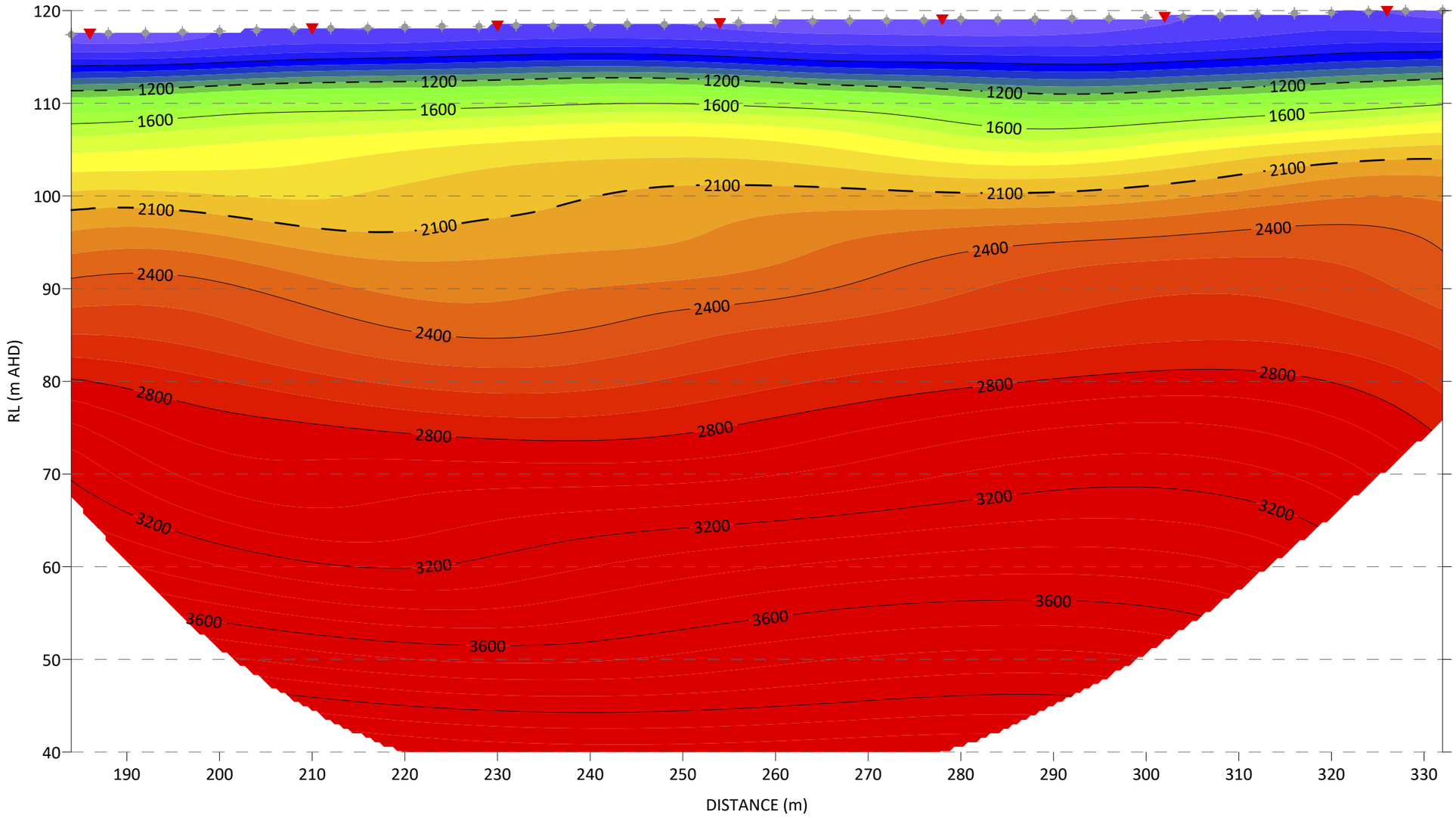
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2308 (0 m to 188 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A33

NORTHWEST

330-01-SR2308 (184 m to 332 m)

SOUTHEAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-19
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

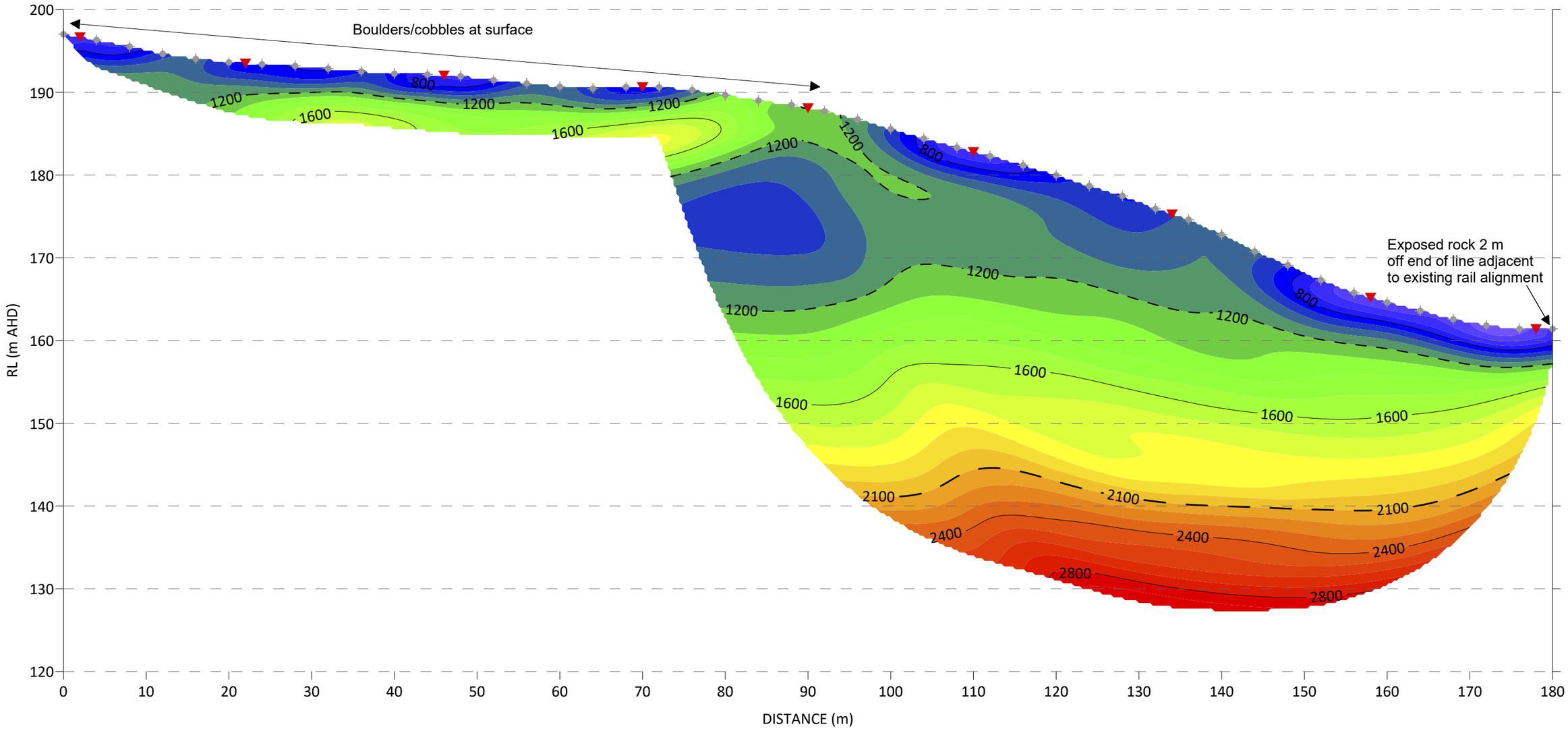
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2308 (184 m to 332 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A34

NORTHWEST

330-01-SR2101

SOUTHEAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-24
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

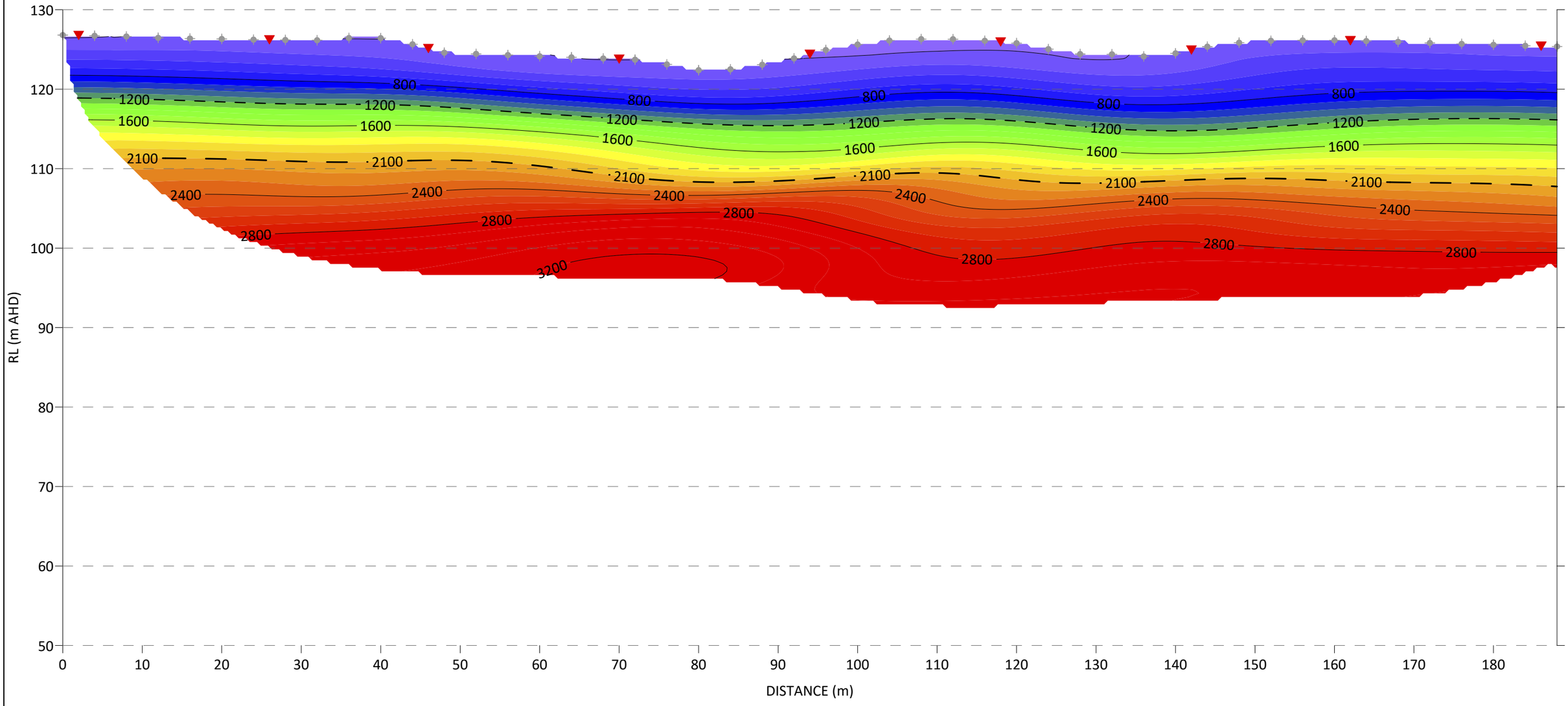
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2101

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A35

WEST

330-01-SR2310 (0 m to 188 m)

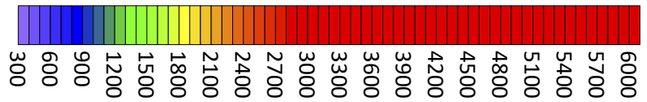
EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)



NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-19
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2310 (0 m to 188 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	B	A36

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

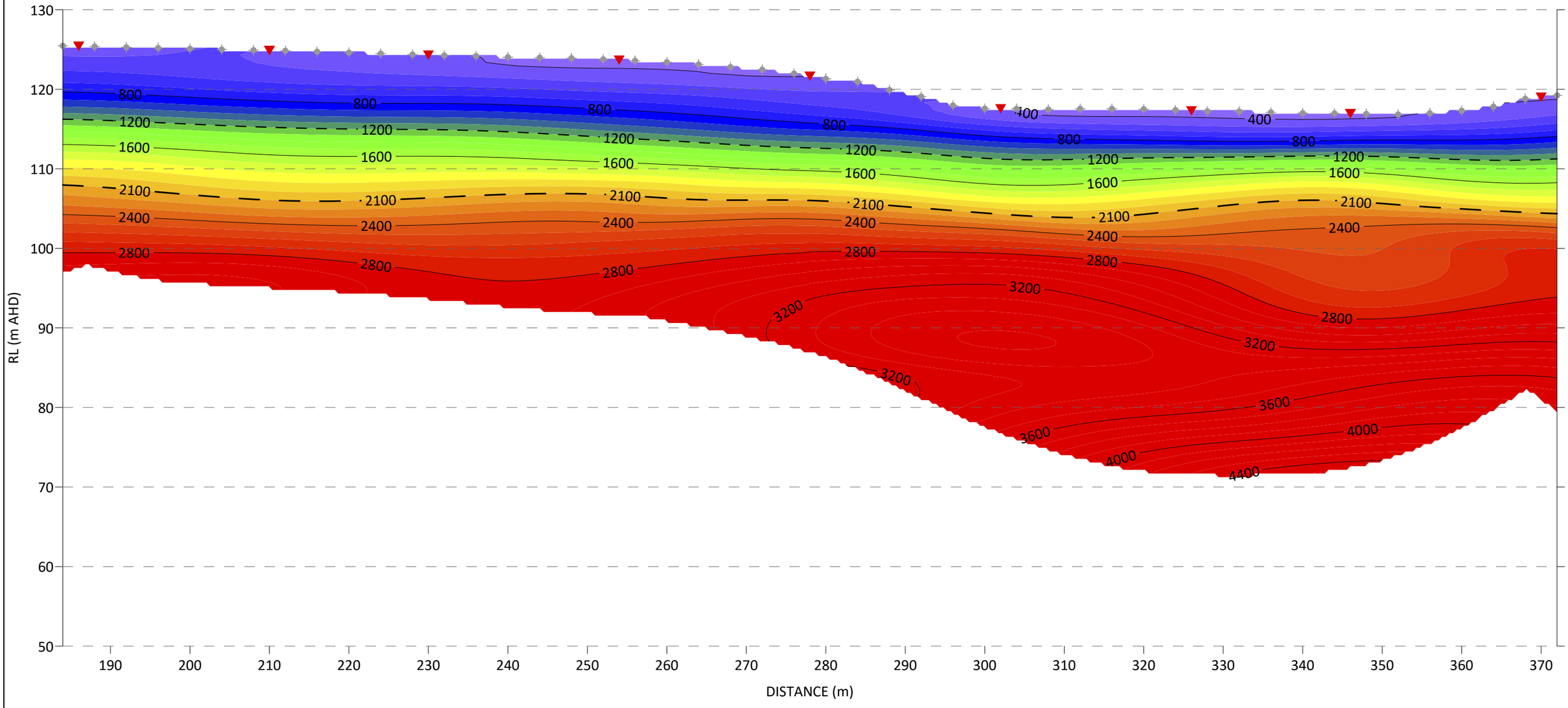
25 mm

0

WEST

330-01-SR2310 (184 m to 372 m)

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-19
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2310 (184 m to 372 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A37

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

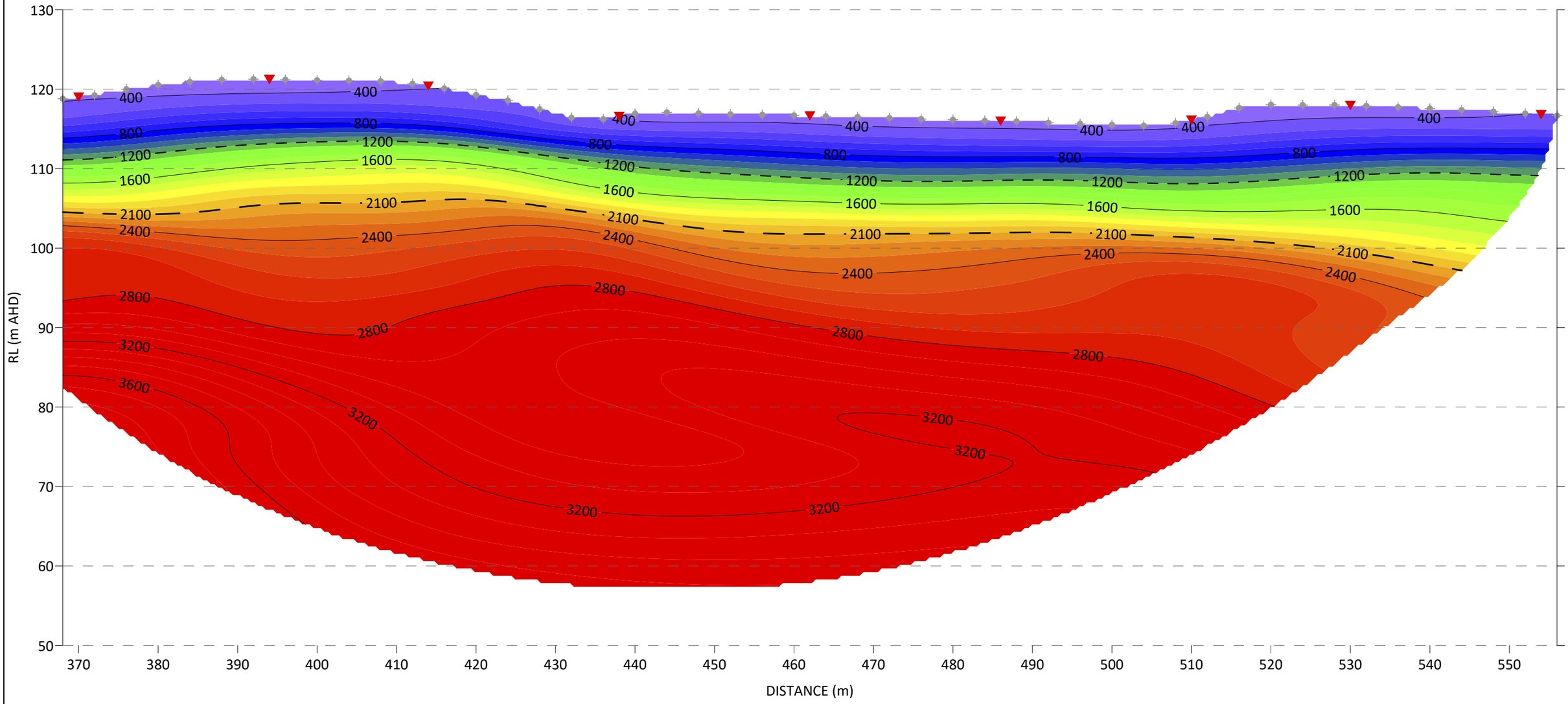
25 mm

0

WEST

330-01-SR2310 (368 m to 556 m)

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-19
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

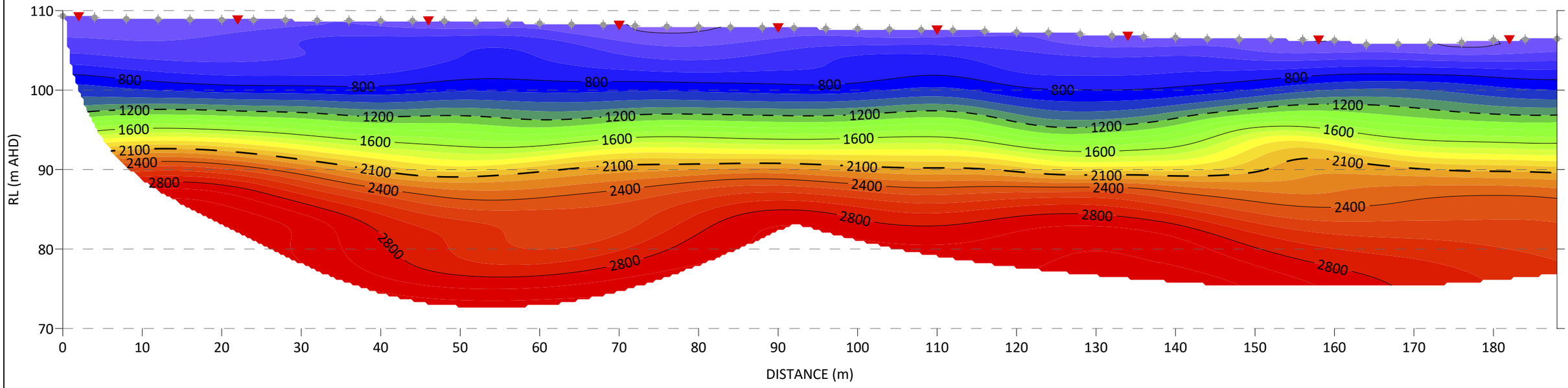
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2310 (368 m to 556 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A38

WEST

330-01-SR2208 (0 m to 188 m)

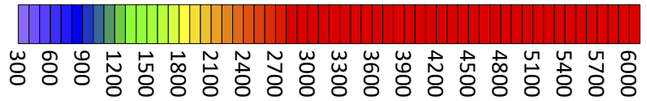
EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)



NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

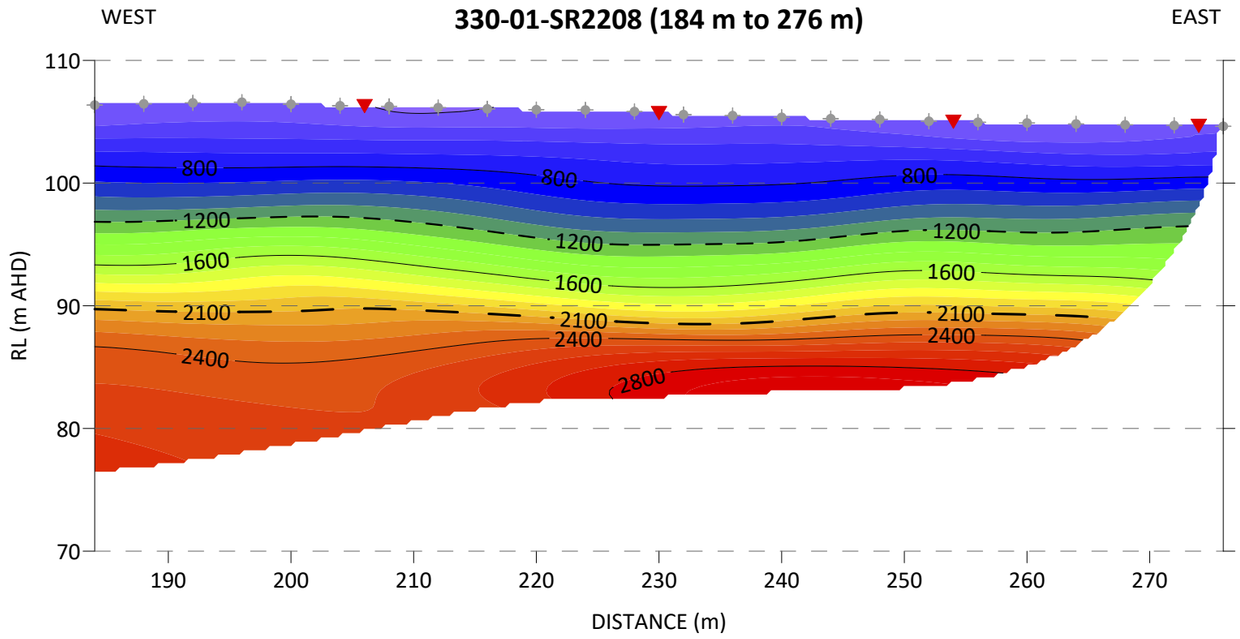
CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-19
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2208 (0 m to 188 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A39



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-24
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2208 (184 m to 276 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A40

WEST

330-01-SR2311 (0 m to 188 m)

EAST

RL (m AHD)

DISTANCE (m)

LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-24
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2311 (0 m to 188 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A41

WEST

330-01-SR2311 (184 m to 372 m)

EAST

RL (m AHD)

DISTANCE (m)

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

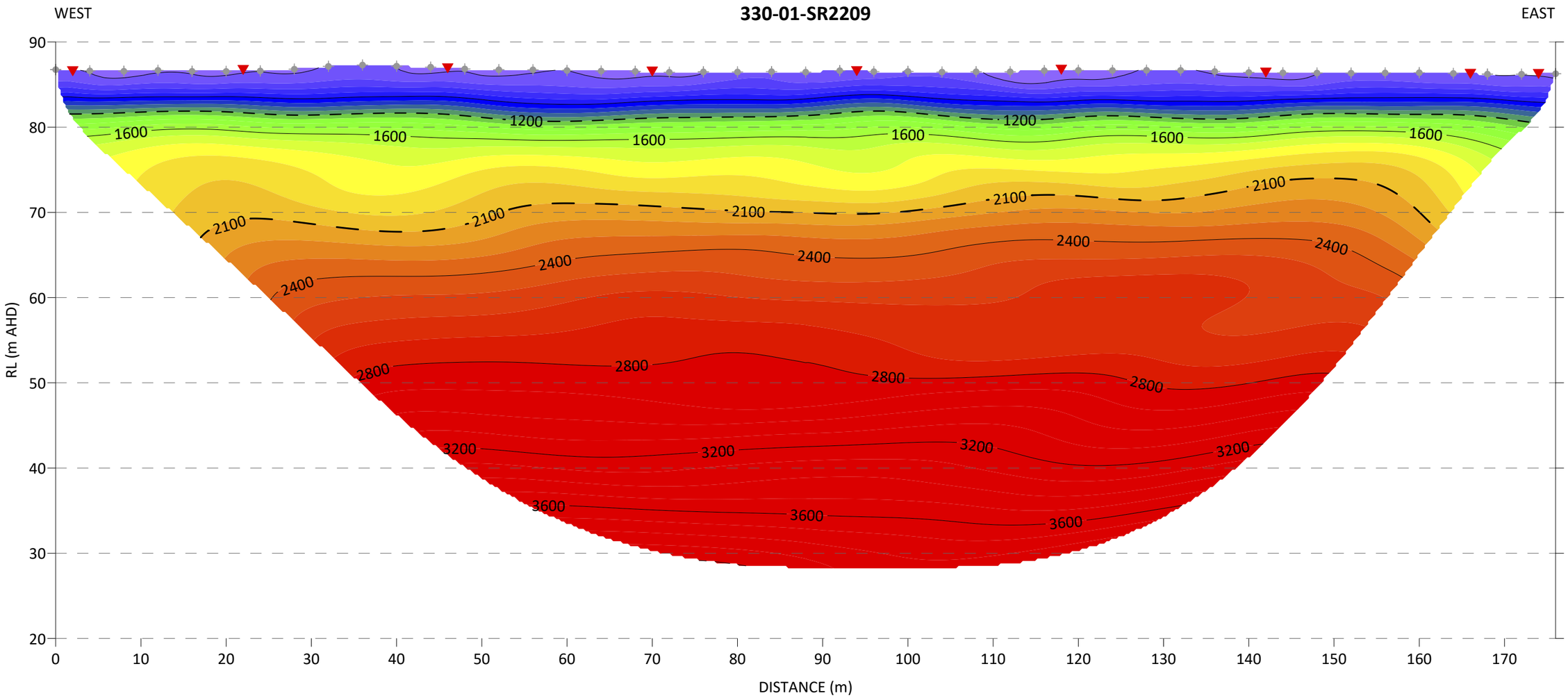
CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-24
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2311 (184 m to 372 m)

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A42



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-24
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

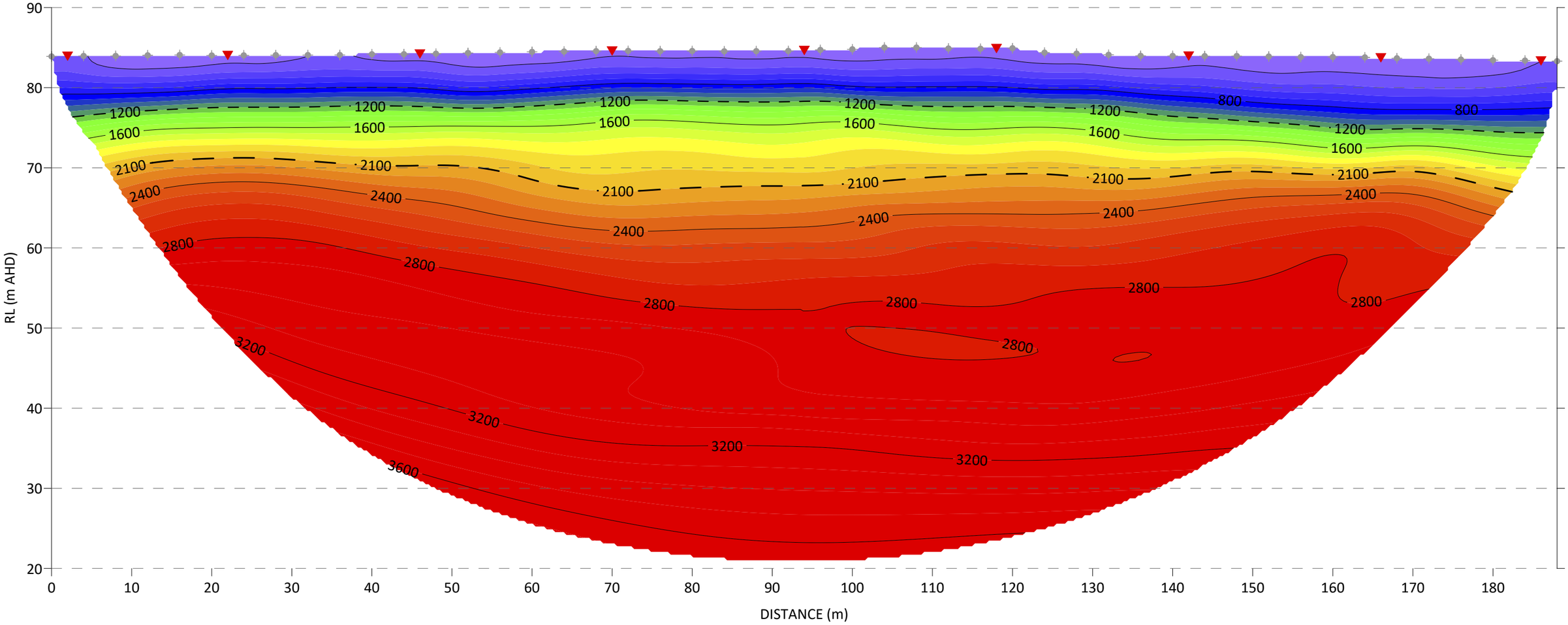
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2209

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A43

WEST

330-01-SR2210

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

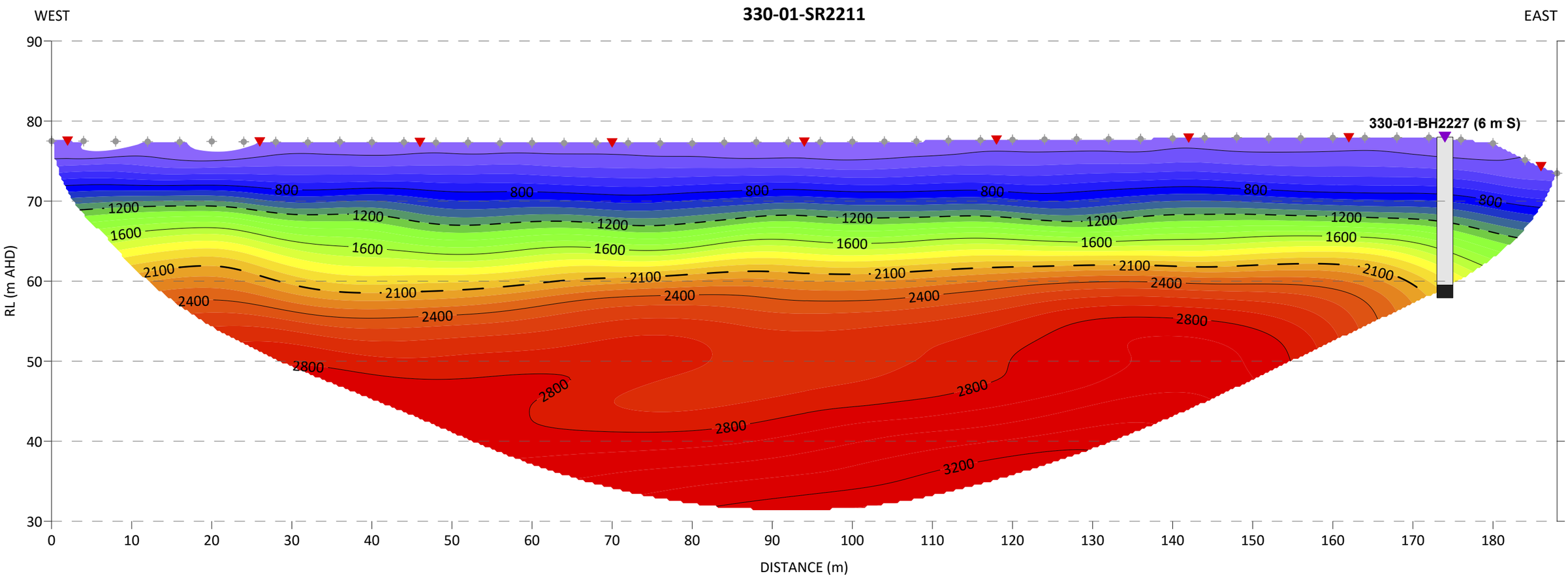
CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-24
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2210

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A44



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- BOREHOLE LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

LEGEND - SUMMARISED GEOLOGICAL UNITS

- UNIT 1 - DRY TOP SOILS, LOOSE TO VERY DENSE ALLUVIUM OR RESIDUAL SOIL
- UNIT 2 - SATURATED FIRM TO VERY STIFF, VERY DENSE RESIDUAL SOILS / DISTINCTLY WEATHERED, LOW STRENGTH ROCK
- UNIT 3 - DISTINCTLY WEATHERED TO FRESH, LOW TO HIGH STRENGTH OR BETTER ROCK

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

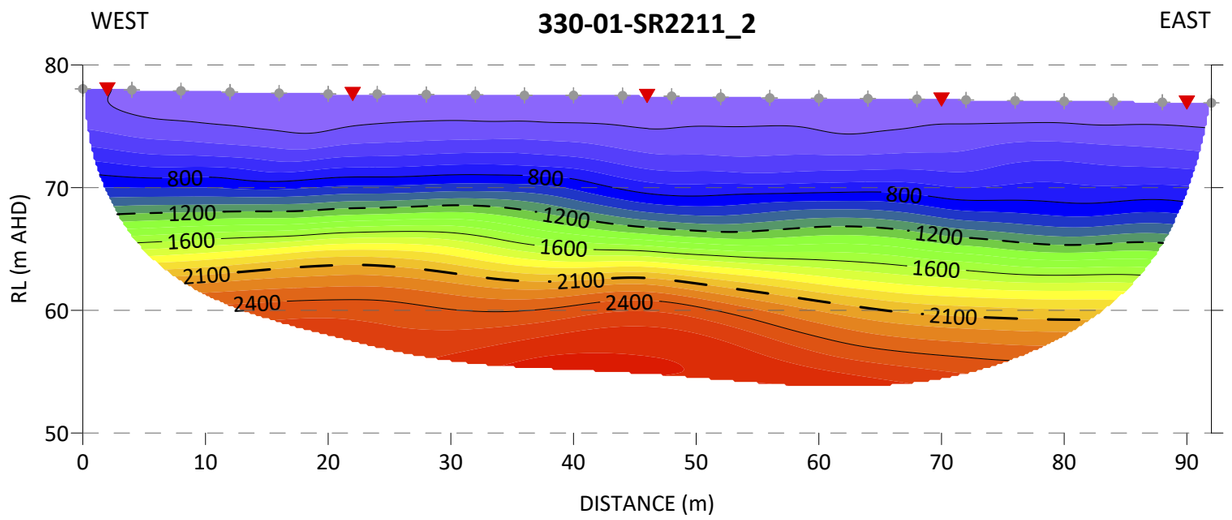
CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-24
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2211

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A45



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-24
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

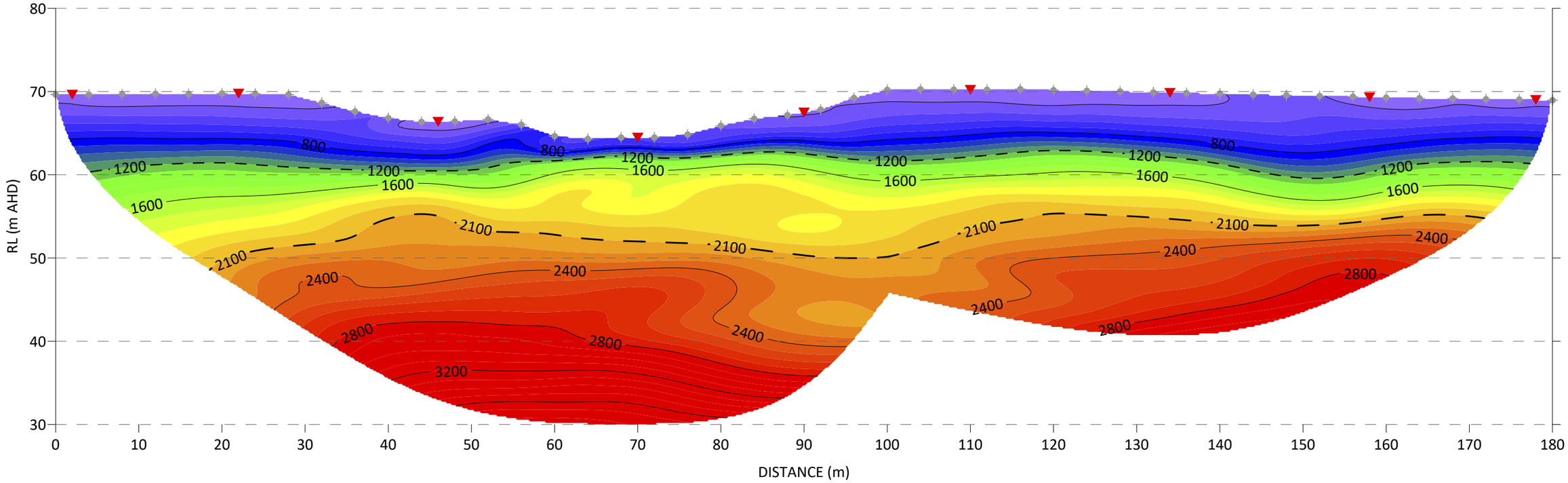
TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2211_2

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A46

WEST

330-01-SR2212

EAST



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

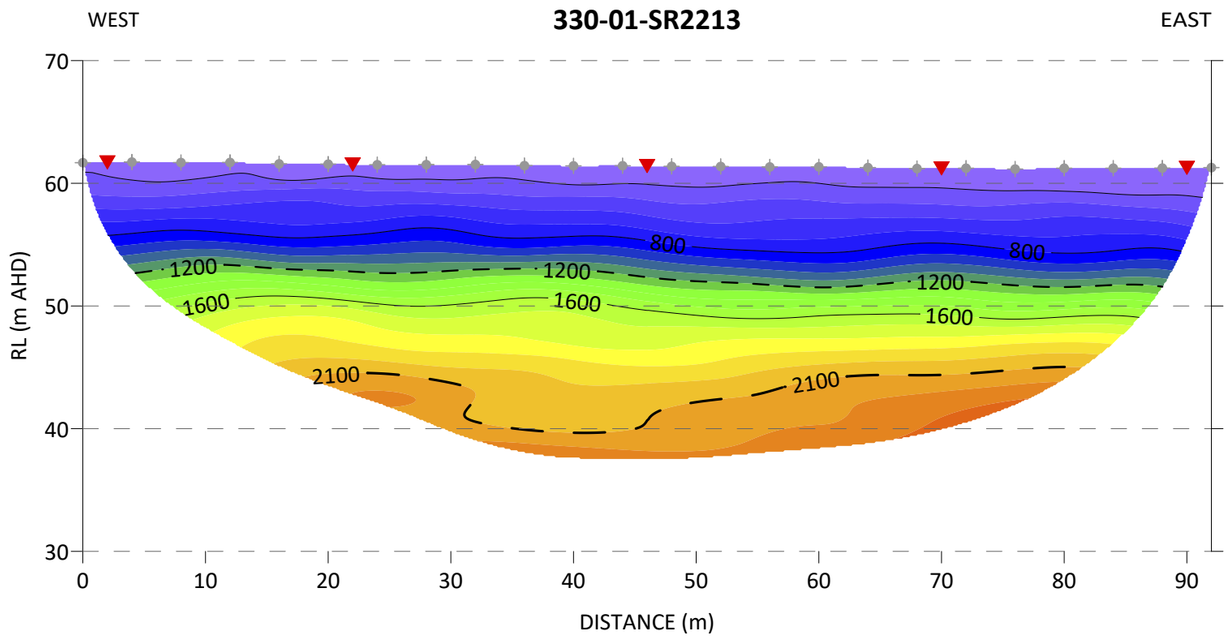
CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-24
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2212

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A47



LEGEND

- GEOPHONE LOCATION
- SEISMIC SHOT LOCATION
- TOP OF UNIT 2, 1200 m/s CONTOUR
- TOP OF UNIT 3, 2100 m/s CONTOUR

SEISMIC P-WAVE VELOCITY, V_P (m/s)

300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 4800 5100 5400 5700 6000

NOTES:
1. Data acquired with a Geometrics Geode seismograph and 14 Hz geophones at 4 m spacing.
2. Data analysis carried out in Pickwin (Geometrics Inc.) and Rayfract (Intelligent Resources)
3. Model RL's are from 1 m DEM received from FFJV (DEM_H2C_1m.tif) derived from LiDAR supplied by ARTC (AAM2015 survey).

CLIENT
FUTURE FREIGHT JOINT VENTURE (FFJV)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-24
DESIGNED	BK
PREPARED	LR
REVIEWED	TR
APPROVED	--

PROJECT
INLAND RAIL
SECTION 330, HELIDON TO CALVERT (H2C)
GEOPHYSICS SURVEY

TITLE
SEISMIC REFRACTION SECTION
LINE 330-01-SR2213

PROJECT NO.	DELIVERABLE	REV.	FIGURE
1893802	021	0	A48

ATTACHMENT B

Borehole Televiewer Results

Golder Associates Pty Ltd
147 Coronation Drive, Milton,
Queensland 4064, Australia
(PO Box 1734, Milton BC, QLD 4064)

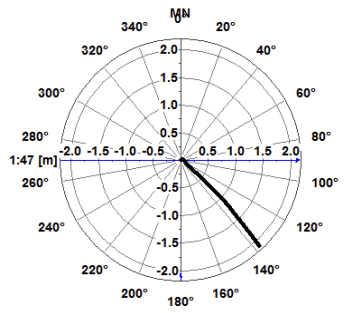
GEOPHYSICAL RECORD OF BOREHOLE: 330-01-BH2101

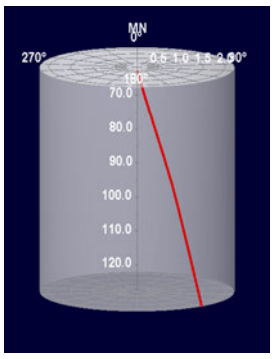
PROJECT	**Inland Rail Pkg 13**	Job #	**1893802**
CLIENT	**FFJV**	DATE	**18/10/18**

LOCATION-	**Laidley**	LOGGED BY-	**TR**
EASTING (MGA94) -	**443843 m E**	LOGGED DATE:	**24/09/18**
NORTHING (MGA94) -	**6941833 m N**	LOGGING DATUM-	**AHD**
ELEVATION (AHD m) -	**244 m**	LOGGED DEPTH-	**63.0 - 129.0 m**
DRILLED DEPTH- **130.4 m**	DIAMETER- **HQ**	DRAWN BY-	**LR**
PLUNGE- **90 deg**	AZIMUTH- **deg MN**	REVIEWED BY-	**TR**
CASING- **Steel - HWT**	DEPTH- **63.8 m**	FILE NAME-	**330-01-BH2101-RevB.WCL**

All defects and bedding oriented to True North (Declination 11 degs).
Mechanical caliper log is used for dip corrections.
Magnetic field stable below 66.0 m below ground level. Image distortion above 64 m below ground level.
Borehole zeroed to ground level. GPS survey of ground level applied for RL conversion.
Imagery is approximately 40 cm higher than cores.

DEVIATION DATA





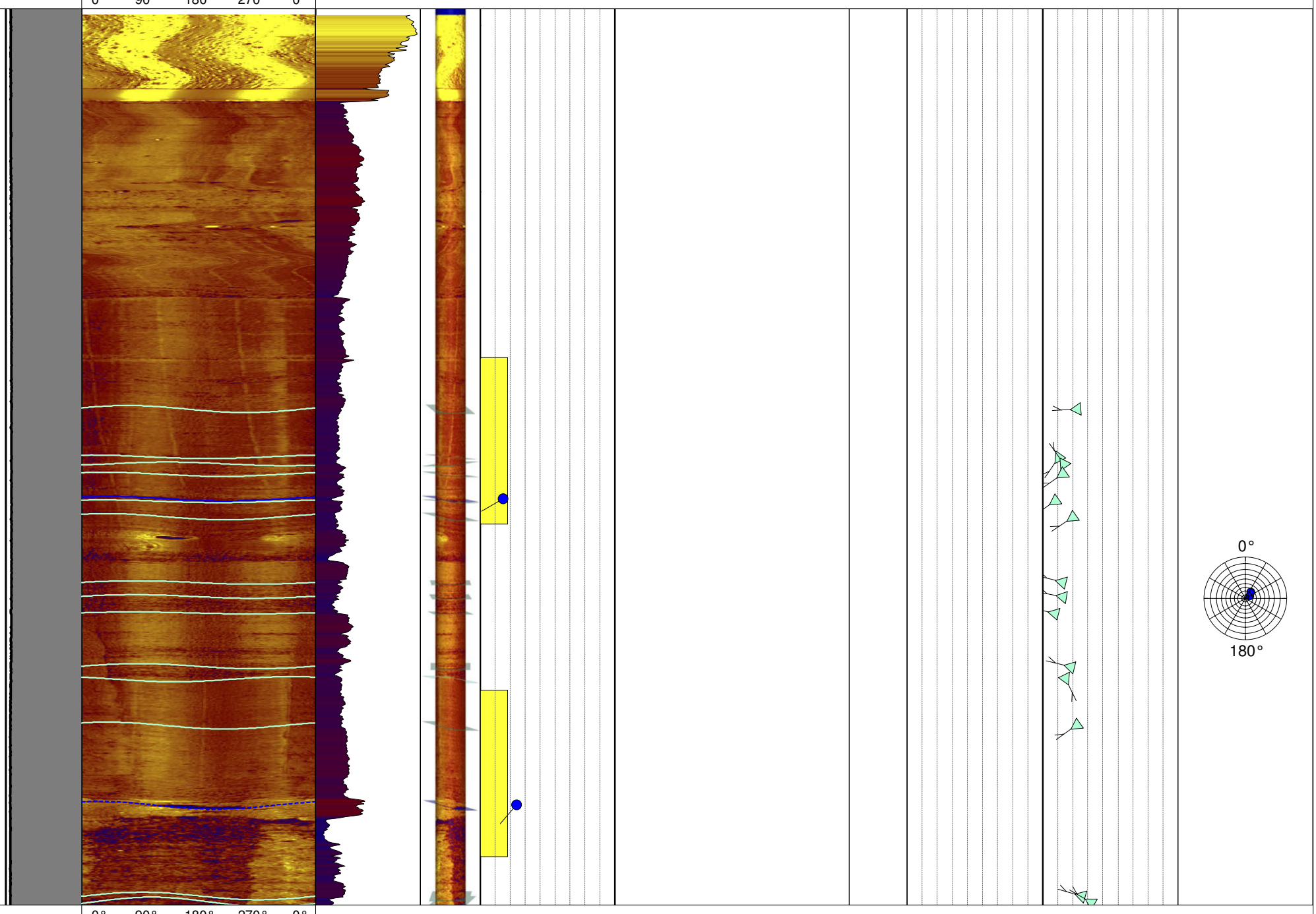
INTERPRETED STRUCTURES

Low Confidence
Medium Confidence
High Confidence

Bedding Parting - High Confidence
Bedding Fabric
Crushed Seam - Low Confidence
Crushed Seam - Medium Confidence
XW Seam - High Confidence
Joint - Low Confidence
Joint - Medium Confidence
Joint - High Confidence

330-01-BH2101

Depth 1m:30m	RL m AHD	Caliper	ATV Data				OTV Data			Summary Structural Data	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects	Bedding	Polar Plot Defects
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90	0 90	
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter		
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1		
			Breakout Projection								
			0° 90° 180° 270° 0°								



			0° 90° 180° 270° 0°								
			Breakout Projection								
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1		
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter		
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90	0 90	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects	Bedding	Polar Plot Defects
1m:30m Depth	AHD RL m	Caliper	ATV Data				OTV Data			Summary Structural Data	

330-01-BH2101

330-01-BH2101

Depth 1m:30m	RL m AHD	Caliper	ATV Data				OTV Data				Summary Structural Data	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter			
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			Breakout Projection									
			0° 90° 180° 270° 0°									
68.5	175.5											
69.0	175.0											
69.5	174.5											
70.0	174.0											
70.5	173.5											
71.0	173.0											
71.5	172.5											
72.0	172.0											
72.5	171.5											
73.0	171.0											
73.5	170.5											
74.0	170.0											
74.5	169.5											
75.0	169.0											
75.5	168.5											
76.0	168.0											
			0° 90° 180° 270° 0°									
			Breakout Projection									
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter			
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
1m:30m Depth	AHD RL m	Caliper	ATV Data				OTV Data				Summary Structural Data	

330-01-BH2101

330-01-BH2101

Depth 1m:30m	RL m AHD	Caliper	ATV Data	OTV Data	Summary Structural Data

QL40 CAL: 90 – 260

Amplitude-NM - Static Norm.: 0° 90° 180° 270° 0°

AP Hardness: 0 – 1020

ATV 3D: 268°

ATV Defects: 0 – 90

Image-NM: 0° 90° 180° 270° 0°

OTV 3D: -0°

OTV Defects: 0 – 90

Bedding: 0 – 90

Polar Plot Defects

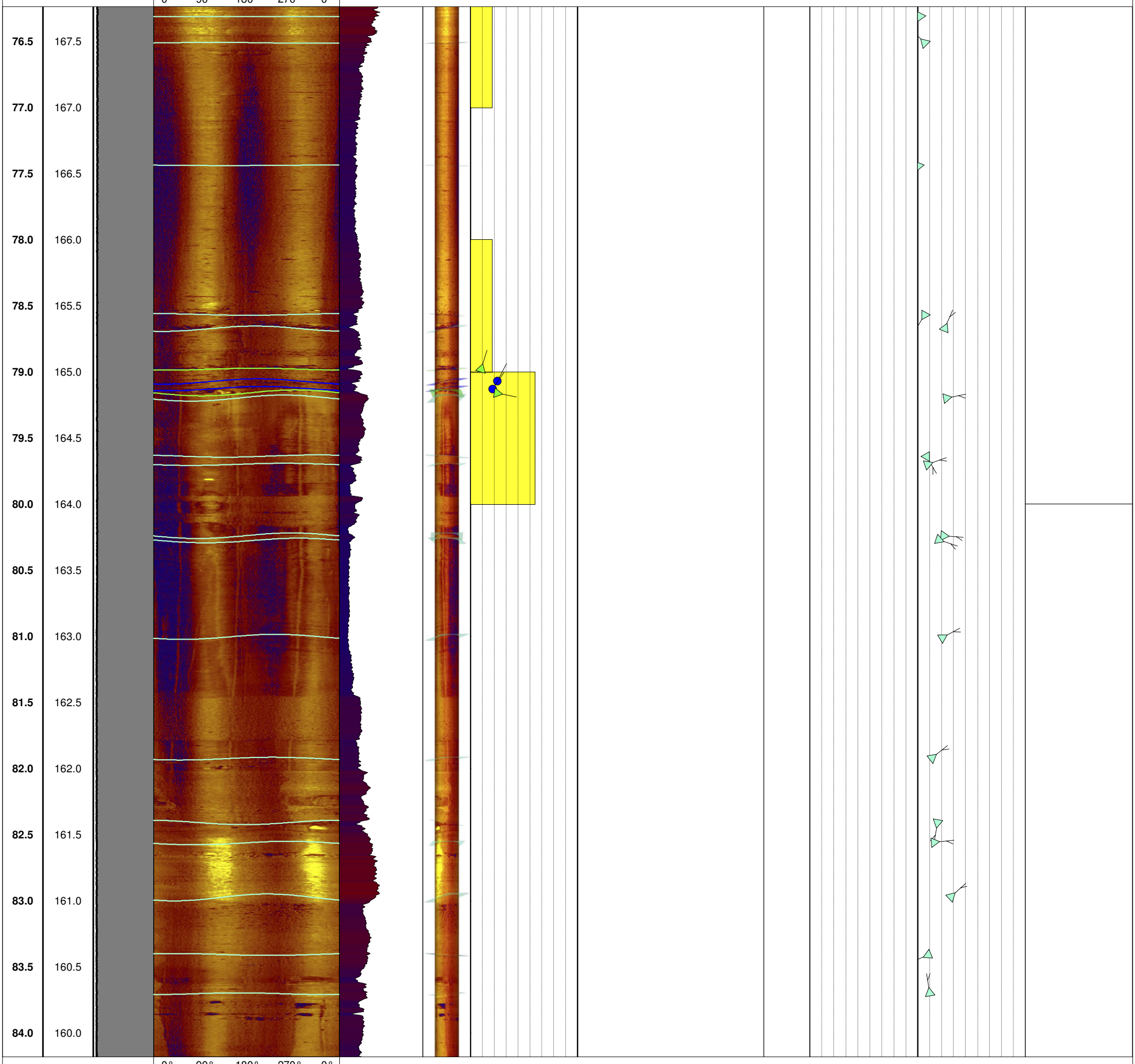
ATV Structure Log: 0° 90° 180° 270° 0°

ATV FF: 0 counts/m 5

OTV Structure Log: 0° 90° 180° 270° 0°

OTV Freq/meter: 0 counts/m 1

Breakout Projection: 0° 90° 180° 270° 0°



Breakout Projection: 0° 90° 180° 270° 0°

ATV Structure Log: 0° 90° 180° 270° 0°

ATV FF: 0 counts/m 5

OTV Structure Log: 0° 90° 180° 270° 0°

OTV Freq/meter: 0 counts/m 1

QL40 CAL: 90 – 260

Amplitude-NM - Static Norm.: 0° 90° 180° 270° 0°

AP Hardness: 0 – 1020

ATV 3D: 268°

ATV Defects: 0 – 90

Image-NM: 0° 90° 180° 270° 0°

OTV 3D: -0°

OTV Defects: 0 – 90

Bedding: 0 – 90

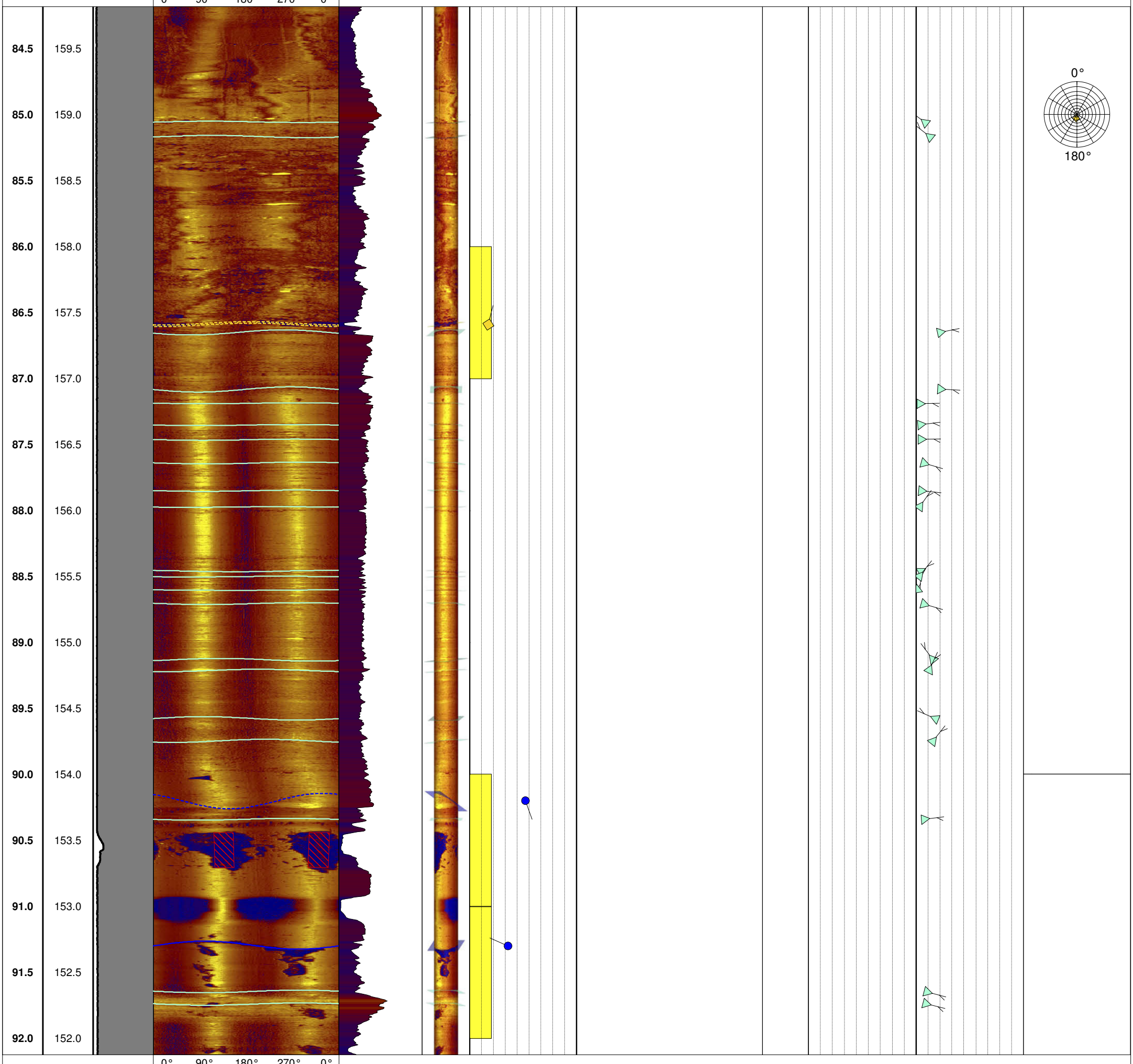
Polar Plot Defects

1m:30m Depth	AHD RL m	Caliper	ATV Data	OTV Data	Summary Structural Data

330-01-BH2101

330-01-BH2101

Depth 1m:30m	RL m AHD	Caliper	ATV Data				OTV Data				Summary Structural Data	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter			
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			Breakout Projection									
			0° 90° 180° 270° 0°									



			0° 90° 180° 270° 0°									
			Breakout Projection									
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter			
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
1m:30m Depth	AHD RL m	Caliper	ATV Data				OTV Data				Summary Structural Data	

330-01-BH2101

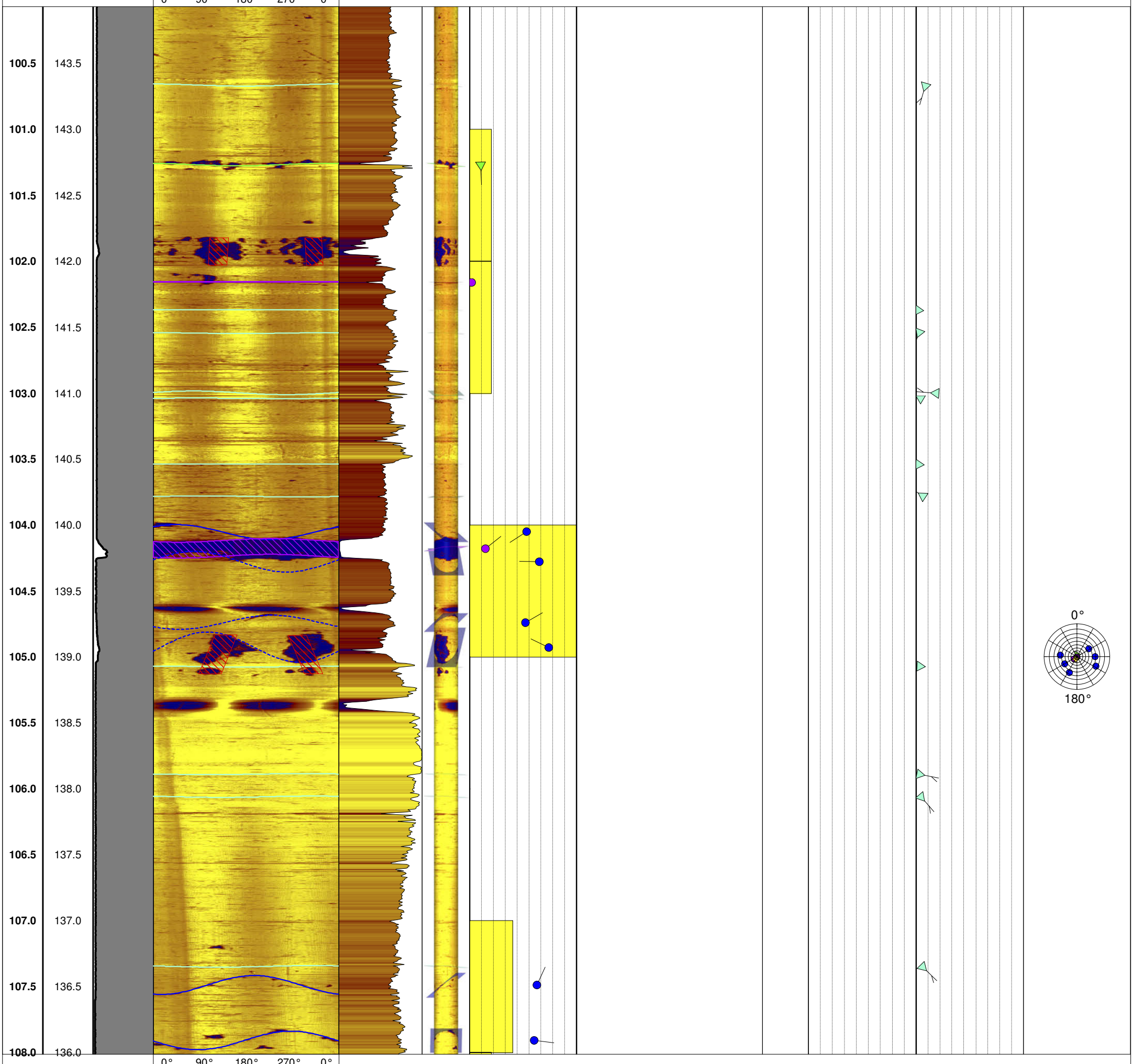
330-01-BH2101

Depth 1m:30m	RL m AHD	Caliper	ATV Data				OTV Data				Summary Structural Data	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter			
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			Breakout Projection									
			0° 90° 180° 270° 0°									
92.5	151.5											
93.0	151.0											
93.5	150.5											
94.0	150.0											
94.5	149.5											
95.0	149.0											
95.5	148.5											
96.0	148.0											
96.5	147.5											
97.0	147.0											
97.5	146.5											
98.0	146.0											
98.5	145.5											
99.0	145.0											
99.5	144.5											
100.0	144.0											
			0° 90° 180° 270° 0°									
			Breakout Projection									
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter			
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
1m:30m Depth	AHD RL m	Caliper	ATV Data				OTV Data				Summary Structural Data	

330-01-BH2101

330-01-BH2101

Depth 1m:30m	RL m AHD	Caliper	ATV Data				OTV Data				Summary Structural Data	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter			
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			Breakout Projection									
			0° 90° 180° 270° 0°									



			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			Breakout Projection			ATV FF	OTV Structure Log		OTV Freq/meter			
			0° 90° 180° 270° 0°									
			ATV Structure Log									
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
1m:30m Depth	AHD RL m	Caliper	ATV Data				OTV Data				Summary Structural Data	

330-01-BH2101

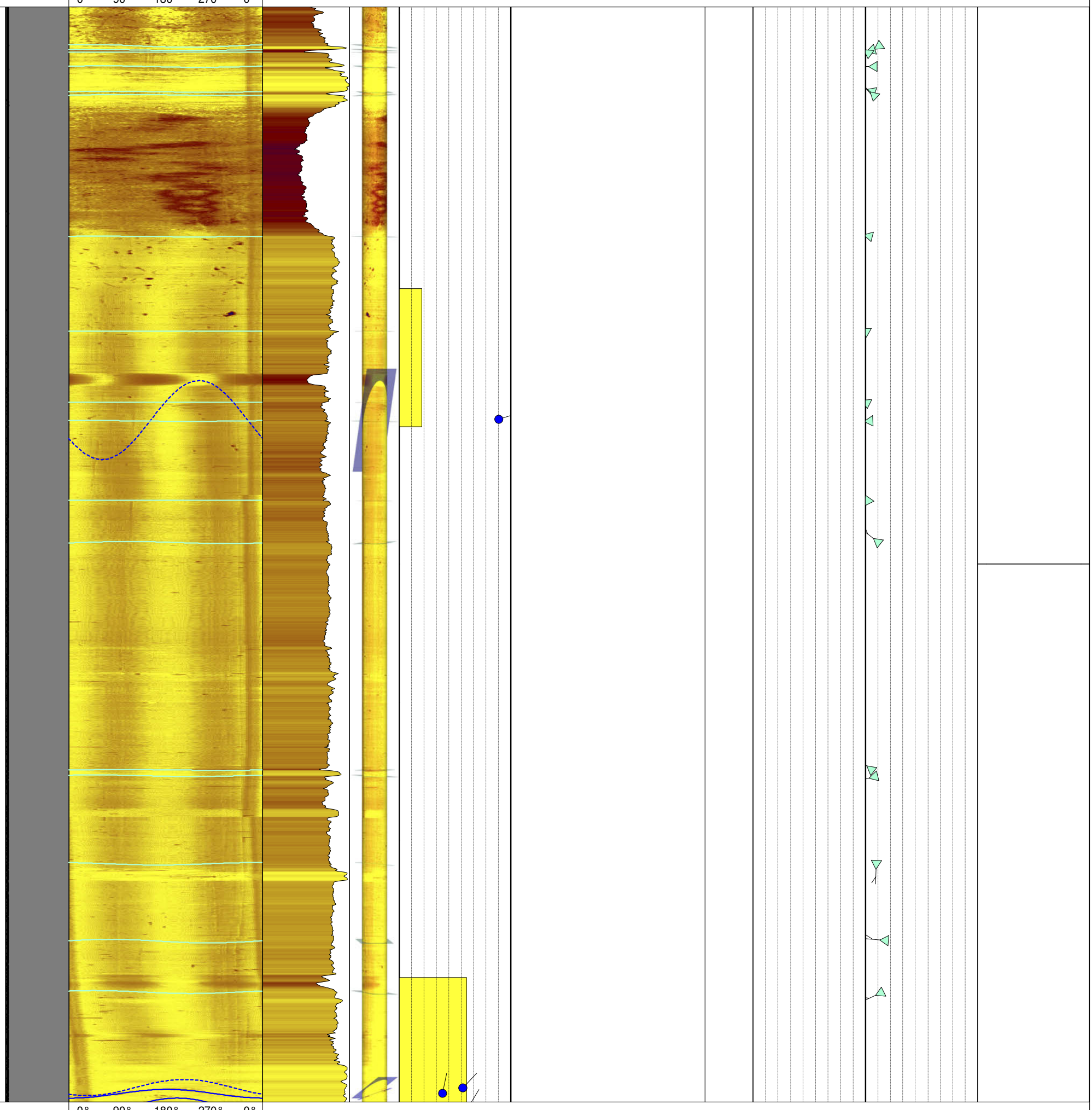
330-01-BH2101

Depth 1m:30m	RL m AHD	Caliper	ATV Data				OTV Data				Summary Structural Data	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter			
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			Breakout Projection									
			0° 90° 180° 270° 0°									
108.0	136.0											
108.5	135.5											
109.0	135.0											
109.5	134.5											
110.0	134.0											
110.5	133.5											
111.0	133.0											
111.5	132.5											
112.0	132.0											
112.5	131.5											
113.0	131.0											
113.5	130.5											
114.0	130.0											
114.5	129.5											
115.0	129.0											
115.5	128.5											
											0° 180°	
			0° 90° 180° 270° 0°									
			Breakout Projection									
			0° 90° 180° 270° 0°									
			ATV Structure Log			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
						ATV FF	OTV Structure Log		OTV Freq/meter			
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
1m:30m Depth	AHD RL m	Caliper	ATV Data				OTV Data				Summary Structural Data	

330-01-BH2101

330-01-BH2101

Depth 1m:30m	RL m AHD	Caliper	ATV Data				OTV Data				Summary Structural Data	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter			
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			Breakout Projection									
			0° 90° 180° 270° 0°									

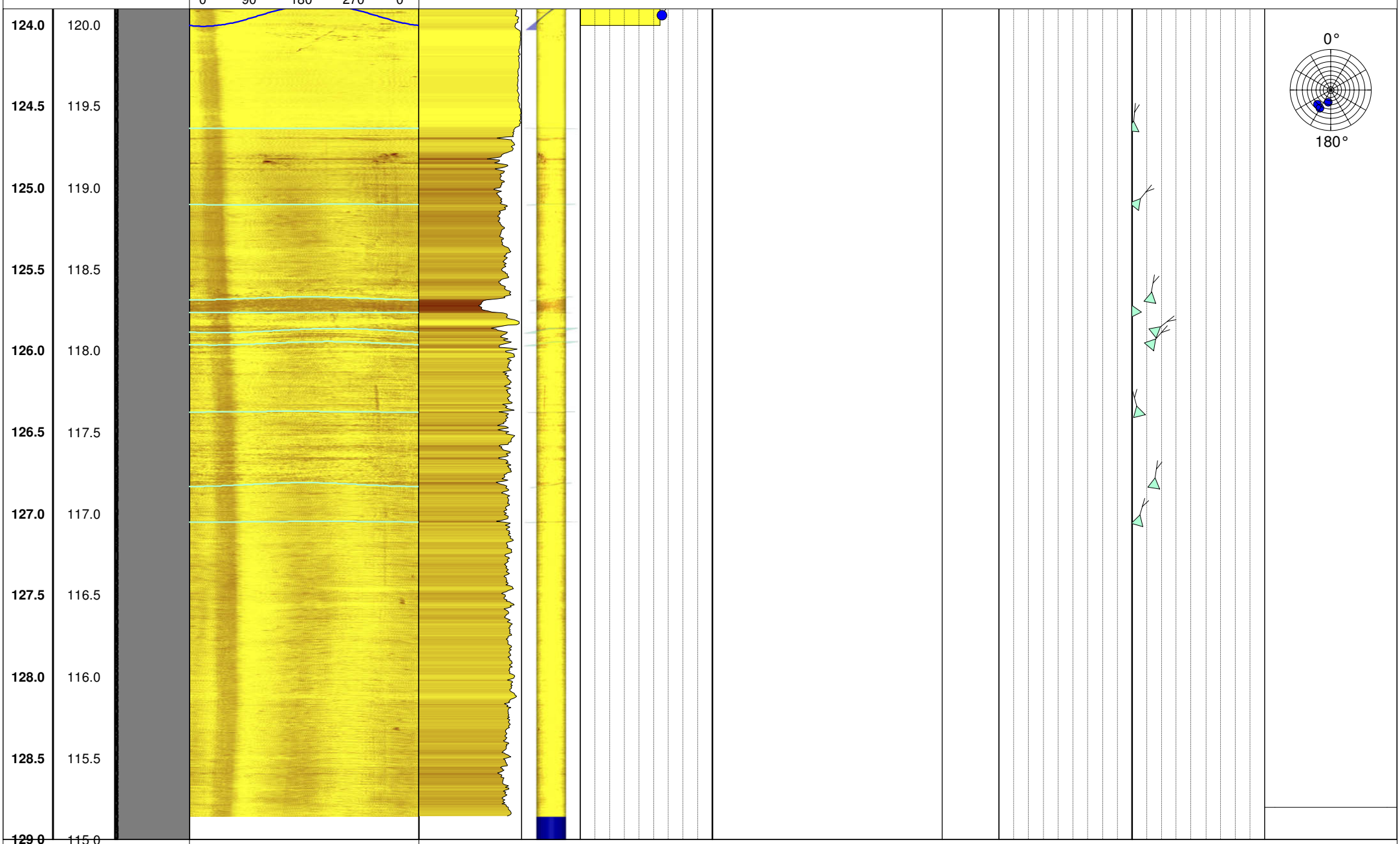


			0° 90° 180° 270° 0°									
			Breakout Projection									
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter			
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
1m:30m Depth	AHD RL m	Caliper	ATV Data				OTV Data				Summary Structural Data	

330-01-BH2101

330-01-BH2101

Depth 1m:30m	RL m AHD	Caliper	ATV Data				OTV Data				Summary Structural Data	
		QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter			
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			Breakout Projection									
			0° 90° 180° 270° 0°									



			0° 90° 180° 270° 0°									
			Breakout Projection									
			0° 90° 180° 270° 0°			0 counts/m 5	0° 90° 180° 270° 0°		0 counts/m 1			
			ATV Structure Log			ATV FF	OTV Structure Log		OTV Freq/meter			
		90 260	0° 90° 180° 270° 0°	0 1020	268°	0 90	0° 90° 180° 270° 0°	-0°	0 90		0 90	
1m:30m Depth	AHD RL m	QL40 CAL	Amplitude-NM - Static Norm.	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects		Bedding	Polar Plot Defects
		Caliper	ATV Data				OTV Data				Summary Structural Data	

330-01-BH2101

Golder Associates Pty Ltd
147 Coronation Drive, Milton,
Queensland 4064, Australia
(PO Box 1734, Milton BC, QLD 4064)

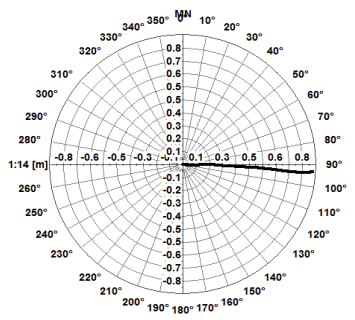
GEOPHYSICAL RECORD OF BOREHOLE: 330-01-BH2102

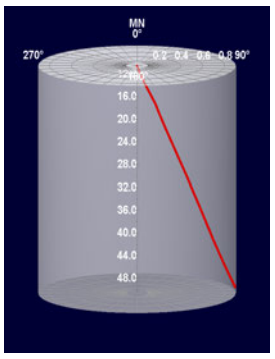
PROJECT	**Inland Rail Pkg 13**	Job #	**1893802**
CLIENT	**FFJV**	DATE	**18/10/18**

LOCATION-	**Laidley**	LOGGED BY-	**TR**
EASTING (MGA94) -	**443525 m E**	LOGGED DATE:	**07/09/18**
NORTHING (MGA94) -	**6942102 m N**	LOGGING DATUM-	**AHD**
ELEVATION (AHD m) -	**165 m**	LOGGED DEPTH-	**10.6 - 49.5 m**
DRILLED DEPTH-	**50.4 m** DIAMETER- **NMLC**	DRAWN BY-	**TR**
PLUNGE-	**90 deg** AZIMUTH- **deg MN**	REVIEWED BY-	
CASING-	**Steel - HWT** DEPTH- **11.4 m**	FILE NAME-	**330-01-BH2102-RevB.WCL**

All defects and bedding oriented to True North (Declination 11 degs).
Mechanical caliper log is used for dip corrections.
Magnetic field stable below 13.6 m below ground level. Image distortion above 12 m below ground level.
Borehole zeroed to ground level. GPS survey of ground level applied for RL conversion.
Imagery is approximately 40 cm higher than cores.

DEVIATION DATA





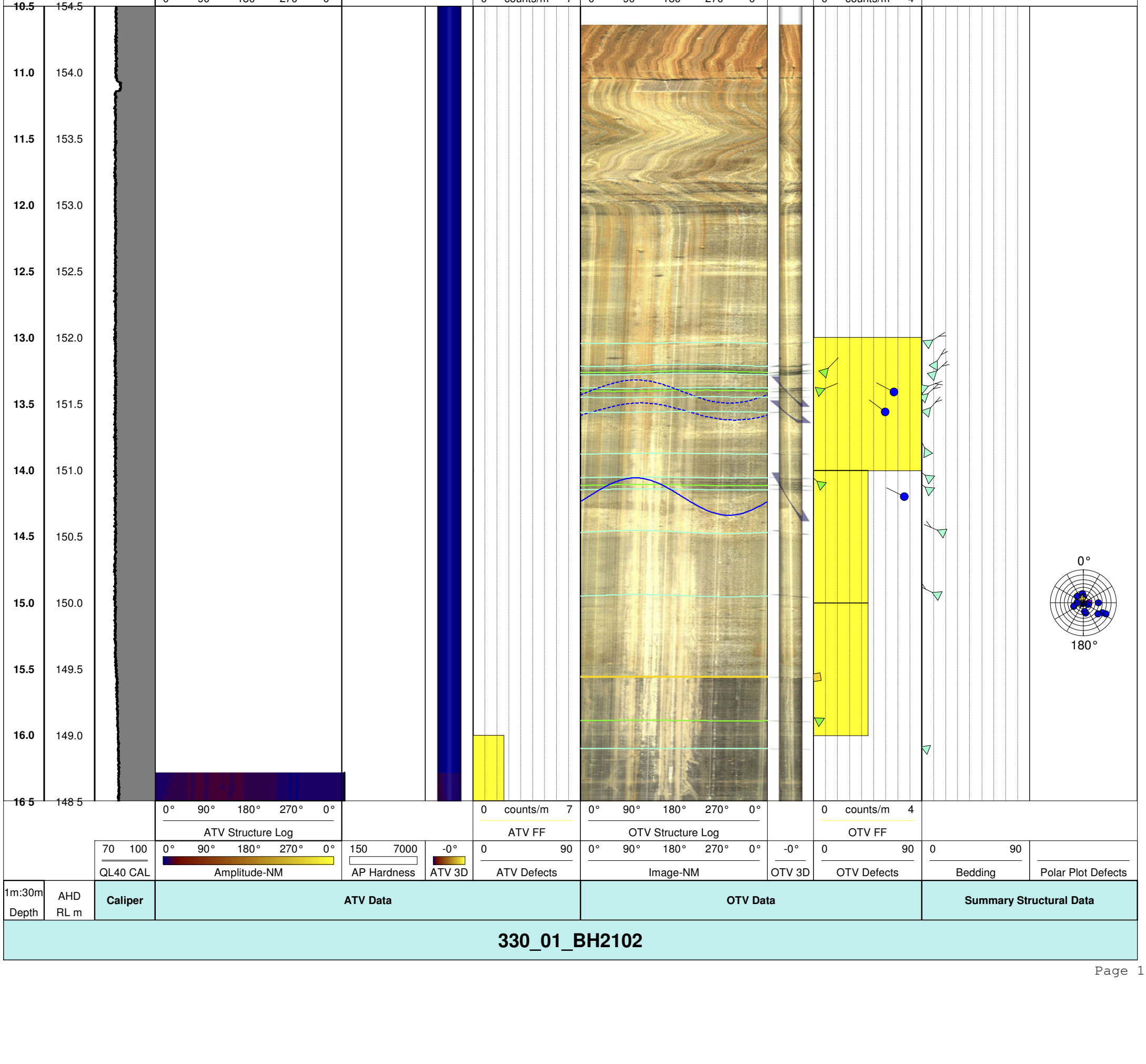
INTERPRETED STRUCTURES

Low Confidence
Medium Confidence
High Confidence

Bedding Parting - High Confidence
Bedding Fabric
Crushed Seam - Low Confidence
Crushed Seam - High Confidence
XW Seam - High Confidence
Joint - Medium Confidence
Joint - High Confidence

330_01_BH2102

Depth 1m:30m	RL m AHD	Caliper	ATV Data				OTV Data			Summary Structural Data	
		QL40 CAL 70 100	Amplitude-NM 0° 90° 180° 270° 0°	AP Hardness 150 7000	ATV 3D -0°	ATV Defects 0 90	Image-NM 0° 90° 180° 270° 0°	OTV 3D -0°	OTV Defects 0 90	Bedding 0 90	Polar Plot Defects
			ATV Structure Log 0° 90° 180° 270° 0°			ATV FF 0 counts/m 7	OTV Structure Log 0° 90° 180° 270° 0°		OTV FF 0 counts/m 4		



1m:30m Depth	AHD RL m	Caliper	ATV Data				OTV Data			Summary Structural Data	
		QL40 CAL 70 100	Amplitude-NM 0° 90° 180° 270° 0°	AP Hardness 150 7000	ATV 3D -0°	ATV Defects 0 90	Image-NM 0° 90° 180° 270° 0°	OTV 3D -0°	OTV Defects 0 90	Bedding 0 90	Polar Plot Defects
			ATV Structure Log 0° 90° 180° 270° 0°			ATV FF 0 counts/m 7	OTV Structure Log 0° 90° 180° 270° 0°		OTV FF 0 counts/m 4		

330_01_BH2102

330_01_BH2102

Depth 1m:30m	RL m AHD	Caliper	ATV Data	OTV Data	Summary Structural Data

QL40 CAL (70 – 100) | Amplitude-NM (0° 90° 180° 270° 0°) | AP Hardness (150 – 7000) | ATV 3D (-0°) | ATV Defects (0 – 90) | Image-NM (0° 90° 180° 270° 0°) | OTV 3D (-0°) | OTV Defects (0 – 90) | Bedding (0 – 90) | Polar Plot Defects

ATV Structure Log (0° 90° 180° 270° 0°) | ATV FF (0 counts/m 7) | OTV Structure Log (0° 90° 180° 270° 0°) | OTV FF (0 counts/m 4)

Depth 1m:30m	RL m AHD
16.5	148.5
17.0	148.0
17.5	147.5
18.0	147.0
18.5	146.5
19.0	146.0
19.5	145.5
20.0	145.0
20.5	144.5
21.0	144.0
21.5	143.5
22.0	143.0
22.5	142.5
23.0	142.0
23.5	141.5
24.0	141.0
24.5	140.5
25.0	140.0

ATV Structure Log (0° 90° 180° 270° 0°) | ATV FF (0 counts/m 7) | OTV Structure Log (0° 90° 180° 270° 0°) | OTV FF (0 counts/m 4)

QL40 CAL (70 – 100) | Amplitude-NM (0° 90° 180° 270° 0°) | AP Hardness (150 – 7000) | ATV 3D (-0°) | ATV Defects (0 – 90) | Image-NM (0° 90° 180° 270° 0°) | OTV 3D (-0°) | OTV Defects (0 – 90) | Bedding (0 – 90) | Polar Plot Defects

Depth 1m:30m | RL m AHD | Caliper | ATV Data | OTV Data | Summary Structural Data

330_01_BH2102

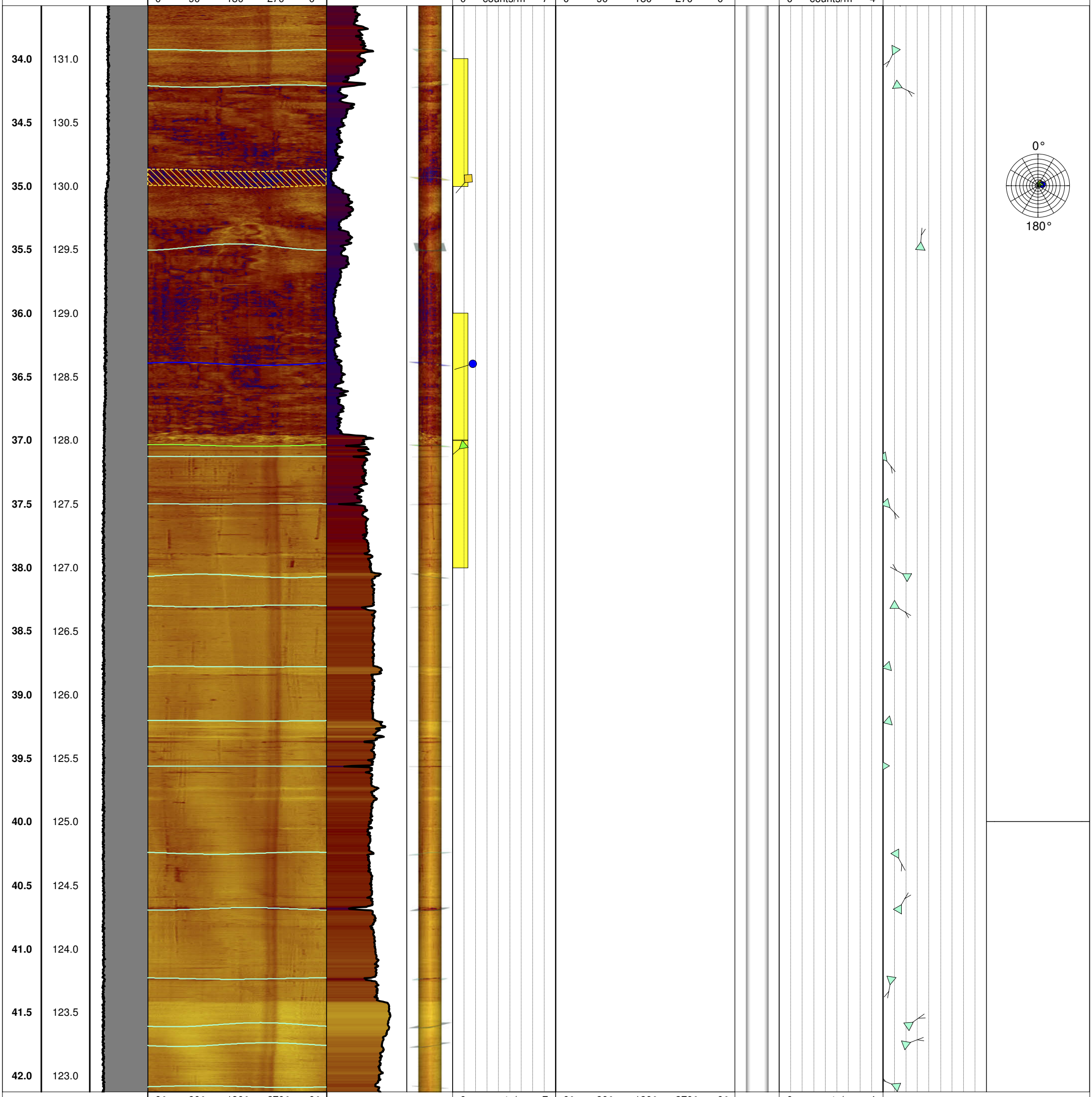
330_01_BH2102

Depth 1m:30m	RL m AHD	Caliper	ATV Data				OTV Data			Summary Structural Data	
		QL40 CAL	Amplitude-NM	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects	Bedding	Polar Plot Defects
		70 100	0° 90° 180° 270° 0°	150 7000	-0°	0 90	0° 90° 180° 270° 0°	-0°	0 90	0 90	
			ATV Structure Log			ATV FF	OTV Structure Log		OTV FF		
			0° 90° 180° 270° 0°			0 counts/m 7	0° 90° 180° 270° 0°		0 counts/m 4		
25.5	139.5										
26.0	139.0										
26.5	138.5										
27.0	138.0										
27.5	137.5										
28.0	137.0										
28.5	136.5										
29.0	136.0										
29.5	135.5										
30.0	135.0										
30.5	134.5										
31.0	134.0										
31.5	133.5										
32.0	133.0										
32.5	132.5										
33.0	132.0										
33.5	131.5										
			0° 90° 180° 270° 0°			0 counts/m 7	0° 90° 180° 270° 0°		0 counts/m 4		
			ATV Structure Log			ATV FF	OTV Structure Log		OTV FF		
		70 100	0° 90° 180° 270° 0°	150 7000	-0°	0 90	0° 90° 180° 270° 0°	-0°	0 90	0 90	
		QL40 CAL	Amplitude-NM	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects	Bedding	Polar Plot Defects
1m:30m Depth	AHD RL m	Caliper	ATV Data				OTV Data			Summary Structural Data	

330_01_BH2102

330_01_BH2102

Depth 1m:30m	RL m AHD	Caliper	ATV Data				OTV Data			Summary Structural Data	
		QL40 CAL	Amplitude-NM	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects	Bedding	Polar Plot Defects
		70 100	0° 90° 180° 270° 0°	150 7000	-0°	0 90	0° 90° 180° 270° 0°	-0°	0 90	0 90	
			ATV Structure Log			ATV FF	OTV Structure Log		OTV FF		
			0° 90° 180° 270° 0°			0 counts/m 7	0° 90° 180° 270° 0°		0 counts/m 4		



			0° 90° 180° 270° 0°			0 counts/m 7	0° 90° 180° 270° 0°		0 counts/m 4		
			ATV Structure Log			ATV FF	OTV Structure Log		OTV FF		
		70 100	0° 90° 180° 270° 0°	150 7000	-0°	0 90	0° 90° 180° 270° 0°	-0°	0 90	0 90	
		QL40 CAL	Amplitude-NM	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects	Bedding	Polar Plot Defects
1m:30m Depth	AHD RL m	Caliper	ATV Data				OTV Data			Summary Structural Data	

330_01_BH2102

330_01_BH2102

Depth 1m:30m	RL m AHD	Caliper	ATV Data				OTV Data			Summary Structural Data	
		QL40 CAL	Amplitude-NM	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects	Bedding	Polar Plot Defects
		70 100	0° 90° 180° 270° 0°	150 7000	-0°	0 90	0° 90° 180° 270° 0°	-0°	0 90	0 90	
			ATV Structure Log			ATV FF	OTV Structure Log		OTV FF		
			0° 90° 180° 270° 0°			0 counts/m 7	0° 90° 180° 270° 0°		0 counts/m 4		
42.5	122.5										
43.0	122.0										
43.5	121.5										
44.0	121.0										
44.5	120.5										
45.0	120.0										
45.5	119.5										
46.0	119.0										
46.5	118.5										
47.0	118.0										
47.5	117.5										
48.0	117.0										
48.5	116.5										
49.0	116.0										
49.5	115.5										
			0° 90° 180° 270° 0°			0 counts/m 7	0° 90° 180° 270° 0°		0 counts/m 4		
			ATV Structure Log			ATV FF	OTV Structure Log		OTV FF		
		70 100	0° 90° 180° 270° 0°	150 7000	-0°	0 90	0° 90° 180° 270° 0°	-0°	0 90	0 90	
		QL40 CAL	Amplitude-NM	AP Hardness	ATV 3D	ATV Defects	Image-NM	OTV 3D	OTV Defects	Bedding	Polar Plot Defects
1m:30m Depth	AHD RL m	Caliper	ATV Data				OTV Data			Summary Structural Data	

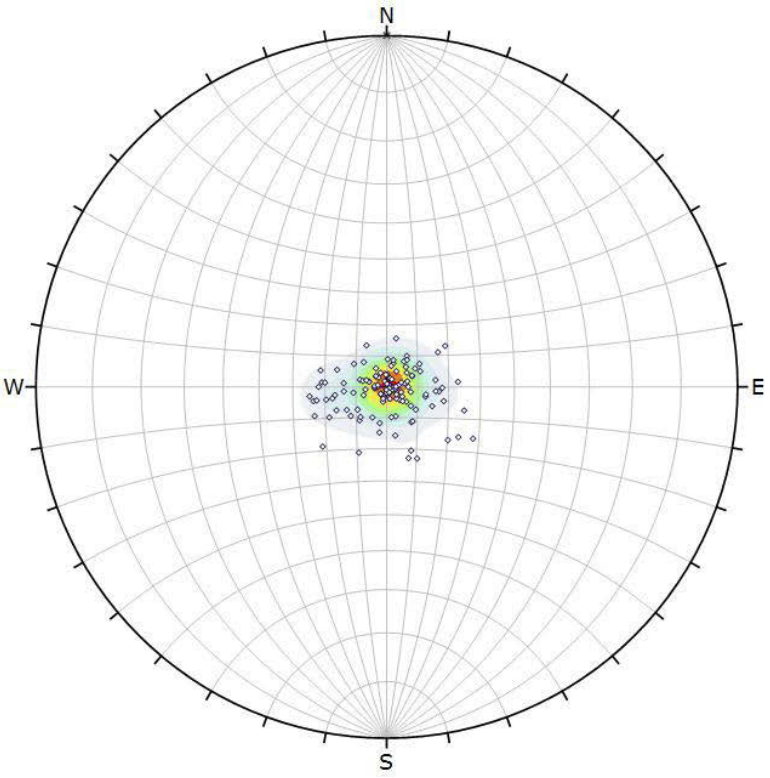
0°

180°

330_01_BH2102

330_01_BH2101 - Stereonets

a) Bedding



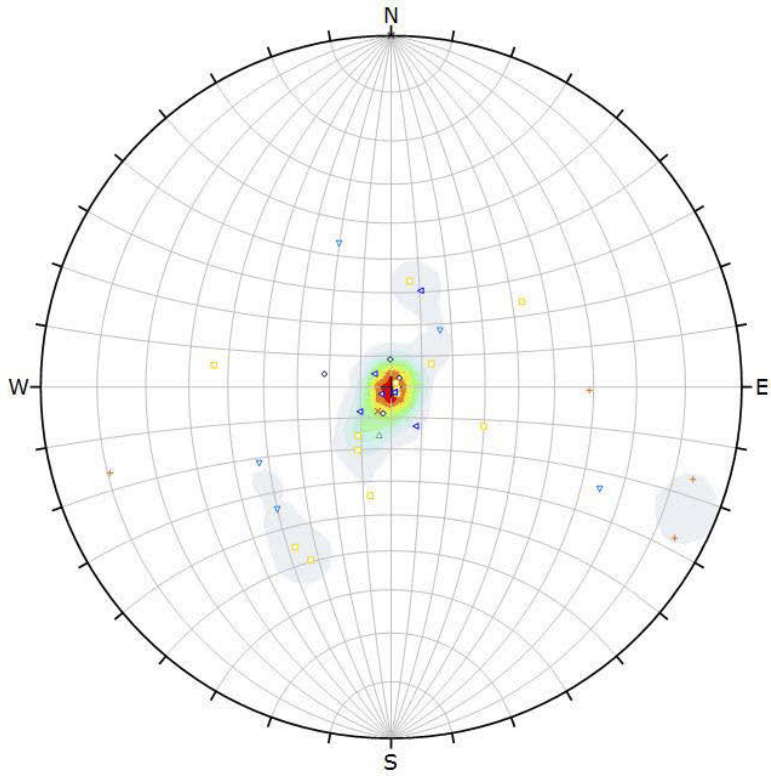
Symbol	TYPE	Quantity
◇	BF	133

Color	Density Concentrations
	0.00 - 4.50
	4.50 - 9.00
	9.00 - 13.50
	13.50 - 18.00
	18.00 - 22.50
	22.50 - 27.00
	27.00 - 31.50
	31.50 - 36.00
	36.00 - 40.50
	40.50 - 45.00

Contour Data	Pole Vectors
Maximum Density	44.52%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Plot Mode	Pole Vectors
Vector Count	133 (133 Entries)
Hemisphere	Lower
Projection	Equal Angle

b) Defects



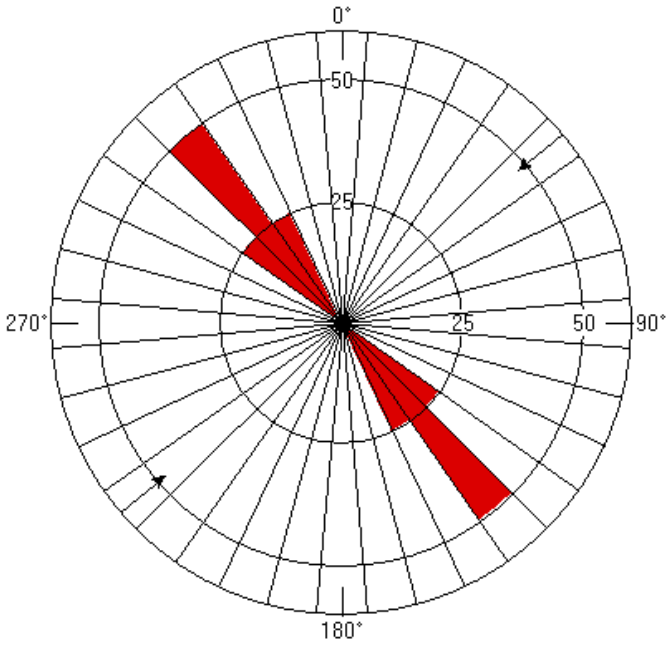
Symbol	TYPE	Quantity
◇	BP 3	6
×	CS 1	1
△	CS 2	1
+	J 1	4
▽	J 2	5
□	J 3	13
◁	XWS 3	7

Color	Density Concentrations
	0.00 - 2.80
	2.80 - 5.60
	5.60 - 8.40
	8.40 - 11.20
	11.20 - 14.00
	14.00 - 16.80
	16.80 - 19.60
	19.60 - 22.40
	22.40 - 25.20
	25.20 - 28.00

Contour Data	Pole Vectors
Maximum Density	27.57%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Plot Mode	Pole Vectors
Vector Count	37 (37 Entries)
Hemisphere	Lower
Projection	Equal Angle

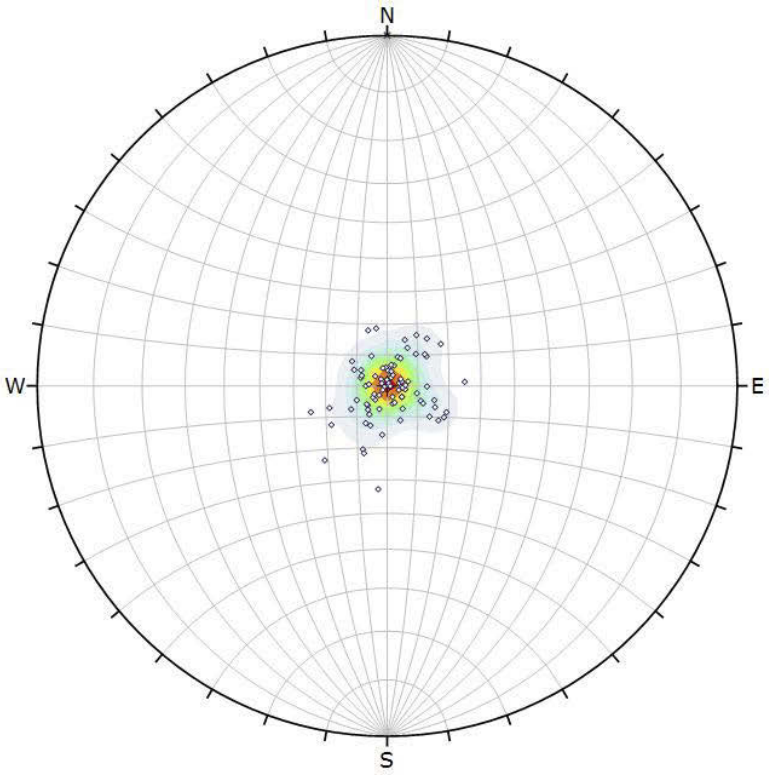
330_01_BH2101 - Rosette



Breakout orientations and direction of maximum stress.

330_01_BH2102 – Stereonets

a) Bedding



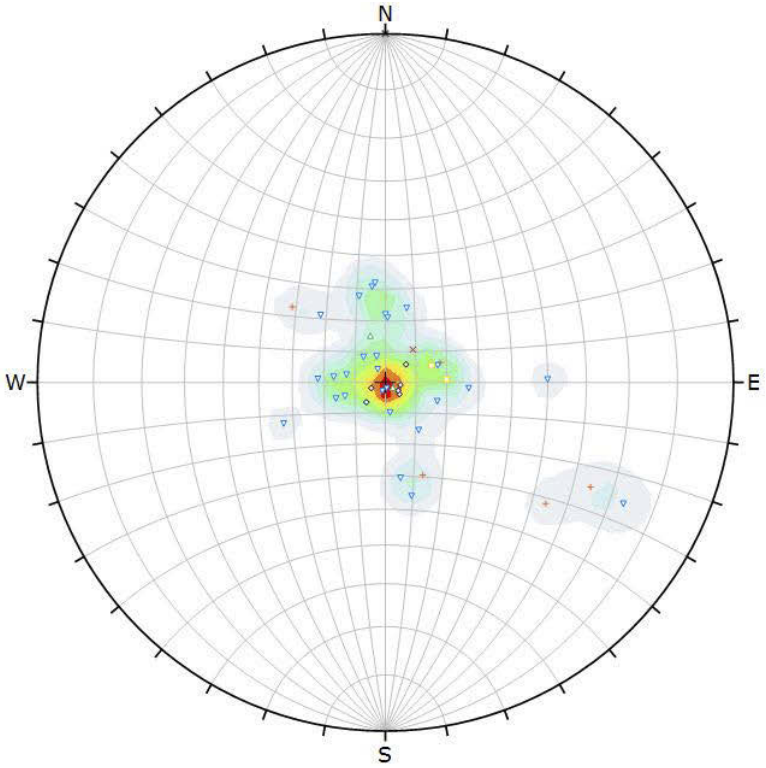
Symbol	TYPE	Quantity
◇	BF	91

Color	Density Concentrations
	0.00 - 4.60
	4.60 - 9.20
	9.20 - 13.80
	13.80 - 18.40
	18.40 - 23.00
	23.00 - 27.60
	27.60 - 32.20
	32.20 - 36.80
	36.80 - 41.40
	41.40 - 46.00

Contour Data	Pole Vectors
Maximum Density	45.15%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Plot Mode	Pole Vectors
Vector Count	91 (91 Entries)
Hemisphere	Lower
Projection	Equal Angle

b) Defects



Symbol	TYPE	Quantity
◇	BP 3	6
×	CS 1	1
△	CS 3	2
+	J 2	5
▽	J 3	27
□	XWS 3	2

Color	Density Concentrations
	0.00 - 2.00
	2.00 - 4.00
	4.00 - 6.00
	6.00 - 8.00
	8.00 - 10.00
	10.00 - 12.00
	12.00 - 14.00
	14.00 - 16.00
	16.00 - 18.00
	18.00 - 20.00

Contour Data	Pole Vectors
Maximum Density	19.21%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Plot Mode	Pole Vectors
Vector Count	43 (43 Entries)
Hemisphere	Lower
Projection	Equal Angle

KEY SHEET – Televiewer Logs

The data displayed on the Televiewer log are as follows:

Track 1 (far left).
Depth

Track 2.
RL

Track 3.

Caliper Data

Track 4.

Amplitude-NM ABi40 - this is an “unwrapped" ATV Image, inside-looking-out view, aligned with magnetic north (0°) at the extreme left and extreme right of the image.

ATV Structure Log - Sine curves (colour coded) representing the planar features manually interpreted from the ATV image

Breakout Projection – Polygons framing the breakout on the oriented image.

Track 5.

Apparent Hardness - this is the median value of the ATV amplitude or reflectivity. This is a pseudo indicator of rock hardness.

Track 6.

3D Log - Three dimensional “wrapped” view of acoustic reflectance amplitude log. Azimuthal angle of view given in log title.

Track 7.

ATV Defects - Orientation "tadpole" symbols indicate the dip angle and dip direction (magnetic azimuth) of manually interpreted planar features identified on the ATV image. Dip angle is indicated by the position of the tadpole within the track and dip direction is indicated by the tail of the tadpole relative to magnetic north which is toward the top of the page. Note that the dip angle has been corrected using the caliper data and the dip and dip direction has been corrected for borehole deviation using borehole tilt and azimuth.

The assigned defect type is indicated by the shape of the tadpole head. Classification has been made on the basis of defect type and confidence rating. The defect type has been classified using the core log and core photos where available. The confidence rating is in reference to how well the defect shows up on the acoustic log with high confidence defects clearly distinguishable from the background, low confidence being

discontinuous and/or hard to distinguish from the background and medium confidence being the middle condition.

Defect classifications are provided in the header of the log under “Interpreted Structures”.

Fracture Frequency
ATV Fracture Frequency

Track 8.

Image-NM OBi40 - this is an “unwrapped" OTV Image, inside-looking-out view, aligned with magnetic north (0°) at the extreme left and extreme right of the image.

Track 9.

OTV Defects - Orientation "tadpole" symbols indicate the dip angle and dip direction (magnetic azimuth) of manually interpreted planar features identified on the OTV image. Dip angle is indicated by the position of the tadpole within the track and dip direction is indicated by the tail of the tadpole relative to magnetic north which is toward the top of the page. Note that the dip angle has been corrected using the caliper data and the dip and dip direction has been corrected for borehole deviation using borehole tilt and azimuth.

The assigned defect type is indicated by the shape of the tadpole head. Classification has been made on the basis of defect type and confidence rating. The defect type has been classified using the core log and core photos where available. The confidence rating is in reference to how well the defect shows up on the acoustic log with high confidence defects clearly distinguishable from the background, low confidence being discontinuous and/or hard to distinguish from the background and medium confidence being the middle condition.

Defect classifications are provided in the header of the log under “Interpreted Structures”.

Fracture Frequency
OTV Fracture Frequency

Track 10.

Bedding – Orientation "tadpole" symbols indicate the dip angle and dip direction (magnetic azimuth) of manually interpreted bedding identified on the ATV and OTV images. These are not necessarily dislocations in the rock, but picks of the dip. Dip angle is indicated by the position of the tadpole within the track and dip direction is indicated by the tail of the tadpole relative to magnetic north which is toward the top of the page. Note that the dip angle has been corrected using the caliper data and the dip and dip direction has been corrected for borehole deviation using borehole tilt and azimuth.

Track 11.

Polar Plot – Lower hemisphere, equal angle stereonet showing poles of combined ATV and OTV defects in 10 m sections.

Appendix C
Auger Hole and Borehole Reports

HELIDON TO CALVERT ENVIRONMENTAL IMPACT STATEMENT

REPORT OF BOREHOLE: 330-01-BH2101

SHEET: 1 OF 8

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RAB			0	244.00				CI-CH	Sandy CLAY medium to high plasticity, orange brown, fine to medium grained sand, trace silt, trace rootlets			TOPSOIL RESIDUAL SOIL (KOUKANDOWIE FORMATION)
				1.00 243.00					becoming brown	w < PL		
			2	*2.00* 242.00					grading to clayey sand			
				2.50 241.50					SANDSTONE fine and medium grained, brown, apparently very low to low strength by observation of cuttings, distinctly weathered			KOUKANDOWIE FORMATION
			4									
			6									
			8	*8.50* 235.50					MUDSTONE pale grey, apparently low strength by observation of cuttings, distinctly weathered to slightly weathered			
			10									
			12									
				13.20 230.80					grading to fine grained sandstone, becoming brown			
			14	*14.50* 229.50					SANDSTONE fine to coarse grained, brown, contains fine to coarse grained, sub-rounded to sub-angular clasts of quartz (to 5 mm), apparently low strength by observation of cuttings, distinctly weathered to slightly weathered			
			16									
			18									
			20									

REPORT OF BOREHOLE: 330-01-BH2101

SHEET: 2 OF 8

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RAB			20	21.00 223.00								KOUKANDOWIE FORMATION
			22						MUDSTONE fine grained, pale grey, possibly interbedded with fine grained sandstone, apparently low strength from observation of cuttings, distinctly weathered to slightly weathered			
				23.20 220.80					SANDSTONE fine to coarse grained, grey to brown, appears to contain coal bands within sandstone between 27.0 and 30 m, apparently medium strength by observation of cuttings, distinctly weathered to slightly weathered			
			24									
			26									
			28									
			30	30.50 213.50					MUDSTONE fine grained, pale grey, possibly low strength and apparently interbedded with fine grained sandstone, distinctly weathered to slightly weathered			
			32	32.00 212.00					SANDSTONE fine and medium grained, grey, apparently medium strength and interbedded with mudstone from observation of cuttings, slightly weathered to fresh			
			34									
			36	36.20 207.80					becoming coarse grained, subangular to angular, quartzose			
			38									
			40	40.00								

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: 330-01-BH2101

SHEET: 3 OF 8

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RAB			40	204.00					MUDSTONE fine grained, pale grey, apparently low strength and interbedded with sandstone by observation of cuttings, slightly weathered			KOUKANDOWIE FORMATION
			42	*43.00* 201.00					SANDSTONE fine grained, grey to brown, apparently high strength from observation of cuttings, slightly weathered to fresh			
			44									
			46	*46.00* 198.00					SANDSTONE fine to coarse grained, brown to red brown, apparently medium to high strength, with inclusions of sub-angular to angular quartz (to 2 mm) from observation of cuttings, distinctly weathered to slightly weathered			
			48									
			50									
			52									
			54									
				55.00 189.00					becoming pale brown, becoming fine grained between 56.0 - 60.0m and 63.0 - 64.0m. Change to PDC bit at 55.0m depth.			
			56									
			58									
			60									

REPORT OF BOREHOLE: 330-01-BH2101

SHEET: 4 OF 8

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RAB			60						SANDSTONE fine to coarse grained, brown to red brown, apparently medium to high strength, with inclusions of sub-angular to angular quartz (to 2 mm) from observation of cuttings, distinctly weathered to slightly weathered			KOUKANDOWIE FORMATION
			62									
			64						For Continuation Refer to Sheet 5			
			66									
			68									
			70									
			72									
			74									
			76									
			78									
			80									

REPORT OF BOREHOLE: 330-01-BH2101

SHEET: 5 OF 8

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 06, L 20, M 60, H 20, VH 60, EH 200) / LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
				60							
				62							
					63.74		Continuation of Sheet 4				
HQ3		100	100 (100)	64	180.26		SANDSTONE fine and medium grained, pale orange brown and grey, bedded (400 to 900 mm) grading to coarse grained and cross bedded; angular, quartzose, trace fine grained, angular gravel (to 5mm) quartz clasts. (Koukandowie Formation)	MW		63.84 m: B, 5-10°, Pl-Un, Ro, SAND	
		100	100 (100)	66						66.41 m: B, 5-10°, Pl-Un, Ro 66.61 m: J, 10°, Un, Ro 67.16 m: B, 5°, Pl-Un, Ro	
		100	100 (100)	68	*68.20* 175.80		becoming fine, medium and coarse grained, grey and pale brown between 68.2m and 69.95m depth			68.05 m: J, 15-20°, Pl, Sm-Ro 68.16 m: J, 10-15°, Un, Ro 68.53 m: B, 5°, Un, Ro	
		100	95 (100)	70	*69.95* 174.05		becoming red brown and orange brown, massive, trace angular lithic clasts (to 50mm) of siliceous siltstone and sanstone		UCS=15.6 - PLI(A)=1.15 PLI(D)=1.04 PLI(A)=1.16 PLI(D)=1.20 PLI(A)=0.94 PLI(D)=0.95 PLI(A)=1.34 PLI(D)=0.84 PLI(A)=0.76 PLI(D)=1.00 PLI(A)=0.36 PLI(D)=0.45	69.14 m: J, 10°, Un, Ro 69.33 m: J, 10-15°, Un, Ro 69.45 m: J, 10-20°, Pl-Un, Ro 69.85 m: J, 15-20°, Pl-Un, Ro 70.86 m: B, 5-10°, Un, Ro 71.17 m: J, 15-20°, Pl-Un, Ro 71.25-71.40 m: J, 80°, Un, Ro 71.76 m: J, 15-20°, Un, Ro 71.80 m: B, 5°, Pl-Un, Ro 72.22 m: J, 10°, Un, Ro 72.75 m: B, 5-10°, Pl-Un, Ro
		100	85 (85)	72	*72.90* 171.10		SANDSTONE AND SILTSTONE fine grained, pale grey, orange and red stained, bedded (to 200mm), grading to laminated siltstone		UCS=7.47 - PLI(A)=0.46 PLI(D)=0.36 PLI(A)=0.30 PLI(D)=0.50 PLI(A)=0.36 PLI(D)=0.23 PLI(A)=0.39 PLI(D)=0.36	73.17 m: B, 5-10°, Pl-Un, Ro 73.46 m: B, 5-10°, Pl-Un, Ro 74.30 m: B, 5°, Pl, Sm-Ro 74.44 m: B, 5°, Pl, Sm-Ro	
		100	100 (100)	74	*73.49* 170.51 *74.53* 169.47		SANDSTONE fine grained, grey and pale grey, thinly bedded and laminated (to 15mm), 3 to 5 deg, trace carbonaceous siltstone laminations, becoming orange brown	SW			
		100	100 (100)	76	*75.74* 168.26		SANDSTONE fine to coarse grained, pale orange brown, bedded (to 500mm), grading from pebble conglomerate subrounded to subangular gravel size clasts (to 30mm) of sandstone and siltstone			75.23 m: B, 5-10°, Un, Ro 75.70 m: B, 5°, Un, Ro	
		100	100 (100)	78	*76.74* 167.26		SANDSTONE fine to medium grained, pale grey, laminated (to 10 mm), trace carbonaceous siltstone, 3 to 5 deg	FR		76.30 m: J, 10°, Un, Ro 76.46 m: B, 5-10°, Pl-Un, Ro	
		100	100 (100)	80	*78.93* 165.07		subrounded to subangular lithic inclusions (clasts) (to 20mm) at 78.93, 79.03, 79.33 and 79.51m				

REPORT OF BOREHOLE: 330-01-BH2101

SHEET: 6 OF 8

CLIENT: FFJV
COORDS: 443843 m E 6941833 m N MGA94 56
DRILL RIG: Comacchio MC-T800

PROJECT: Inland Rail, Phase 2
SURFACE RL: 244 m DATUM: AHD
CONTRACTOR: Drillpower

LOCATION: H2C
INCLINATION: -90°
LOGGED: RC DATE: 28/9/18

JOB NO: 1893802
HOLE DEPTH: 130.14 m
CHECKED: IT DATE: 24/10/18

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
HQ3	28/09/18	100	100 (100)	80	80.60 163.40		SANDSTONE fine to medium grained, pale grey, laminated (to 10 mm), trace carbonaceous siltstone, 3 to 5 deg carbonaceous laminae (cross bedded, 15deg)	FR			80.80 m: J, 20°, Pl, Ro, Cn	
		100	100 (100)	82	83.43 160.57		carbonaceous laminae (cross bedded, 15deg)			UCS=13.0 PLI(A)=0.79 PLI(D)=0.80 PLI(A)=0.70 PLI(D)=0.84 PLI(A)=0.83 PLI(D)=0.80 PLI(A)=1.12 PLI(D)=1.02 PLI(A)=1.23 PLI(D)=1.10	82.83 m: J, 30°, Pl-Un, Ro, seperation up to 35 mm, joint along gravelly layer infilled with Gravelly SAND 83.45 m: J, 10°, Pl-Un, Sm-Ro	
		100	100 (100)	84	85.14 158.86		carbonaceous siltstone (10 mm) at 85.14m, subrounded to subangular gravel size clasts (to 20mm) of lithic siltstone and sandstone at 85.2 and 85.5m				85.42 m: J, 20°, Pl, Sm 85.70 m: B, 5-8°, Un, Ro	
		100	100 (100)	86	86.15 157.85 87.00 157.00 87.52 156.48		SANDSTONE AND CONGLOMERATE fine to coarse grained, massive, pale grey, fine to coarse grained gravel size lithic clasts of sub-rounded to sub-angular, siltstone and sandstone SANDSTONE fine to medium grained, pale grey, cross bedded			PLI(A)=0.36 PLI(D)=0.45 UCS=2.37 PLI(A)=0.17 PLI(D)=0.17 PLI(A)=0.36 PLI(D)=0.33 PLI(A)=0.36 PLI(D)=0.36 PLI(A)=0.08 PLI(D)=0.11	86.78 m: J, 10-20°, Un, Ro 87.51 m: C, Pl, Sm, between sandstone and siltstone 87.73 m: B, 5°, Pl-Un, Sm-Ro, within carbonaceous band 88.30 m: B, 5°, Pl, Sm	
		100	100 (100)	88	89.00 155.00		SILTSTONE dark brown, laminated/ thinly interbedded with fine grained sandstone SANDSTONE fine to medium grained, pale grey, siltstone bedding (to 250 mm), interlaminated dark grey, 5 deg			UCS=10.1 PLI(A)=0.93 PLI(D)=0.64 PLI(A)=0.72 PLI(D)=0.57 PLI(A)=0.54 PLI(D)=0.21		
		100	100 (100)	90	90.32 90.59 153.25 91.74 152.26		SILTSTONE fine grained, dark brown, carbonaceous COAL massive, black SILTSTONE fine grained, dark brown, carbonaceous			PLI(A)=1.00 PLI(D)=0.51 PLI(A)=0.29 PLI(D)=0.01 PLI(A)=0.09 PLI(A)=0.18 PLI(D)=0.03 PLI(A)=0.07 PLI(A)=0.35 PLI(D)=0.09	90.26 m: B, 5-10°, Un, Ro, joint along carbonaceous band 90.43 m: J, 40°, Pl-Un, Sl 90.60-90.64 m: FC multiple/ cleat, within coal 90.71 m: B, 5°, Un, Ro, multiple fracture/ cleat in coal 91.24 m: B, 5-10°, Un, Ro 91.36 m: B, 5-10°, Un, Ro 91.65 m: J, 30°, Pl, Sl 92.21 m: J, 10°, Un, Ro 92.50 m: B, 5°, Un, Ro	
		100	100 (100)	92			SANDSTONE fine to medium grained, pale grey, trace carbonaceous siltstone laminations (to 10 mm) between 96.9 to 97.06m, 97.39 to 97.53 m and 98.10 to 98.23 m				93.72 m: B, 5-10°, Un, Ro	
		100	100 (100)	94							95.67 m: B, 5°, Un, Ro	
		100	100 (100)	96						UCS=6.78 PLI(A)=1.10 PLI(D)=0.69 PLI(A)=0.77 PLI(D)=0.80 PLI(A)=1.45 PLI(D)=1.48 PLI(A)=1.14 PLI(D)=1.06 PLI(A)=1.21 PLI(D)=0.84		
		100	100 (100)	98	98.88 145.12 99.30 144.70		SILTSTONE dark brown, trace lithic inclusions, gravel sized sub-angular clasts of sandstone, laminated (to 5mm)				98.07 m: J, 5°, Un, Ro, carbonaceous lamination 99.07 m: J, 10°, Un, Ro 99.60-99.83 m: J, 80°, Pl-Un, Ro	
		100	100 (100)	100						UCS=57.7		

REPORT OF BOREHOLE: 330-01-BH2101

SHEET: 7 OF 8

CLIENT: FFJV
COORDS: 443843 m E 6941833 m N MGA94 56
DRILL RIG: Comacchio MC-T800

PROJECT: Inland Rail, Phase 2
SURFACE RL: 244 m DATUM: AHD
CONTRACTOR: Drillpower

LOCATION: H2C
INCLINATION: -90°
LOGGED: RC DATE: 28/9/18

JOB NO: 1893802
HOLE DEPTH: 130.14 m
CHECKED: IT DATE: 24/10/18

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
HQ3		100	100 (100)	100	100.13 143.88		SANDSTONE fine grained, pale grey and dark grey, carbonaceous, irregular laminations (to 8mm), 3-5deg	FR				
							SANDSTONE AND SILTSTONE fine grained, dark brown, interbedded (to 100mm) with sandy siltstone, 5 deg, trace lithic inclusions				100.72 m: B, 5-10°, Pl-Un, Ro 100.88 m: J, 10°, Pl-Un, Ro	
		100	100 (100)		*101.56* 142.44		claystone clast (to 30 mm)					
				102							101.90 m: B, 5°, Un, Ro	
					102.67						102.48 m: B, 5°, Pl-Un, Ro 102.64 m: B, 5°, Pl-Un, Ro	
		100	90 (100)		141.33 *103.13* 140.87		SANDSTONE fine grained, pale grey, laminated (to 10 mm), trace carbonaceous laminations, 3 to 5deg					
					103.78		trace lithic inclusions (clasts)				103.66 m: B, 5°, Un, Ro	
				104	140.22		SILTSTONE / MUDSTONE dark brown to black, (carbonaceous)				104.39 m: J, 50-60°, Pl, Sl 104.43 m: J, 10°, Pl, Sl 104.48-104.51 m: CS, 5-10°, Un, towards botton of joint pale brown material possibly Claystone	
					104.93					PLI(A)=1.03 PLI(D)=0.17		
					138.87		SILSTONE dark brown, laminated, carbonaceous			PLI(A)=0.79 PLI(D)=0.08		
		100	90 (100)	106			SANDSTONE pale grey, laminated (to 10mm) trace carbonaceous laminations/ wisps, 3deg				104.59 m: J, 10°, Pl, Sl 104.70 m: J, 25-30°, Pl, Sl 104.90 m: J, 55-60°, Pl, Sl 105.06 m: J, 40-50°, Pl-Un, Sm-Ro 105.17 m: B, 5-10°, Pl, Sl, along base of coal band	
					107.20							
					136.80		SANDSTONE AND SILTSTONE fine to medium grained, grey and pale grey sandstone interbedded (to 130mm) with dark brown, laminated siltstone					
				108							107.76 m: J, 50-60°, Pl, Sl	
											108.16 m: J, 50-60°, Pl, Sl	
		100	100 (100)							PLI(A)=0.63 PLI(A)=0.10 PLI(A)=0.48 PLI(A)=0.36 PLI(A)=0.98 PLI(D)=0.05	108.45 m: J, 10-20°, Pl-Un, Sl 109.45-109.70 m: FZ, all varying orientations. Probably more distorted through the drilling process	
					110.01							
				110	133.99		SANDSTONE fine grained, massive, pale grey, cross bedded					
					112.00							
				112	132.00		becoming bedded (to 120 mm), medium grained (trace lithic clasts) grading to dark grey, fine grained, silty sandstone					
		100	100 (100)									
				114						UCS=26.7 PLI(A)=1.80 PLI(D)=1.99 PLI(A)=1.54 PLI(D)=1.20 PLI(A)=2.62 PLI(D)=1.39 PLI(A)=2.13 PLI(D)=1.13 PLI(A)=2.08 PLI(D)=1.88	113.90 m: B, 10°, Pl-Un, Ro	
					115.00							
		100	100 (100)		128.96		grading to coarse grained sandstone with medium grained gravel size lithic clasts				115.15 m: B, 10°, Pl, Ro, Cn	
				116	*116.11*		SANDSTONE AND SILTSTONE fine to medium grained, grey and pale grey sandstone interbedded (to 130mm) with dark brown, laminated siltstone				116.23 m: J, 20°, Un, Ro	
					127.89		SANDSTONE fine to coarse grained, massive, pale grey, lithic inclusions (clasts) of dark brown siltstone/ claystone			UCS=32.9		
					117.92							
		100	100 (100)	118	126.08		SANDSTONE AND SILTSTONE fine to medium grained, grey and pale grey sandstone interbedded (to 100mm) with dark grey, laminated siltstone				117.91 m: C, 5-10°, Un, Ro, boundary between sandstone fine to coarse and silstone 118.25 m: J, 10°, Pl-Un, Ro 118.57 m: J, 10-20°, Pl, Sl 118.75 m: J, 10-20°, Pl-Un, Ro 119.10 m: J, 75°, St, Ro, Cn	
				120							119.47 m: J, 35-40°, Pl, Sl 119.63 m: J, 25-30°, Pl, Sl	

REPORT OF BOREHOLE: 330-01-BH2101

SHEET: 8 OF 8

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

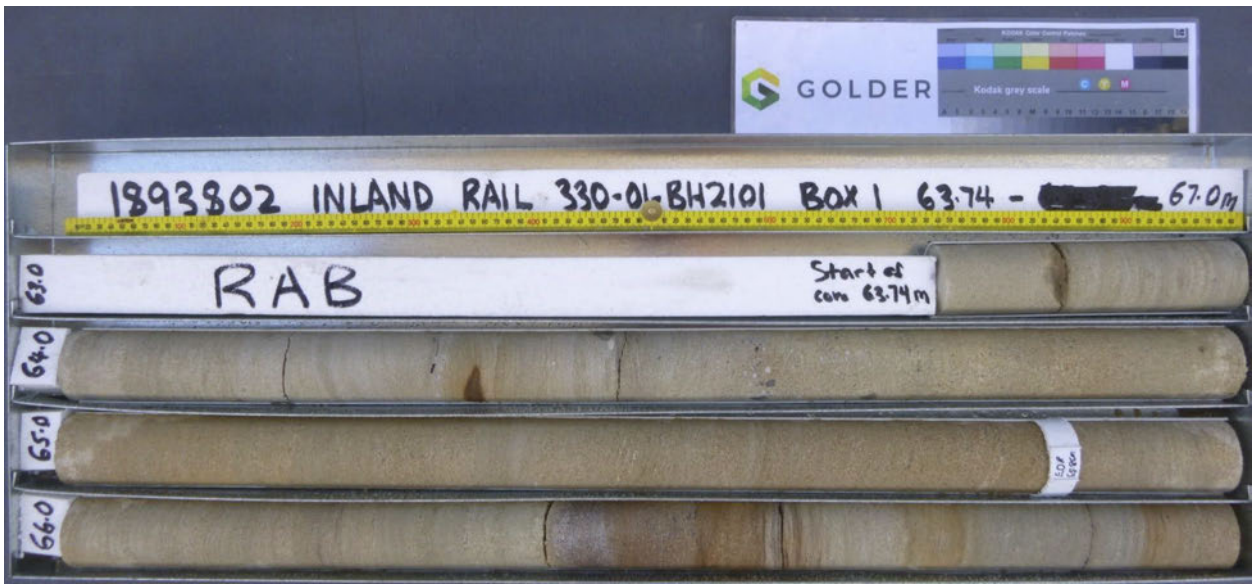
Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE FREQUENCY (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
HQ3		100	100 (100)	120			SANDSTONE AND SILTSTONE fine to medium grained, grey and pale grey sandstone interbedded (to 100mm) with dark grey, laminated siltstone	FR		PLI(A)=1.01 PLI(D)=0.55 PLI(A)=1.04 PLI(D)=0.56 PLI(A)=0.92 PLI(D)=0.25 PLI(A)=0.67 PLI(D)=0.18		
				122								
				124	*124.20*							
		100	100 (100)		119.80		SANDSTONE fine grained, massive, pale grey, becoming dark grey and pale grey, indistinctly laminated, becoming laminated (to 7 mm), trace carbonaceous laminations				124.07 m: J, 50°, Pl, Sl	
											125.04 m: B, 5°, Un, Ro	
				126							125.64 m: B, 5-10°, Un, Ro 125.84 m: J, 10°, Pl-Un, Ro	
					127.00						126.50 m: B, 5°, Pl-Un, Ro, carbonaceous	
		100	100 (100)		117.00		SANDSTONE fine grained, trace medium grained, grey and pale grey sandstone interbedded (to 80 mm) with dark grey laminated, siltstone					
				128								
		100	100 (100)								129.36 m: B, 5°, Pl-Un, Ro	
				130	*130.14*						129.91 m: B, 5-10°, Pl-Un, Ro	
					113.86		END OF BOREHOLE @ 130.14 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 81.50 m DEPTH STANDPIPE INSTALLED					
				132								
				134								
				136								
				138								
				140								

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

FINAL REPORT OF CORE PHOTOGRAPHS: 330-01-BH2101

SHEET: 1 OF 9

CLIENT:	FFJV	COORDS: 443843 m E 6941833 m N MGA94 56	DRILL RIG: Comacchio MC-T800
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 244 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 28/9/18
JOB NO:	1893802	HOLE DEPTH: 130.14 m	CHECKED: IT DATE: 24/10/18



This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F28 RL1

FINAL REPORT OF CORE PHOTOGRAPHS: 330-01-BH2101

CLIENT:	FFJV	COORDS: 443843 m E 6941833 m N MGA94 56	DRILL RIG: Comacchio MC-T800
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 244 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 28/9/18
JOB NO:	1893802	HOLE DEPTH: 130.14 m	CHECKED: IT DATE: 24/10/18

FINAL REPORT OF CORE PHOTOGRAPHS: 330-01-BH2101

SHEET: 3 OF 9

CLIENT:	FFJV	COORDS: 443843 m E 6941833 m N MGA94 56	DRILL RIG: Comacchio MC-T800
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 244 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 28/9/18
JOB NO:	1893802	HOLE DEPTH: 130.14 m	CHECKED: IT DATE: 24/10/18

This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

FINAL REPORT OF CORE PHOTOGRAPHS: 330-01-BH2101

CLIENT:	FFJV	COORDS: 443843 m E 6941833 m N MGA94 56	DRILL RIG: Comacchio MC-T800
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 244 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 28/9/18
JOB NO:	1893802	HOLE DEPTH: 130.14 m	CHECKED: IT DATE: 24/10/18

FINAL REPORT OF CORE PHOTOGRAPHS: 330-01-BH2101

CLIENT:	FFJV	COORDS: 443843 m E 6941833 m N MGA94 56	DRILL RIG: Comacchio MC-T800
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 244 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 28/9/18
JOB NO:	1893802	HOLE DEPTH: 130.14 m	CHECKED: IT DATE: 24/10/18

FINAL REPORT OF CORE PHOTOGRAPHS: 330-01-BH2101

SHEET: 6 OF 9

CLIENT:	FFJV	COORDS: 443843 m E 6941833 m N MGA94 56	DRILL RIG: Comacchio MC-T800
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 244 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 28/9/18
JOB NO:	1893802	HOLE DEPTH: 130.14 m	CHECKED: IT DATE: 24/10/18

This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F28 RL1

FINAL REPORT OF CORE PHOTOGRAPHS: 330-01-BH2101

SHEET: 7 OF 9

CLIENT:	FFJV	COORDS: 443843 m E 6941833 m N MGA94 56	DRILL RIG: Comacchio MC-T800
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 244 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 28/9/18
JOB NO:	1893802	HOLE DEPTH: 130.14 m	CHECKED: IT DATE: 24/10/18

FINAL REPORT OF CORE PHOTOGRAPHS: 330-01-BH2101

SHEET: 8 OF 9

CLIENT:	FFJV	COORDS: 443843 m E 6941833 m N MGA94 56	DRILL RIG: Comacchio MC-T800
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 244 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 28/9/18
JOB NO:	1893802	HOLE DEPTH: 130.14 m	CHECKED: IT DATE: 24/10/18

FINAL REPORT OF CORE PHOTOGRAPHS: 330-01-BH2101

SHEET: 9 OF 9

CLIENT:	FFJV	COORDS: 443843 m E 6941833 m N MGA94 56	DRILL RIG: Comacchio MC-T800
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 244 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 28/9/18
JOB NO:	1893802	HOLE DEPTH: 130.14 m	CHECKED: IT DATE: 24/10/18

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2101 -

SHEET: 1 OF 7

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL Tip Depth & RL 111.90 m 132.10 m AHD Installation Date
RAB		0	244.00		SANDY CLAY	
			1.00			
			243.00			
		2	2.00			
			242.00			
			2.50			
			241.50		SANDSTONE	
		4				Cement Grout
		6				6.00, RL238.00
		8	8.50			
			235.50		MUDSTONE	
		10				Bentonite Seal
		12				
			13.20			
			230.80			
		14	14.50			
			229.50		SANDSTONE	
		16				
		18				
		20				

LevelTROLL

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared - for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are - for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination. -

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2101 -

SHEET: 2 OF 7

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 111.90 m 132.10 m AHD	Installation Date
RAB		20			SANDSTONE			
			21.00 223.00		MUDSTONE			
		22						
			23.20 220.80		SANDSTONE			
		24						
		26						
		28						
		30	30.50 213.50		MUDSTONE			
			32.00 212.00		SANDSTONE			
		32						
		34						
		36	36.20 207.80					
		38						
		40	40.00					

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2101 -

SHEET: 3 OF 7

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type	Tip Depth & RL	Installation Date
						LevelTROLL	111.90 m 132.10 m AHD	
RAB		40	204.00		MUDSTONE			
		42						
			43.00					
			201.00		SANDSTONE			
		44						
			46.00					
		46	198.00		SANDSTONE			
		48						
		50						
		52						
		54						
			55.00					
			189.00					
		56						
		58						
		60						

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2101 -

SHEET: 4 OF 7

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type	Tip Depth & RL	Installation Date
						LevelTROLL	111.90 m 132.10 m AHD	
RAB		60			SANDSTONE			
		62						
			63.74 180.26		SANDSTONE			
HQ3		64						
		66						
		68	68.20 175.80					
		70	69.95 174.05					
		72						
			72.90 171.10		SANDSTONE AND SILTSTONE			
			73.49 170.51		SANDSTONE			
		74						
			74.53 169.47		SANDSTONE			
			75.74 168.26					
		76						
			76.74 167.26		SANDSTONE			
		78						
			78.93 165.07					
		80						

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2101 -

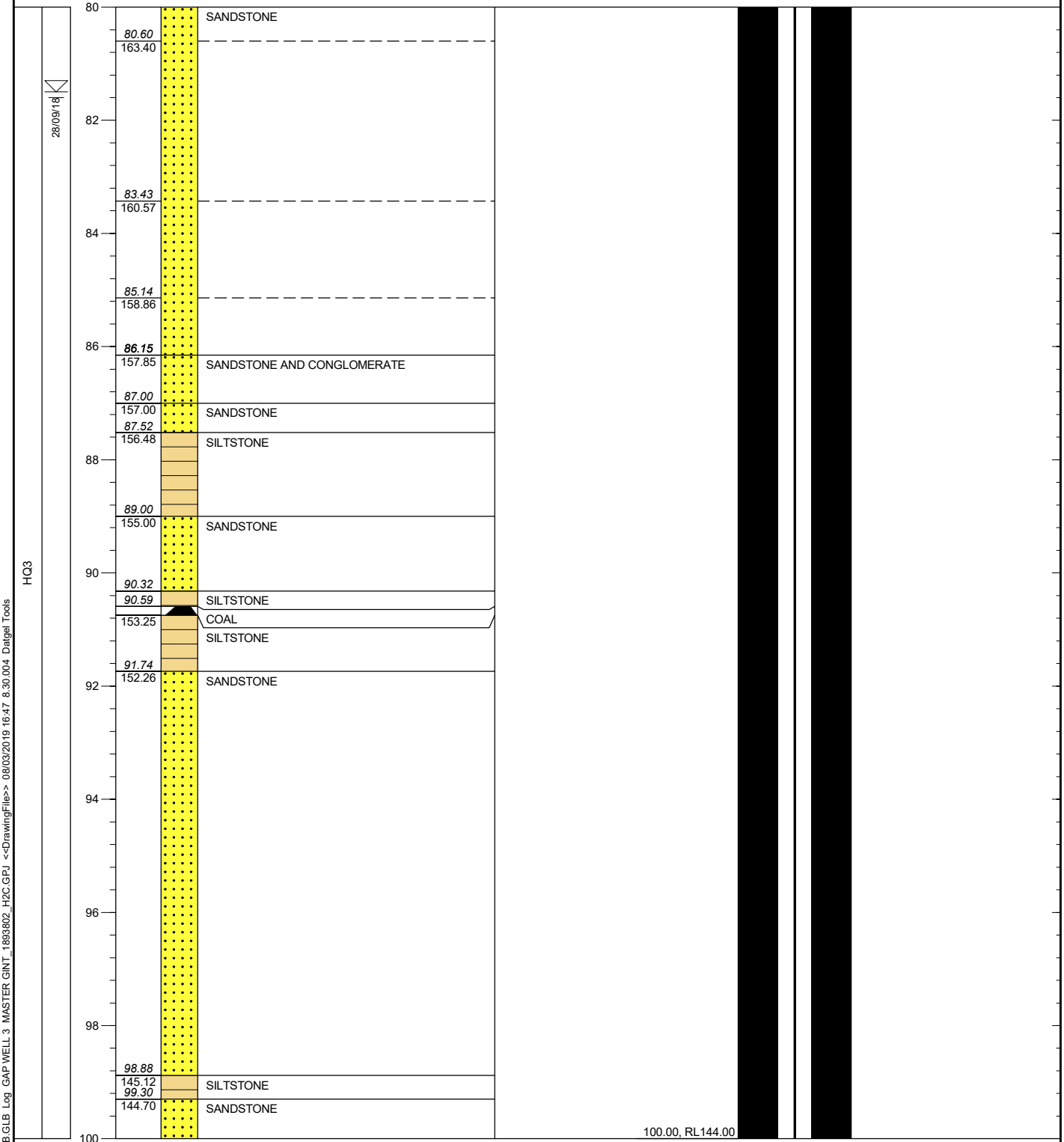
SHEET: 5 OF 7

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 111.90 m 132.10 m AHD	Installation Date



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2101 -

SHEET: 6 OF 7

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 111.90 m 132.10 m AHD	Installation Date
HQ3		100	144.13					
			143.88		SANDSTONE AND SILTSTONE			
			101.56					
			142.44					
		102	*102.67*					
			141.33		SANDSTONE			
			103.13					
			140.87					
			103.78					
		104	140.22		SILTSTONE / MUDSTONE			
			104.93					
			138.87		SILSTONE SANDSTONE			
		106						
			107.20					
			136.80		SANDSTONE AND SILTSTONE			
		108						
			110.01					
		110	133.99		SANDSTONE			
			112.00					
		112	132.00					
		114						
			115.00					
			128.96		SANDSTONE AND SILTSTONE			
		116	*116.11*					
			127.89		SANDSTONE			
			117.92					
		118	126.08		SANDSTONE AND SILTSTONE			
		120						

Filter Pack
Water Level Probe
Slotted PVC

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2101 -

SHEET: 7 OF 7

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443843 m E 6941833 m N MGA94 56
SURFACE RL: 244 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 130.14 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 28/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type / Tip Depth & RL / Installation Date
		120			SANDSTONE AND SILTSTONE	ID LevelTROLL; Tip Depth & RL 111.90 m 132.10 m AHD
		122				
		124	124.20			
HQ3			119.80		SANDSTONE	
		126				
			127.00			
			117.00		SANDSTONE	
		128				129.00, RL115.00
		130	130.14			130.00, RL114.00
			113.86		END OF BOREHOLE @ 130.14 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 81.50 m DEPTH STANDPIPE INSTALLED	
		132				
		134				
		136				
		138				
		140				

REPORT OF BOREHOLE: 330-01-BH2102

SHEET: 1 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443525 m E 6942102 m N MGA94 56
SURFACE RL: 165 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 50.36 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 7/9/18
CHECKED: IT DATE: 24/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT			0	165.00				SP	TOPSOIL: SAND fine to medium grained, brown, with silt, trace rootlets		VD	TOPSOIL
				0.50								
	L			164.50	SPT 0.50-0.95 m 6, 6, 8 N=14			SP	Clayey SAND fine grained, pale brown, low to medium plasticity clay	D	MD	ALLUVIUM
				1.80								
	M		2	163.20	SPT 2.00-2.19 m 13, 30/40mm HB			SP	SAND (EXTREMELY WEATHERED sandstone) fine grained, pale brown, with laminations of sandy clay	M	VD	KOUKANDOWIE FORMATION
					SPT 3.50-3.54 m 30/40mm HB				For Continuation Refer to Sheet 2			
			4									
			6									
			8									
			10									
			12									
			14									
			16									
			18									
			20									

REPORT OF BOREHOLE: 330-01-BH2102

SHEET: 2 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443525 m E 6942102 m N MGA94 56
SURFACE RL: 165 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 50.36 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 7/9/18
CHECKED: IT DATE: 24/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
				0								
				2								
					3.54		Continuation of Sheet 1					
HMLC		100	85 (95)	4	161.34 4.14 160.86		CORE LOSS SANDSTONE fine to medium grained, pale brown, cross bedding MUDSTONE pale and dark grey, irregularly laminated, trace carbonaceous laminations	DW XW DW		UCS=7.67 PLI(A)=0.18 PLI(D)=0.28 PLI(A)=0.53 PLI(D)=0.31 PLI(A)=0.43 PLI(D)=0.38 PLI(A)=0.85 PLI(D)=0.27 PLI(A)=0.01 PLI(D)=0.00	3.81 m: B, 5-10°, Pl-Un, Ro 4.10-4.13 m: B x3, 5°, Un, Ro	
		100	75 (100)	6	6.39						5.43 m: J, 20°, Pl-Un, Sl-Sm 5.74-5.83 m: J, 55-60°, Pl, Sl-Sm 5.89 m: B, 10°, Pl, Sl-Sm	
					6.64 158.36 7.27		COAL black, fractured MUDSTONE				6.25 m: B, 10°, Un, Ro 6.39-6.63 m: CZ, coal	
		100	100 (100)		157.73		dark brown, laminated (to 2mm) SANDSTONE fine to medium grained, grey, laminated, trace black carbonaceous laminations, apparently cross bedded	SW - FR FR			7.35 m: B, 10°, Un, Ro, Cn, close 7.86 m: B, 10°, Un, Ro, Clayey SAND Ct	
		100	100 (100)	10	10.30 154.70		SANDSTONE fine to coarse grained, grey, bedded, 5 deg, cross bedded laminations (to 2 mm)			UCS=41.2 PLI(A)=1.76 PLI(D)=0.73 PLI(A)=1.37 PLI(D)=1.90 PLI(A)=1.37 PLI(D)=0.69 PLI(A)=1.41 PLI(D)=1.36 PLI(A)=1.14 PLI(D)=1.31	9.86 m: B, 5°, Pl-Un, Ro 10.13 m: IS, 10°, Pl-Un, Ro, Clayey SAND Ct 10.46 m: B, 10°, Un, Ro, Cn, close 10.69 m: B, 0-5°, Un, Ro, Cn, close	
					11.32 153.68		trace carbonaceous laminations, some pale brown staining to 11.68 m	SW			11.09 m: B, 5-10°, Un, Ro, Clayey SAND Ct 11.30 m: J, 10-15°, Pl-Un, Ro, Ve, carbonaceous 11.38-11.58 m: J, 70-80°, Un, healed joint 11.65 m: B, 10-15°, Un, Ro 11.69 m: B, 20-30°, Un, Ro, Clayey SAND Ct, <2 mm, open 12.19 m: J, 20°, Un, Ro 12.76 m: J, 50°, Un, Ro, Cn, close	
		100	100 (100)	12							13.45 m: J, 5°, Un, Ro, Cn, close	
				14							14.53-14.68 m: J, 80°, Un, Ro, Cn, close	
		100	80 (100)	16	15.94 149.06		MUDSTONE AND SANDSTONE laminated (to 2 mm), dark brown, mudstone interbedded (to 300 mm) fine grained, grey, sandstone, trace carbonaceous mudstone laminations (to 2 mm), 10 deg	DW			15.93 m: C, 5-10°, Un, Ro, CLAY Ct 16.03 m: J, 20-30°, Un, Ro, Cn, close 16.28 m: B, 5°, Pl-Un, Ro, Ve, carbonaceous 16.30-16.95 m: J, 80°, Pl-Un, Ro, fractured 16.62-16.69 m: J x4, 10-30°, Pl-Un, Ro 16.80 m: J, 80°, Pl, Sm, Cn, close	
	08/09/18	100	70 (100)	18							17.33 m: C, 5°, Pl-Un, Ro 17.78 m: J, 10°, Un, Ro 18.04 m: J, 0-5°, Pl-Un, Ro 18.31 m: J, 5°, Pl-Un, Ro 18.45 m: J, 5°, Pl-Un, Ro - 18.68 m: J, 20°, Pl-Un, Ro	
				20	19.80 145.20						19.12 m: J, 5-10°, Pl-Un, Ro, Clayey SAND 19.22 m: J, 5°, Pl-Un, Ro 19.27-19.52 m: J, 85°, Pl-Un, Ro, fractured 19.56-19.62 m: J, 40°, Pl, Sl-Sm, Cn	

REPORT OF BOREHOLE: 330-01-BH2102

SHEET: 3 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443525 m E 6942102 m N MGA94 56
SURFACE RL: 165 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 50.36 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 7/9/18
CHECKED: IT DATE: 24/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
HMLC		100	70 (100)	20			MUDSTONE dark brown, becoming very dark brown to black, carbonaceous	DW		PLI(A)=0.54 PLI(D)=0.17 PLI(A)=0.50 PLI(D)=0.03 PLI(A)=0.21 PLI(D)=0.15 PLI(A)=0.40 PLI(D)=0.05 PLI(A)=0.45 PLI(D)=0.18	19.76 m: J, 20°, Pl-Un, Ro 19.91-19.93 m: J, 5-15°, Pl-Un, Ro, CLAY Ct 20.09 m: J, 5-10°, Un, Ro, Cn, close 20.13 m: J, 5-10°, Un, Ro, Cn, close 20.26-20.30 m: CZ 20.39-20.45 m: CZ 21.11-21.13 m: IS, clay and rock fragments 21.24 m: B, 5-10°, Pl-Un, Ro, Cn, close 21.29 m: B, 10°, Pl-Un, Ro, Cn, close 21.73 m: J, 30°, Pl-Un, Ro 22.13 m: B, 5-10°, Un, Ro, Cn, close 22.53 m: B, 5°, Pl-Un, Ro, Cn, close 22.60 m: J, 20°, Pl-Un, Ro 22.63 m: B, 10°, Pl, Ro, CLAY Ct 22.76 m: B, 10°, Pl-Un, Ro, Cn, close 23.02 m: B, 5-10°, Un, Sm-Ro, Cn, close 23.15 m: B, 5°, Pl-Un, Ro, Cn, close 23.28 m: B, 10°, Pl-Un, Ro, Cn, close 23.38 m: J, 10-15°, Pl-Un, Ro 23.60 m: B, 0-10°, Pl-Un, Ro, Cn, close 23.88 m: B, 5°, Un, Ro, Cn, close 24.11 m: B, 5°, Pl, Sm, Cn, close 24.15 m: B, 5°, Un, Ro, Cn, close 24.34 m: B, 10°, Un, Ro, Cn, close 24.52 m: IS, 10°, Un, Ro, CLAY 24.78 m: B, 0-10°, Un, Ro, Cn, close 24.95 m: J, 15-25°, Pl-Un, Ro 25.05 m: B, 5-10°, Un, Ro, Cn, close 25.16 m: B, 0-5°, Un, Ro, Cn, close 25.23 m: B, 15-20°, Un, Ro, Cn, close 25.26 m: J, 15-20°, Un, Ro, CLAY Ct 25.43 m: B, 10°, Un, Ro, Cn, close 25.86 m: B, 5-10°, Pl-Un, Ro, Cn, close 26.69 m: B, 5°, Pl-Un, Ro, Cn, close 26.95 m: B, 10°, Pl-Un, Ro, Cn, close 27.81 m: B, 5-10°, Pl-Un, Ro, Cn, close 28.26 m: B, 10°, Pl-Un, Ro, Cn, close 28.93 m: B, 10°, Un, Ro, Cn, close 28.99 m: J, 20°, Un, Ro, Cn, close 30.19 m: J, 30°, Pl, Sm-Ro, Cn, close 30.39 m: B, 10°, Pl-Un, Sm-Ro, Cn, close 31.49 m: B, 5°, Pl-Un, Ro, Cn, close 32.78 m: B, 5-10°, Un, Ro, Cn 33.43 m: B, 15-20°, Pl-Un, Ro, Cn 34.95 m: B, 10°, Un, Ro, Sn 35.29 m: J, 20°, Un, Ro, Sn 35.69 m: B, 10°, Pl-Un, Ro, sand and rock fragments Ct 35.90 m: B, 5°, Un, Ro, Cn, close 37.30 m: J, 10-20°, Un, Ro, Cn, close 38.39 m: B, 5°, Un, Ro, Cn, close 39.46 m: B, 5°, Un, Ro, Cn, close	
					21.20							
		100	85 (100)	22	143.80		SANDSTONE fine grained, grey, trace carbonaceous laminations 2 to 10 mm, cross bedded, 10 to 20 deg					
					22.60							
					142.40		MUDSTONE dark grey, grading to dark brown to black, carbonaceous (to 5 mm) laminations					
					23.79							
				24			with trace laminations of fine grained sandstone					
		100	90 (100)		25.15							
					139.85		SANDSTONE fine grained, pale grey, irregularly laminated (to 3 mm), trace carbonaceous, trace cross bedding	SW				
				26	26.60							
					138.40		beds (x2) to 15 mm, brown, fine grained sandstone	FR				
		100	100 (100)	28								
					29.06							
					135.94		irregular beds (to 70 mm), brown, fine grained, sandstone and pebble conglomerate					
				30								
		100	100 (100)		30.87							
					134.13		interbedded (220 mm) fine grained pale brown sandstone					
				32								
					32.22							
					132.78		irregular beds of pebble conglomerate (gravel size clasts) (10 mm), 32.2 m, 32.85 m,					
		100	100 (100)	34								
					34.60							
					130.40		SANDSTONE fine to coarse grained, grey, trace carbonaceous laminations (to 2 mm), with subangular to angular, lithic inclusions (to 2 0mm) of siltstone and sandstone	DW				
		100	80 (100)	36								
					37.33							
					127.62		grading to coarse grained sandstone with sub-angular to angular lithic inclusions (clasts) to 20 mm	FR				
				38			SILTSTONE AND SANDSTONE dark brown, thinly bedded (to 150 mm) and irregularly laminated siltstone					
		100	100 (100)									
				40								

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF BOREHOLE: 330-01-BH2102

SHEET: 4 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443525 m E 6942102 m N MGA94 56
SURFACE RL: 165 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 50.36 m

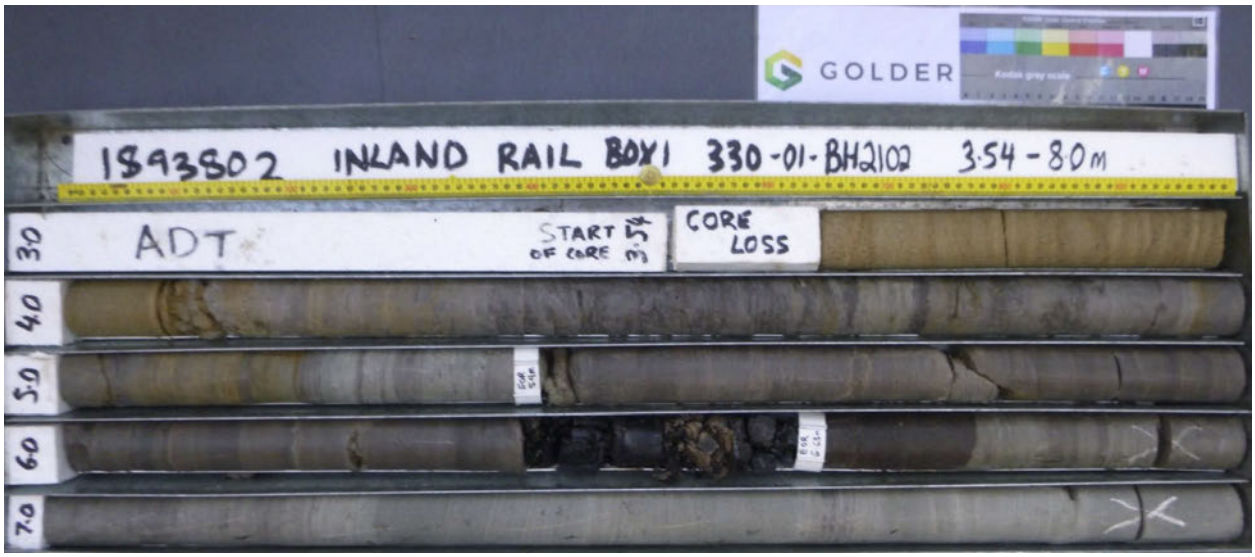
DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 7/9/18
CHECKED: IT DATE: 24/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE FREQUENCY (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
HMLC		100	100 (100)	40	41.72		SILTSTONE AND SANDSTONE dark brown, thinly bedded (to 150 mm) and irregularly laminated siltstone	FR			41.03 m: B, 10°, Un, Sm-Ro, Cn 41.15 m: J, 30-40°, Pl-Un, Ro, Cn 41.59 m: B, 5°, Un, Ro, Cn	
				42	123.28 43.14		SANDSTONE fine grained, grey, becoming interbedded (to 90 m) siltstone, and with irregular clasts of siltstone				42.26 m: J, 15°, Pl, Sm-Ro, Cn 42.52 m: B, 5°, Un, Sm-Ro, Cn	
		100	100 (100)		121.86 44.62		SANDSTONE AND SILTSTONE fine grained, grey, interbedded with silty sandstone and siltstone (to 210 mm), 10 deg				43.28 m: B, 3°, Pl, Sm-Ro, Cn 43.72 m: B, 5°, Un, Ro, Cn 43.82 m: B, 3°, Un, Ro, Cn 44.25 m: B, 10°, Un, Ro, Cn 44.55 m: B, 5-10°, Un, Ro, Cn	
				44	120.36		carbonaceous (coal) bed					
					45.86 119.14		SANDSTONE fine grained, grey, interbedded with silty sandstone and siltstone (to 100 mm), 10 deg				45.48 m: B, 10°, Un, Ro, Cn 45.76 m: B, 5°, Un, Ro, Cn	
				46			trace sub-angular to angular, lithic clasts (to 10 mm)				46.05 m: B, 10°, Pl-Un, Ro, Cn 46.20 m: B, 10-15°, Un, Ro, Cn 46.26 m: B, 5-10°, Un, Ro, Cn 46.69 m: B, 15-20°, Pl, Sm, Cn 46.85 m: B, 5°, Pl, Sm-Ro, Cn 46.97 m: B, 5°, Pl-Un, Sm-Ro, Cn 47.05 m: B, 10°, Pl, Sm-Ro, Cn 47.07 m: B, 5-10°, Pl, Sm-Ro, Cn 47.11 m: B, 5°, Pl, Sm, Cn 47.25 m: B, 10°, Un, Ro, Cn 47.37 m: B, 5°, Pl, Sm, Cn 47.43 m: B, 5°, Pl-Un, Sm-Ro, Cn 48.03 m: B, 10°, Un, Ro, Cn	
		100	100 (100)		47.15 47.27 117.53		bed (120mm) with sub-rounded clasts (45 mm), pebble conglomerate					
				48			SILTSTONE dark brown, laminated, grading to fine grained sandstone with sub-angular clasts of siltstone					
							SANDSTONE fine grained, grey, indistinctly laminated (5 deg), becoming interbedded (to 150 mm) with dark brown siltstone				49.13 m: B, 5-10°, Pl-Un, Ro, Cn	
		100	100 (100)		49.75 115.25		SILTSTONE dark brown, trace laminations of fine grained sandstone (to 5 mm), 5 deg					
				50	50.36 114.64		END OF BOREHOLE @ 50.36 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 18.20 m DEPTH STANDPIPE INSTALLED					
				52								
				54								
				56								
				58								
				60								

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2102

SHEET: 1 OF 5

CLIENT:	FFJV	COORDS:	443525 m E 6942102 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	165 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 7/9/18
JOB NO:	1893802	HOLE DEPTH:	50.36 m	CHECKED: IT	DATE: 24/10/18



This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F28 RL1

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2102

SHEET: 2 OF 5

CLIENT:	FFJV	COORDS:	443525 m E 6942102 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	165 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 7/9/18
JOB NO:	1893802	HOLE DEPTH:	50.36 m	CHECKED: IT	DATE: 24/10/18

This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2102

SHEET: 3 OF 5

CLIENT:	FFJV	COORDS:	443525 m E 6942102 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	165 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 7/9/18
JOB NO:	1893802	HOLE DEPTH:	50.36 m	CHECKED: IT	DATE: 24/10/18

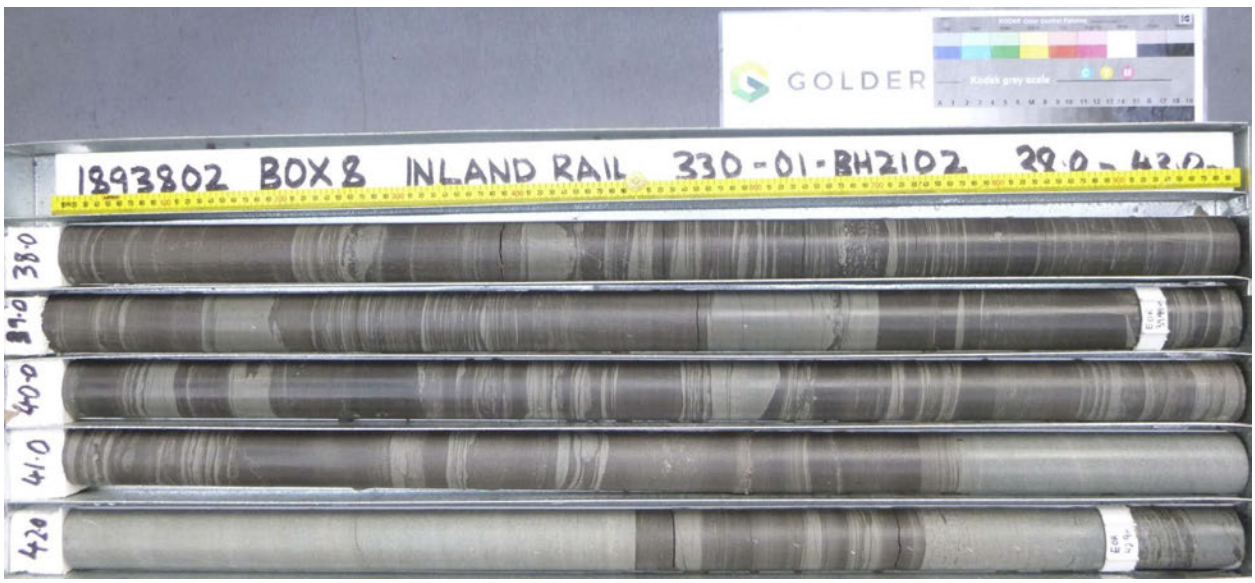
This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F28 RL1

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2102

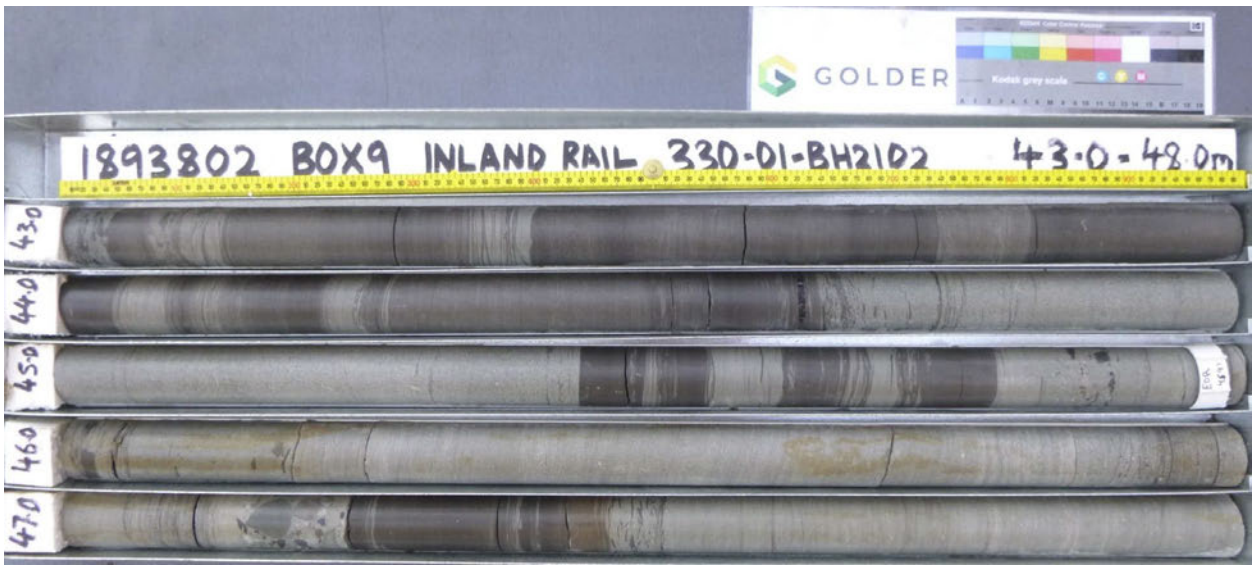
SHEET: 4 OF 5

CLIENT:	FFJV	COORDS:	443525 m E 6942102 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	165 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 7/9/18
JOB NO:	1893802	HOLE DEPTH:	50.36 m	CHECKED: IT	DATE: 24/10/18



REPORT OF CORE PHOTOGRAPHS: 330-01-BH2102

CLIENT:	FFJV	COORDS: 443525 m E 6942102 m N MGA94 56	DRILL RIG: Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 165 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 7/9/18
JOB NO:	1893802	HOLE DEPTH: 50.36 m	CHECKED: IT DATE: 24/10/18



REPORT OF STANDPIPE INSTALLATION: 330-01-BH2102 -

SHEET: 1 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443525 m E 6942102 m N MGA94 56
SURFACE RL: 165 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 50.36 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 7/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL Tip Depth & RL 46.21 m 118.79 m AHD Installation Date
ADT		0	165.00		SAND	Gatic cover
			0.50			
			164.50		CLAYEY SAND	
			1.80			
		2	163.20		SAND (EXTREMELY WEATHERED SANDSTONE)	
			3.54			
			161.34		CORE LOSS	
		4	4.14		SANDSTONE	
			160.86		MUDSTONE	
		6	6.39			
			6.64		COAL	
			158.36		MUDSTONE	
			7.27			
			157.73		SANDSTONE	
		8				
		10	10.30			
			154.70		SANDSTONE	
			11.32			
			153.68			
		12				Cement grout
		14				
			15.94			
		16	149.06		MUDSTONE AND SANDSTONE	
		18				
HMLC	08/09/18					LevelTROLL

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2102 -

SHEET: 2 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443525 m E 6942102 m N MGA94 56
SURFACE RL: 165 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 50.36 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 7/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details			
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID / Type	Tip Depth & RL	Installation Date	
						LevelTROLL	46.21 m 118.79 m AHD		
HMLC		20	19.80						
			145.20		MUDSTONE				
			21.20						
			143.80		SANDSTONE				
		22	22.60						
			142.40		MUDSTONE				
			23.79						
		24					24.00, RL141.00		Bentonite seal
			25.15				25.00, RL140.00		
			139.85		SANDSTONE				
		26	26.60						
			138.40						
		28							
			29.06						
			135.94						
		30							
			30.87						
			134.13						
		32	32.22						
			132.78						
		34							
			34.60						
			130.40		SANDSTONE				
		36							
			37.33						Filter Pack
			127.62		SILTSTONE AND SANDSTONE				
		38							

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

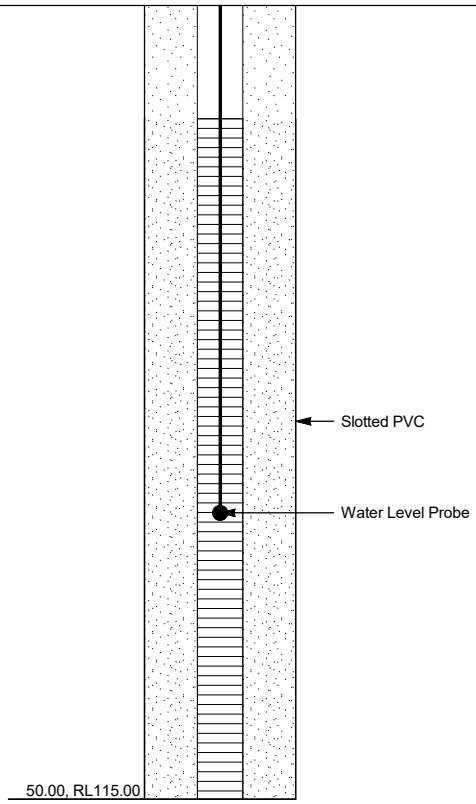
GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2102 -

SHEET: 3 OF 3

CLIENT:	FFJV	COORDS: 443525 m E 6942102 m N MGA94 56	DRILL RIG: Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 165 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 7/9/18
JOB NO:	1893802	HOLE DEPTH: 50.36 m	CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 46.21 m 118.79 m AHD	Installation Date
HMLC		40			SILTSTONE AND SANDSTONE			
			41.72 123.28		SANDSTONE			
		42	43.14 121.86		SANDSTONE AND SILTSTONE			
		44	44.62 120.36		SANDSTONE			
			45.86 119.14					
		46	47.15 47.27					
			117.53		SILTSTONE SANDSTONE			
		48	49.75					
		50	115.25 50.36		SILTSTONE			
			114.64		END OF BOREHOLE @ 50.36 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 18.20 m DEPTH STANDPIPE INSTALLED			
		52						
		54						
		56						
		58						



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF BOREHOLE: 330-01-BH2103

SHEET: 1 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 444151 m E 6941339 m N MGA94 56
SURFACE RL: 154 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.80 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 18/9/18
CHECKED: IT DATE: 24/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT			0	154.00				CL	FILL: Sandy CLAY low plasticity, brown, fine and medium grained sand, with fine to coarse grained, sub-angular to angular gravel of sandstone and siltstone, trace sub-angular to sub-rounded cobbles, with rootlets, (appears compact)	D	MD	FILL
			1		SPT 0.50-0.95 m 7, 6, 5 N=11							
				1.80								
			2	152.20	SPT 2.00-2.45 m 2, 2, 3 N=5				red-brown, becoming coarse gained		L	
				2.20								
				151.80				CH	FILL: Sandy CLAY high plasticity, brown, fine and medium grained sand, trace fine grained, sub-rounded to sub-angular gravel of sandstone and siltstone (low strength), lenses of red-brown, yellow-brown, dark grey and orange-brown (appears compact)			
			3									
					SPT 3.50-3.95 m 3, 3, 4 N=7							
	L		4									
				4.50								
				149.50					trace lense of dark grey, carbonaceous clay, (500mm)			
			5		SPT 5.00-5.45 m 1, 3, 2 N=5					w < PL	F - St	
				6.00								
RD			6	148.00	U50 6.00-6.29 m PP = 100-150 kPa			CI	CLAY medium plasticity, brown, trace fine grained, sub-rounded to sub-angular gravel of sandstone and siltstone (low strength), trace fine and medium grained sand			COLLUVIUM
					SPT 6.50-6.95 m HW/150mm, 3, 3 N=6							
				6.90								
			7	147.10					becoming high plasticity, orange brown, CLAY with sand, fine grained			
				7.80								
				146.20				SW	SAND fine and medium grained, brown, with dark brown clayey sand, trace fine grained, sub-rounded, gravel of ferruginous sandstone, trace quartz, trace subangular gravel of siltstone		MD	
	M		8		SPT 8.00-8.45 m 11, 14, 11 N=25							
				9.00						M		
			9	145.00				SP	SAND fine grained, pale brown and yellow-brown			RESIDUAL SOIL (KOUKANDOWIE FORMATION)
					SPT 9.50-9.76 m 21, 30/110mm HB						VD	
			10									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01a RL3

REPORT OF BOREHOLE: 330-01-BH2103

SHEET: 2 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 444151 m E 6941339 m N MGA94 56
SURFACE RL: 154 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.80 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 18/9/18
CHECKED: IT DATE: 24/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RD	M		10					SP	SAND fine grained, pale brown and yellow-brown			RESIDUAL SOIL (KOUKANDOWIE FORMATION)
				10.50 143.50								
			11		SPT 11.00-11.10 m 30/100mm HB				SAND fine and medium grained, angular, quartzose, brown, trace fine grained, sub-rounded, gravel (<3mm), trace, red brown to orange brown clay	M	VD	
		▽	12	*12.00* 142.00					grading to medium and coarse grained, quartzose sand, fine grained, sub-rounded gravel of quartz and siliceous siltstone			
					SPT 12.50-12.59 m 30/85mm HB				For Continuation Refer to Sheet 3			
			13									
			14									
			15									
			16									
			17									
			18									
			19									
			20									

REPORT OF BOREHOLE: 330-01-BH2103

SHEET: 3 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 444151 m E 6941339 m N MGA94 56
SURFACE RL: 154 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.80 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 18/9/18
CHECKED: IT DATE: 24/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
				10								
				11								
				12	12.60		Continuation of Sheet 2					
NMLC	20/11/18	100	0 (0)	13	141.40		Clayey SAND (EXTREMELY WEATHERED sandstone and pebble conglomerate) (SC) fine to coarse grained quartzose sand, orange brown, medium plasticity clay, trace - grading to with subrounded clasts (to 20mm) of siliceous siltstone/ chert	XW			13.45 m: J x2, 60°, sp = 50 mm, Pl-Un, pale grey clay (to 5mm) Ct	
				14	14.50							
		95	95 (95)	15	139.50		MUDSTONE fine grained, dark grey, carbonaceous	HW				
					14.95							
					139.05		SILTSTONE fine grained, grey and orange-grey, laminated (to 5mm), 5-10deg					
				16	15.96							
					16.20		CORE LOSS					
		100	100 (100)		137.80		SILTSTONE fine grained, grey and orange-grey, laminated				16.28 m: J, 60°, Pl, Sm, Cn, 2 mm, HW joint wall	
							SANDSTONE fine and medium grained, pale grey, laminated (to 10mm), 5-10deg, trace dark grey carbonaceous staining, stained orange brown to 16.4m	MW				
				17						UCS=6.89 - PLI(A)=0.35 - PLI(D)=0.12 -		
					17.65							
					136.35		becoming orange brown stained to 19.2m	HW			17.63 m: B, 10°, Un, Ro, Cn	
				18						PLI(A)=0.30 - PLI(D)=0.21 -		
					18.56						18.33-18.43 m: CS, 10°, Pl-Un, Sm-Ro, clayey gravel, fine grained, sub-rounded Ct	
					135.44		carbonaceous seam (30mm) and carbonaceous laminations (to 5mm), 5-10deg between 18.68m and 19.2m					
				19				MW				
		100	95 (100)							PLI(A)=0.17 - PLI(D)=0.16 - UCS=3.53 -		
				20				HW				

REPORT OF BOREHOLE: 330-01-BH2103 -

SHEET: 4 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 444151 m E 6941339 m N MGA94 56
SURFACE RL: 154 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.80 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 18/9/18
CHECKED: IT DATE: 24/10/18

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200) / LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	95 (100)	20–21	20.45 / 133.55		orange brown staining 20.45 to 20.8m, laminated (to - 10mm), 10deg -	MW / HW / MW			
					21.61 / 132.39		SILTSTONE - fine grained, grey and dark grey, carbonaceous, - irregularly laminated (to 10mm) -	HW / MW	PLI(A)=0.20 - PLI(D)=0.16 - UCS=3.98 -	21.61 m: B, 20°, Un, Sm, dark grey clay Ct, 3 mm 21.66-21.70 m: CS, 10°, Un, Sm, dark grey clay Ct	
				22	22.20 / 131.80		SANDSTONE - fine and medium grained, grey, interbedded with - siltstone and fine grained sandstone (to 150mm), dark - grey, irregular carbonaceous siltstone laminae (to - 10mm), 5-10deg -			22.16 m: B, 10°, Pl, Sm, clay Ve	
										22.56 m: B x2, 10°, sp = 110 mm, Un, Sm-Ro, Cn-Sn, <2 mm, open	
				23					UCS=3.52 - PLI(A)=0.44 - PLI(D)=0.15 -		
		100	100 (100)		23.54 / 130.46					23.35 m: J x2, 30°, sp = 260 mm, Pl-Un, Sm, dark grey clay Ct, <=3 mm 23.56 m: B, 10°, Un, Sm, Sn, <=2 mm, open	
				24						23.83 m: J, 70°, Pl-Un, Ro, Cn, <=2 mm, open 23.91 m: B, 10°, Pl, Ro, Cn, <=1 mm	
										24.17 m: J/CS, 30°, Pl, dark grey clay Ct 24.28 m: B x2, 10°, sp = 300 mm, Un-St, Sm, Sn, <=1 mm	
				25	25.00 / 129.00		dark grey 25.32 to 25.45m -	SW		25.04 m: B x4, 10-20°, sp = 200-400 mm, Un, Sm, Cn-Sn, <=4 mm 25.07 m: J, 30°, Pl-Un, Sm, Cn, <2 mm	
				26							
		100	80 (100)								
				27					UCS=5.63 -	27.06 m: J x6, 20-30°, sp = 100-300 mm, Pl, Sm, close Cn-Sn	
					27.40 / 126.60		grading to siltstone between 27.85 and 28.2m, dark grey and partly red brown staining	MW	PLI(A)=1.24 - PLI(D)=0.66		
				28					PLI(A)=0.40 - PLI(D)=0.44		
					28.30 / 125.70		carbonaceous siltstone bed (30mm) and carbonaceous laminations to 28.5m	SW		28.32 m: B x4, 10°, sp = 100-250 mm, Un, Sm-Ro, Cn, <=1 mm	
		100	90 (90)		28.90 / 125.10		irregular (sheared) bed (non-persistent) relic soft sediment structure				
				29						29.05-29.10 m: CS/ FZ, 10°, pale grey clay and sandstone fragments Ct 29.17 m: J, 80°, Pl-Un, Sm, Ve	
					29.51 / ~~124.49~~ / 124.43		29.51m: carbonaceous bed (5mm) 29.57m: relic soft sediment slump structure shear plane				
				30							

REPORT OF BOREHOLE: 330-01-BH2103

SHEET: 5 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 444151 m E 6941339 m N MGA94 56
SURFACE RL: 154 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.80 m

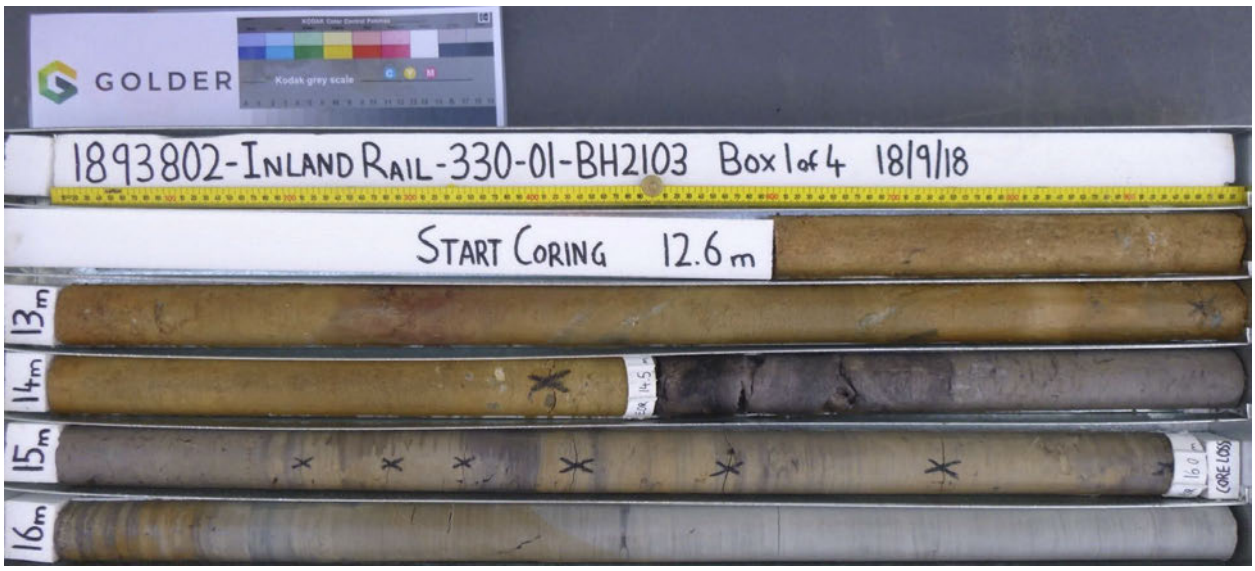
DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 18/9/18
CHECKED: IT DATE: 24/10/18

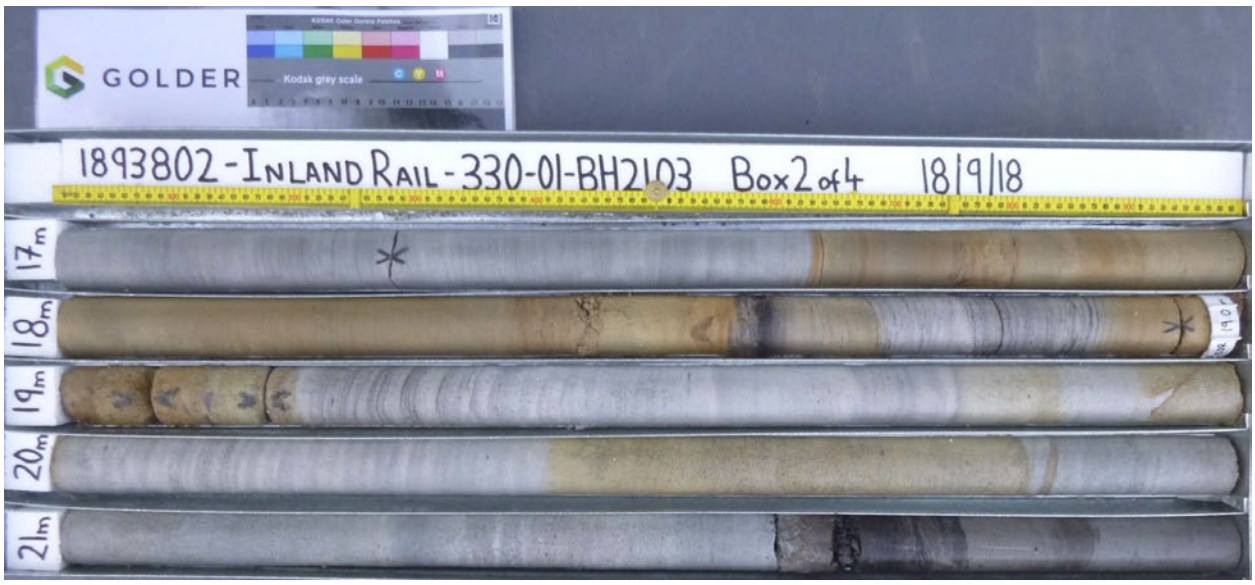
Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	90 (90)	30			SANDSTONE fine and medium grained, grey, interbedded with siltstone and fine grained sandstone (to 150mm), dark grey, irregular carbonaceous siltstone laminae (to 10mm), 5-10deg	SW			30.16 m: B x3, 10°, sp = 50-200 mm, Un, Sm-Ro, Cn, <=2 mm 30.47 m: J x2, 70°, sp = 280 mm, Pl-St, Sm-Ro, Cn-Ve, <=2 mm	
					30.80 123.20		END OF BOREHOLE @ 30.80 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 13.20 m DEPTH STANDPIPE INSTALLED					
				31								
				32								
				33								
				34								
				35								
				36								
				37								
				38								
				39								
				40								

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2103

SHEET: 1 OF 2

CLIENT:	FFJV	COORDS:	444151 m E 6941339 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	154 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: CHV	DATE: 18/9/18
JOB NO:	1893802	HOLE DEPTH:	30.80 m	CHECKED: IT	DATE: 24/10/18

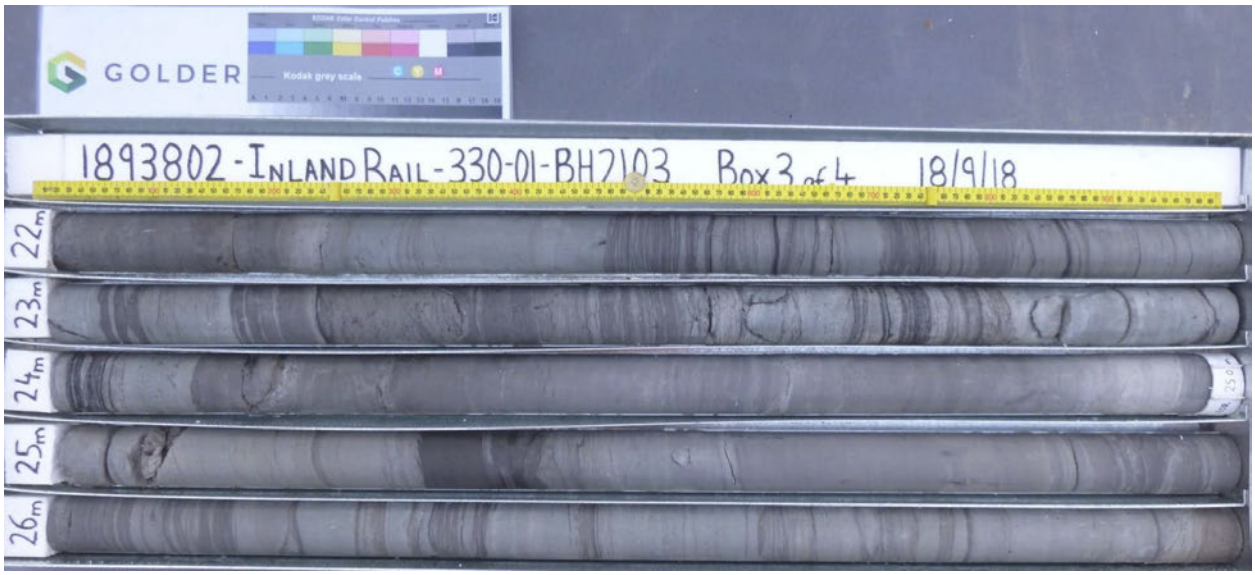




REPORT OF CORE PHOTOGRAPHS: 330-01-BH2103

SHEET: 2 OF 2

CLIENT:	FFJV	COORDS:	444151 m E 6941339 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	154 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: CHV	DATE: 18/9/18
JOB NO:	1893802	HOLE DEPTH:	30.80 m	CHECKED: IT	DATE: 24/10/18



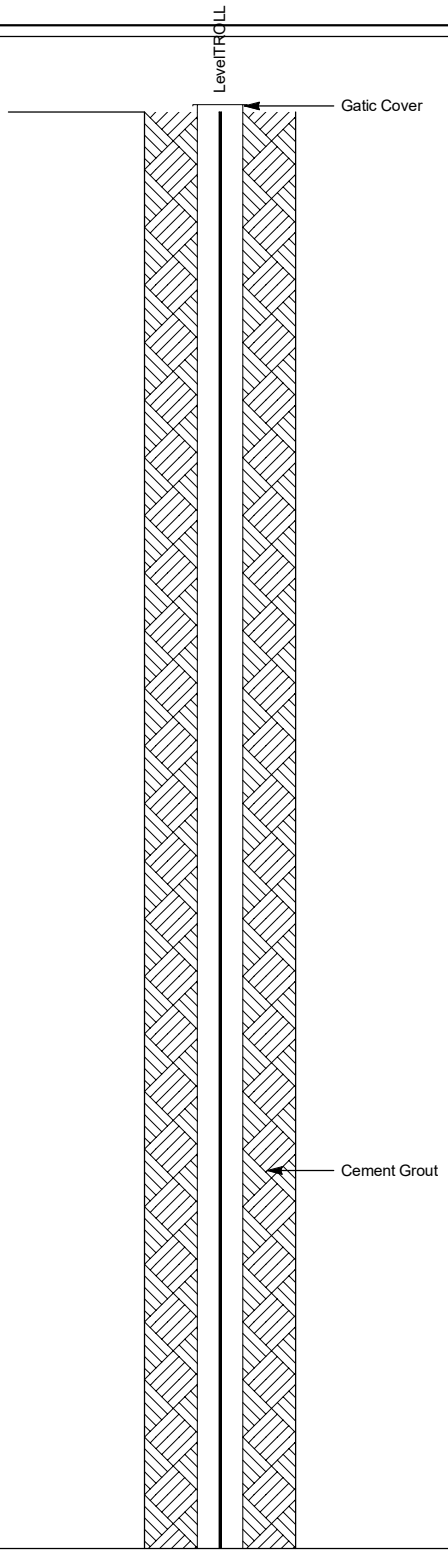
This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2103 -

SHEET: 1 OF 4

CLIENT:	FFJV	COORDS: 444151 m E 6941339 m N MGA94 56	DRILL RIG: Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 154 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: CHV DATE: 18/9/18
JOB NO:	1893802	HOLE DEPTH: 30.80 m	CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type	Tip Depth & RL	Installation Date
						LevelTROLL	22.20 m 131.80 m AHD	



ADT	0	154.00	SANDY CLAY
		1.80	
	1	152.20	
		2.20	
	2	151.80	SANDY CLAY
RD	3		
	4		
		4.50	
	5	149.50	
		6.00	
	6	148.00	CLAY
		6.90	
	7	147.10	
		7.80	
	8	146.20	SAND
		9.00	
	9	145.00	SAND

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2103 -

SHEET: 2 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 444151 m E 6941339 m N MGA94 56
SURFACE RL: 154 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.80 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 18/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 22.20 m 131.80 m AHD	Installation Date
RD		10	10.50 143.50		SAND			
		11			SAND			
		12	12.00 142.00					
			12.60 141.40		CLAYEY SAND (EXTREMELY WEATHERED SANDSTONE AND PEBBLE CONGLOMERATE)			
NMLC	20/11/18	13						
		14	14.50 139.50		MUDSTONE			
		15	14.95 139.05		SILTSTONE		15.00, RL139.00	Bentonite Seal
		16	15.96 16.20 137.80		CORE LOSS SILTSTONE SANDSTONE		16.00, RL138.00	
		17						Filter Pack
		18	17.65 136.35					
		19	18.56 135.44					

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2103 -

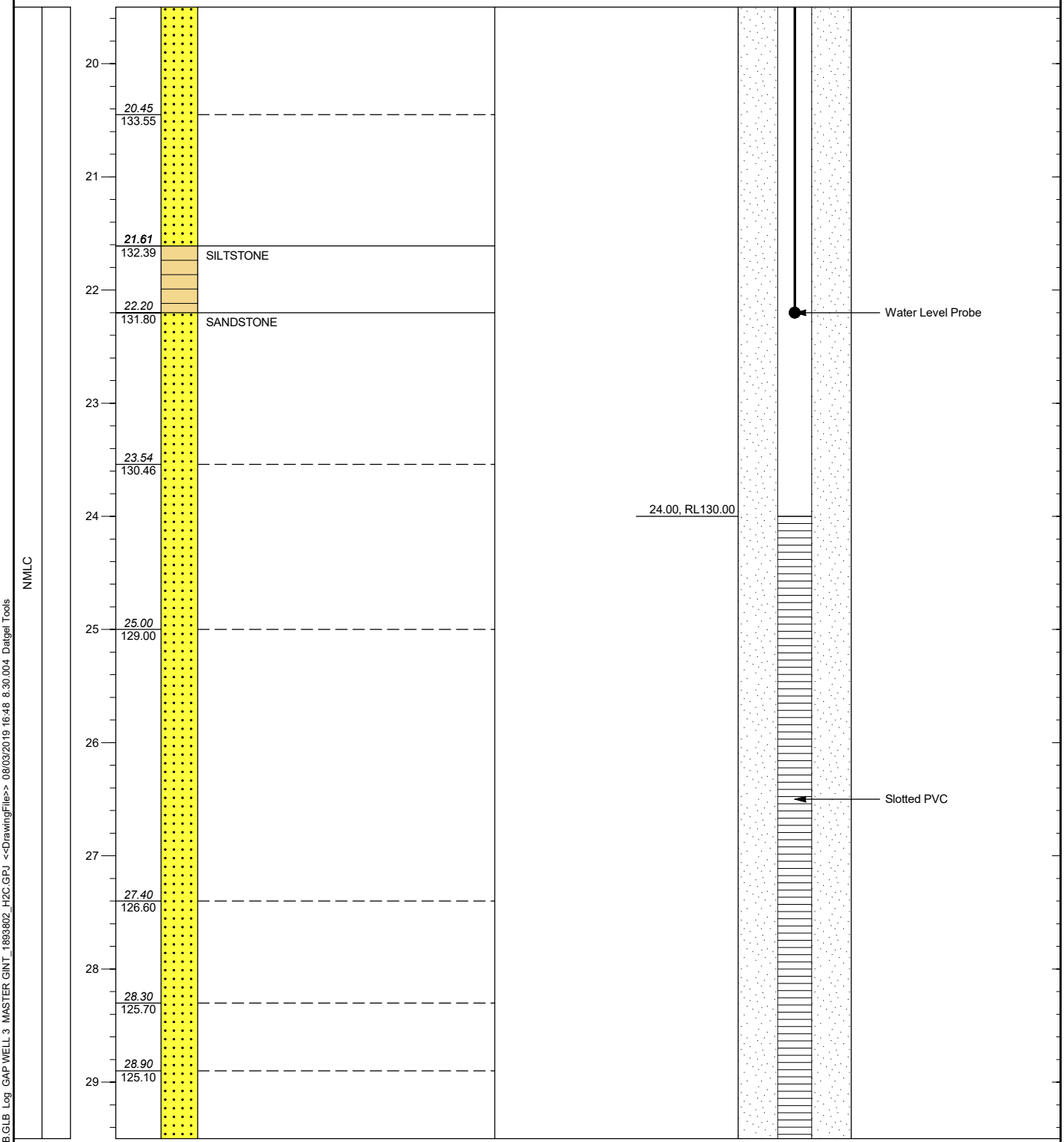
SHEET: 3 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 444151 m E 6941339 m N MGA94 56
SURFACE RL: 154 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.80 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 18/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 22.20 m 131.80 m AHD	Installation Date



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2103

SHEET: 4 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 444151 m E 6941339 m N MGA94 56
SURFACE RL: 154 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.80 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 18/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 22.20 m 131.80 m AHD	Installation Date
NMLC		30	~~124.50~~ 124.43		SANDSTONE		29.90, RL124.10	
			30.80 123.20		END OF BOREHOLE @ 30.80 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 13.20 m DEPTH STANDPIPE INSTALLED		30.80, RL123.20	
		31						
		32						
		33						
		34						
		35						
		36						
		37						
		38						
		39						

REPORT OF BOREHOLE: 330-01-BH2104

SHEET: 1 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443345 m E 6942248 m N MGA94 56
SURFACE RL: 159 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.02 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 12/9/18
CHECKED: IT DATE: 24/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT			0	159.00				SC	TOPSOIL: Clayey SAND fine to medium grained, brown, medium plasticity clay, woody organics			TOPSOIL
				0.50								
				158.50	SPT 0.50-0.95 m 6, 6, 7 N=13			CI	Sandy CLAY medium plasticity, brown, fine to medium grained sand			COLLUVIUM (Potentially Reworked)
			1									
				1.80								
				157.20				CI	Gravelly CLAY medium plasticity, dark brown, subangular gravel of siliceous siltstone/ chert gravel, with fine grained sand			
			2		SPT 2.00-2.29 m 17, 30/140mm							
		12/09/18		2.80								
				156.20				CH	Sandy CLAY high plasticity, pale brown, red brown and orange brown mottled, fine to medium grained sand			RESIDUAL SOIL (KOUKANDOWIE FORMATION)
			3		SPT 3.50-3.94 m 12, 18, 30/140mm							
			4									
				4.90								
RD	L		5	154.10	SPT 5.00-5.45 m 16, 22, 25 N=47			CI	Sandy CLAY (EXTREMELY WEATHERED siltstone) medium plasticity, pale grey and mottled orange brown, fine grained sand, with silt, and trace carbonaceous veneer on lamination partings	w < PL	H	EXTREMELY WEATHERED, lateritised (KOUKANDOWIE FORMATION)
			6		SPT 6.50-6.80 m 24, 130/145mm							
			7									
				7.80								
				151.20	SPT 8.00-8.45 m 14, 20, 28 N=48			CI	CLAY (EXTREMELY WEATHERED mudstone) medium plasticity, grey and mottled dark grey with orange brown, trace fine grained sand, carbonaceous laminations (<3mm)			EXTREMELY WEATHERED(KOUKANDOWIE FORMATION)
			8									
			9									
				9.50								
				149.50	SPT 9.50-9.79 m 12, 30/140mm				with black (carbonaceous) flecks and laminations			
			10	10.00								

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: 330-01-BH2104

SHEET: 2 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443345 m E 6942248 m N MGA94 56
SURFACE RL: 159 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.02 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 12/9/18
CHECKED: IT DATE: 24/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RD			10	149.00				CI	(EXTREMELY WEATHERED mudstone) medium plasticity, grey, trace fine grained sand, interlaminated (to 3mm) with fine grained sand and silt			EXTREMELY WEATHERED(KOUKANDOWIE FORMATION)
			11		SPT 11.00-11.18 m 29, 30/30mm HB							
			12									
	L			*12.50* 146.50	SPT 12.50-12.63 m 30/130mm				grading to highly weathered mudstone	w < PL	H	
			13									
			14		SPT 14.00-14.15 m 30/145mm							
			15									
	M			*15.30* 143.70	SPT 15.50-15.56 m 30/60mm HB				SANDSTONE fine to medium grained, pale grey		VD	
			16						For Continuation Refer to Sheet 3			
			17									
			18									
			19									
			20									

REPORT OF BOREHOLE: 330-01-BH2104

SHEET: 3 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443345 m E 6942248 m N MGA94 56
SURFACE RL: 159 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.02 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 12/9/18
CHECKED: IT DATE: 24/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE FREQUENCY (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
				10								
				11								
				12								
				13								
				14								
				15								
					15.56		Continuation of Sheet 2 -					
NMLC		100	100 (100)	16	143.44		SANDSTONE fine to medium grained, grey, grey, bedded (to 200mm), 5deg, and cross bedded trace - carbonaceous mudstone flecks (to 2mm) some interbedded, dark grey, fine grained sandstone/ silty sandstone (to 60mm)	DW - FR		UCS=3.04 PLI(A)=0.26 PLI(D)=0.20		
				17							17.32 m: J, 5-10°, Un, Ro	
				18	*17.97*						17.83 m: J, 20°, Pl-Un, Ro	
					18.13		trace lithic inclusions (clasts) to 20mm					
		100	100 (100)		140.80		MUDSTONE fine grained, layered, dark brown	DW				
							SANDSTONE fine and medium grained, grey, bedded (to 1300mm) - and cross bedded	SW - FR				
				19	*19.05*							
					139.95		trace lithic inclusions of siliceous gravel, fine to meduim grained, subangular to subrounded			UCS=1.91 PLI(A)=0.34 PLI(D)=0.32		
				20								

REPORT OF BOREHOLE: 330-01-BH2104

SHEET: 4 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443345 m E 6942248 m N MGA94 56
SURFACE RL: 159 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.02 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 12/9/18
CHECKED: IT DATE: 24/10/18

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200) / LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	100 (100)	20			SANDSTONE fine and medium grained, grey, bedded (to 1300mm) and cross bedded	SW - FR			
				21							
					21.30 137.70					21.31 m: B, 5-10°, Un, Ro, Cn, <2 mm, open	
					21.52 137.48		becoming with coarse grained sand and gravel size clasts of siliceous rock (lithic inclusions, carbonaceous laminations)		UCS=5.38		
		100	100 (100)	22	22.10 136.90		SANDSTONE AND CONGLOMERATE fine to coarse grained, pale grey, fine to coarse grained sand, subangular to angular gravel size clats (to 12mm), carbonaceous irregular laminations and flecks		PLI(A)=0.22 PLI(D)=0.11		
							SANDSTONE fine to medium grained, pale grey, becoming interbedded sandstone and siltstone (to 80 mm), 3-5deg	DW		22.54 m: B, 5-10°, Un, Ro, Cn, <3 mm, open	
				23						22.92 m: B, 5°, Un, Ro, close 23.09 m: B, 5°, Un, Ro, Cn, <2 mm, open 23.18 m: B, 10°, Un, Ro, close	
					23.46 135.54		SILSTONE dark brown, with subangular clats of sandstone and siltstone (lithic inclusions), laminated, 3-5deg, with sandy (fine grained) siltstone	SW - FR	PLI(A)=0.24 PLI(D)=0.28		
				24	24.08 134.92		SANDSTONE fine to medium grained, pale grey, cross bedded. Interbedded silstone, 3deg. Occassional carbonaceuos inclusions up to 3 mm			23.86 m: B, 10°, Pl-Un, Ro, close 23.89 m: B, 20°, Pl, Sl-Sm, close 23.91 m: B, 10°, Pl-Un, Ro, close 24.04 m: B, 5°, Pl-Un, Ro, close	
		100	100 (100)	25	25.10 133.90		becoming coarse grained		UCS=31.5 PLI(A)=0.33 PLI(D)=1.42	25.01 m: B, 3°, Un, Ro, Cn, <1 mm, open	
					25.50 133.50		interbedded with fine grained sandstone/ siltstone (to 120mm), 3deg	FR	UCS=17.7	25.44 m: B, 5°, Un, Ro, close 25.56 m: B, 5°, Un, Ro, close	
					25.70 133.30 25.90 133.10		carbonaceous laminations sandstone with approx 40% interbedded siltstone and fine grained sandstone			25.79 m: B, 5-10°, Un, Ro, close 26.04 m: B, 5-10°, Pl-Un, Ro, close	
				27					UCS=12.5 PLI(A)=1.42 PLI(D)=0.75		
		100	100 (100)	28						28.51 m: B, 5°, Un, Ro, CLAY Ct, <2 mm, open 28.80 m: B, 10-15°, Un, Ro, close	
				29	29.00 130.00		lithic inclusions (to 20mm)				
					29.66 129.34						
		100	100 (100)		129.25		lithic inclusions (to 15mm)				
				30							

REPORT OF BOREHOLE: 330-01-BH2104

SHEET: 5 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443345 m E 6942248 m N MGA94 56
SURFACE RL: 159 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.02 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 12/9/18
CHECKED: IT DATE: 24/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	100 (100)	30			SILTSTONE dark brown, interbedded with grey, fine grained, sandstone (to 100mm), 3deg	FR		UCS=14.6 PLI(A)=0.77 PLI(D)=0.42		
				31	*31.02* 127.98		END OF BOREHOLE @ 31.02 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 2.50 m DEPTH STANDPIPE INSTALLED					
				32								
				33								
				34								
				35								
				36								
				37								
				38								
				39								
				40								

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2104

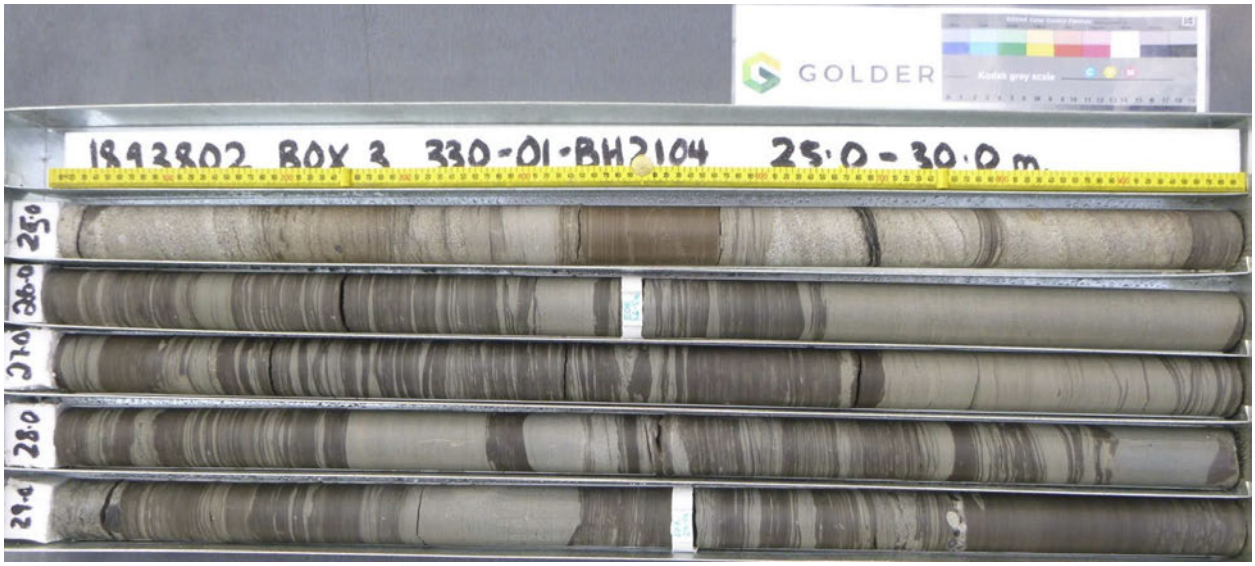
SHEET: 1 OF 2

CLIENT:	FFJV	COORDS:	443345 m E 6942248 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	159 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 12/9/18
JOB NO:	1893802	HOLE DEPTH:	31.02 m	CHECKED: IT	DATE: 24/10/18

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2104

SHEET: 2 OF 2

CLIENT:	FFJV	COORDS:	443345 m E 6942248 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	159 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 12/9/18
JOB NO:	1893802	HOLE DEPTH:	31.02 m	CHECKED: IT	DATE: 24/10/18



REPORT OF STANDPIPE INSTALLATION: 330-01-BH2104 -

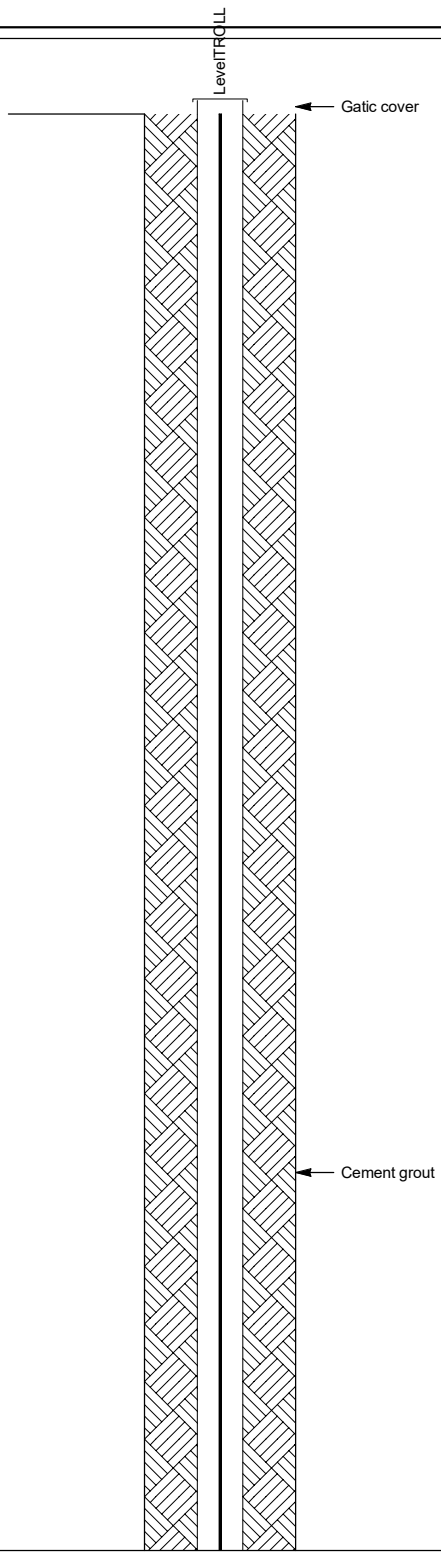
SHEET: 1 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443345 m E 6942248 m N MGA94 56
SURFACE RL: 159 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.02 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 12/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL; Tip Depth & RL 26.87 m 132.13 m AHD; Installation Date
ADT	12/09/18	0	159.00		CLAYEY SAND	
			0.50			
			158.50		SANDY CLAY	
		1				
			1.80			
			157.20		GRAVELLY CLAY	
		2				
			2.80			
			156.20		SANDY CLAY	
		3				
		4				
			4.90			
RD			154.10		SANDY CLAY (EXTREMELY WEATHERED SILTSTONE)	
		5				
		6				
		7				
			7.80			
			151.20		CLAY (EXTREMELY WEATHERED MUDSTONE)	
		8				
		9				
			9.50			



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2104 -

SHEET: 2 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443345 m E 6942248 m N MGA94 56
SURFACE RL: 159 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.02 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 12/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 26.87 m 132.13 m AHD	Installation Date
RD		10	149.50					
			10.00 149.00		(EXTREMELY WEATHERED MUDSTONE)			
		11						
		12						
			12.50 146.50					
		13						
		14					14.00, RL145.00	
								Bentonite seal
		15					15.00, RL144.00	
			15.30 143.70		SANDSTONE			
NMLC			15.56 143.44		SANDSTONE			
		16						
		17						
		18	17.97 18.13					
			140.80		MUDSTONE SANDSTONE			
		19	19.05 139.95				19.00, RL140.00	

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

GAP 8_16.7 LIB.GLB Log GAP WELL 3 MASTER GINT_1893802_H2C.GPJ <<DrawingFile>> 08/03/2019 16:48 8.30.004 Datgel Tools

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2104 -

SHEET: 3 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443345 m E 6942248 m N MGA94 56
SURFACE RL: 159 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.02 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 12/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL Tip Depth & RL 26.87 m 132.13 m AHD Installation Date
NMLC		20			SANDSTONE	
		21	21.30 137.70			
			21.52 137.48		SANDSTONE AND CONGLOMERATE	
		22	22.10 136.90		SANDSTONE	
		23	23.46 135.54		SILSTONE	
		24	24.08 134.92		SANDSTONE	Filter Pack -
		25	25.10 133.90			Slotted PVC
			25.50 133.50			
			25.70 133.30			
			25.90 133.10			
		26				
		27				Water Level Probe
		28				
		29	29.00 130.00			

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared - for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are - for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination. -

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2104

SHEET: 4 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 443345 m E 6942248 m N MGA94 56
SURFACE RL: 159 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.02 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 12/9/18
CHECKED: IT DATE: 24/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type	Tip Depth & RL	Installation Date
						LevelTROLL	26.87 m 132.13 m AHD	
NMLC		30	29.66 129.34 129.25		SILTSTONE		31.00, RL128.00	
		31	31.02 127.98		END OF BOREHOLE @ 31.02 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 2.50 m DEPTH STANDPIPE INSTALLED			
		32						
		33						
		34						
		35						
		36						
		37						
		38						
		39						

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF BOREHOLE: 330-01-BH2203

SHEET: 1 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 419239 m E 6952190 m N MGA94 56
SURFACE RL: 137 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.18 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 24/8/18
CHECKED: IT DATE: 29/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L		0	137.00				SC	TOPSOIL: Sandy CLAY medium to high plasticity, brown, fine to coarse grained sand, with silt, trace fine grained subrounded gravel, trace rootlets			TOPSOIL
				0.60	U 0.50-0.78 m PP >600 kPa			CH	CLAY high plasticity, dark brown, trace fine grained sand, trace rootlets	w < PL	H	ALLUVIUM
			1	1.80				SC	Clayey SAND brown, medium plasticity clay, trace fine grained subangular to subrounded gravel	D	L	
			2	2.20	SPT 2.00-2.45 m 4, 8, 9 N=17			Cl	Sandy CLAY medium plasticity, fine to medium grained sand, trace fine grained subangular to subrounded gravel	w < PL	VSt	
				2.70				SC	Clayey SAND fine to coarse grained, brown, medium plasticity clay	D	MD	
			3									
					SPT 3.50-3.95 m 4, 5, 7 N=12					w ~ PL		
			4	4.30					grading to clayey sand			
				4.50				CL	Sandy CLAY low plasticity, brown mottled pale grey, fine to medium grained sand			
			5		SPT 5.00-5.45 m 1, 6, 10 N=16					w ~ PL	VSt	
			6	6.10					grading to clayey sand			
RD				6.30				SW	SAND fine to coarse grained, red brown, with clay, trace fine grained subangular to angular gravel, black (carbonaceous) flecks	M	D	
			7		SPT 6.50-6.95 m 8, 11, 16 N=27							
				7.60					becoming with trace clay			
			8	8.00	SPT 8.00-8.45 m 9, 18, 30 N=48				becoming red brown with mottled pale grey			
		24/08/18		8.40					becoming dark red (ferruginous)			
				8.60					becoming with gravel			
				8.80								
			9	9.00				SW	Gravelly SAND fine to coarse grained, fine to coarse grained, sub-angular to angular of siliceous sandstone and siltstone, trace quartz gravel, trace clay	W	VD	
					SPT 9.50-9.77 m 13, 30/120mm HB							
			10									

REPORT OF BOREHOLE: 330-01-BH2203

SHEET: 2 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 419239 m E 6952190 m N MGA94 56
SURFACE RL: 137 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.18 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 24/8/18
CHECKED: IT DATE: 29/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RD	L		10					SW	Gravelly SAND fine to coarse grained, fine to coarse grained, sub-angular to angular of siliceous sandstone and siltstone, trace quartz gravel, trace clay	W	VD	ALLUVIUM
			11		SPT 11.00-11.29 m 8, 30/140mm HB							
			12	12.20 124.80				CI	CLAY medium plasticity, brown mottled pale grey		H	RESIDUAL SOIL (WOOGAROO SUBGROUP)
				12.65 124.35	SPT 12.50-12.78 m 15, 30/125mm HB			SP	SAND fine to medium grained, brown mottled pale grey			EXTREMELY WEATHERED sandstone
	M-H		13									
			14	14.00	SPT 14.00-14.14 m 30/140mm HB				SANDSTONE medium to coarse grained, brown, low strength, highly weathered For Continuation Refer to Sheet 3			
			15									
			16									
			17									
			18									
			19									
			20									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF BOREHOLE: 330-01-BH2203

SHEET: 3 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 419239 m E 6952190 m N MGA94 56
SURFACE RL: 137 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.18 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 24/8/18
CHECKED: IT DATE: 29/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
				10								
				11								
				12								
				13								
				14								
					14.20		Continuation of Sheet 2					
NMLC		100	100 (100)	15	122.80		SANDSTONE medium to coarse grained, brown	HW - MW		PLI(A)=0.28 PLI(D)=0.18 UCS=9.65		
					14.80 122.20		becoming grey	SW - FR				
		100	95 (100)	16	*16.03* 120.97		CONGLOMERATE fine to coarse grained, pale grey, low to medium strength sandstone with gravel and cobbles (5 mm to 60 mm) dark grey rounded and subangular clasts, apparent high strength laminated siltstone. Predominately (sandstone) matrix supported.	FR		PLI(A)=0.43 PLI(D)=0.05 UCS=26.6	16.06 m: B, 5-10°, Pl-Un, Ro, Cn, close 16.18 m: B, 10°, Pl, Sl-Sm, Cn, close 16.30 m: J, 20°, Pl-Un, Sl-Sm, Cn, open (to 2 mm) 16.45 m: B, 5°, Un, Sl-Sm, Cn, close	
				17							17.00 m	
		100	85 (100)	18						PLI(A)=0.23 PLI(D)=0.13	17.63 m: J, 15-20°, Pl-Un, Ro, Cn, open (to 3 mm) 17.81 m: B, 5°, Un, Ro, Cn, close 17.82 m: J, 25-35°, Un, Sl-Sm, apparently crushed (within conglomerate) 17.89 m: B, 20°, Pl, Sl-Sm, Cn, close 18.06 m: B, 25-30°, Un, Ro, sandy clay high plasticty Ct, (to 3 mm) 18.11-18.21 m: SZ, Cs 18.21-18.30 m: FZ, Cn 18.31 m: B, 5°, Pl, Sm, open (to 2 mm), trace sand	
				19								
				20						PLI(A)=2.00 PLI(D)=2.24 UCS=21.4		

REPORT OF BOREHOLE: 330-01-BH2203

SHEET: 4 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 419239 m E 6952190 m N MGA94 56
SURFACE RL: 137 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.18 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 24/8/18
CHECKED: IT DATE: 29/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE FREQUENCY (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	85 (100)	20	20.40 116.60		SANDSTONE pale grey, fine, medium and coarse grained, pale grey, trace rounded and platey clasts (<40 mm) of dark grey apparent high stregnth siltstone	FR		PLI(A)=2.00 PLI(D)=2.24		
		100	100 (100)	21 22						PLI(A)=0.29 PLI(D)=0.19 UCS=6.66		
				23							23.40 m: J, 40-50°, Un, Ro, Cn	
		100	100 (100)	24 25	25.18 111.82		END OF BOREHOLE @ 25.18 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 8.10 m DEPTH STANDPIPE INSTALLED					
				26 27 28 29 30								

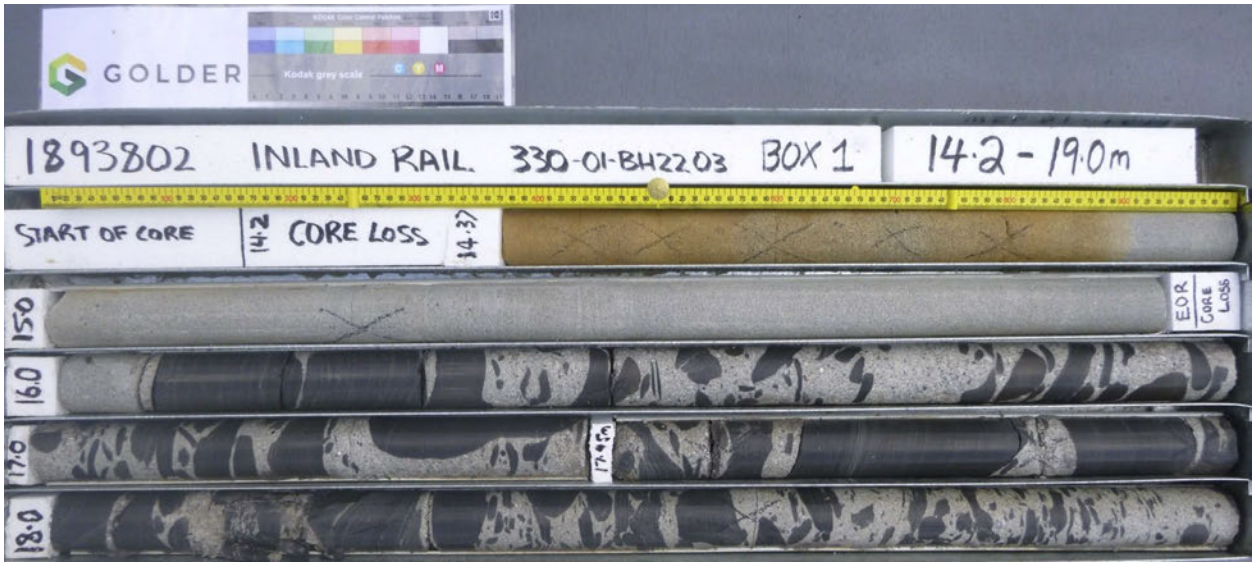
This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

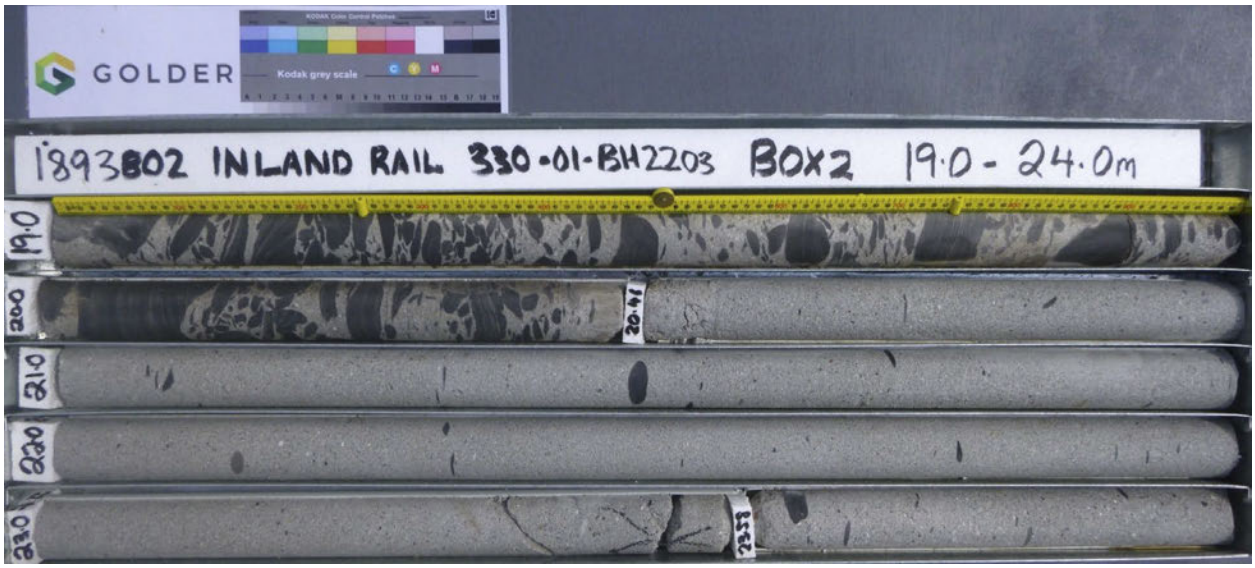
GAP gINT FN. F02b RL3

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2203

SHEET: 1 OF 2

CLIENT:	FFJV	COORDS:	419239 m E 6952190 m N MGA94 56	DRILL RIG:	Comacchio MC-T800
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	137 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 24/8/18
JOB NO:	1893802	HOLE DEPTH:	25.18 m	CHECKED: IT	DATE: 29/10/18





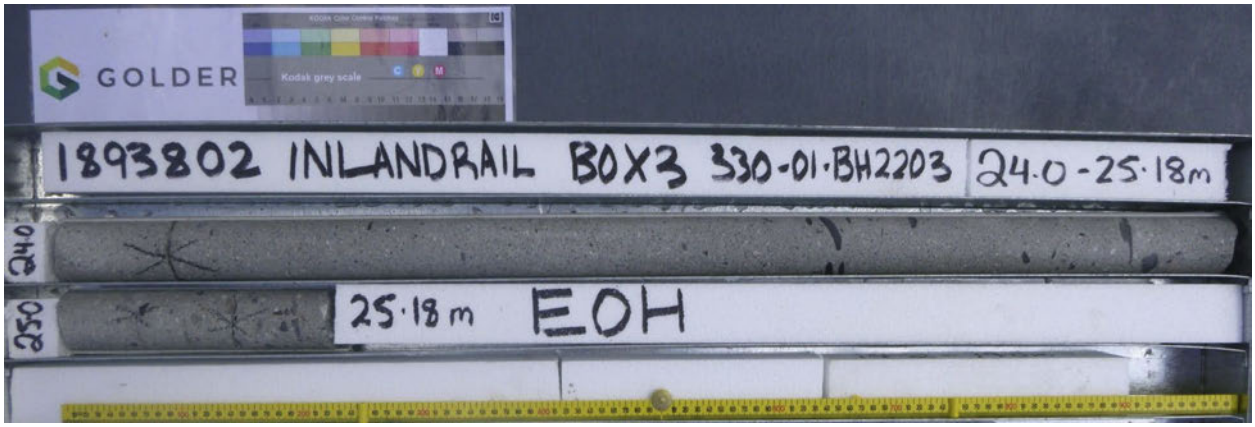
This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F28
RL1

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2203

SHEET: 2 OF 2

CLIENT:	FFJV	COORDS:	419239 m E 6952190 m N MGA94 56	DRILL RIG:	Comacchio MC-T800
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	137 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 24/8/18
JOB NO:	1893802	HOLE DEPTH:	25.18 m	CHECKED: IT	DATE: 29/10/18



REPORT OF STANDPIPE INSTALLATION: 330-01-BH2203 -

SHEET: 1 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 419239 m E 6952190 m N MGA94 56
SURFACE RL: 137 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.18 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 24/8/18
CHECKED: IT DATE: 29/10/18

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL Tip Depth & RL 10.70 m 126.30 m AHD Installation Date
ADT		0	137.00		SANDY CLAY	Gatic cover
			0.60			
			136.40		CLAY	
		1				
			1.80			
			135.20		CLAYEY SAND -	
		2	2.20			
			134.80		SANDY CLAY	
			2.70			
			134.30		CLAYEY SAND	
		3				
						Cement grout
		4				
			4.30			
			132.70			
			4.50			
			132.50		SANDY CLAY	
		5				5.00, RL132.00
						6.00, RL131.00
		6	6.10			
			130.90			
			6.30			
			130.70		SAND	Bentonite Seal
RD		7				
			7.60			
			129.40			
			8.00			
		8	129.00			
			8.40			
			128.60			
			8.60			
			128.40			
			8.80			
			128.20		GRAVELLY SAND -	Filter Pack -
		9				
						Slotted PVC
		10				

LevelTROLL

24/08/18

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared - for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are - for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination. -

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2203 -

SHEET: 2 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 419239 m E 6952190 m N MGA94 56
SURFACE RL: 137 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.18 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 24/8/18
CHECKED: IT DATE: 29/10/18

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL Tip Depth & RL 10.70 m 126.30 m AHD Installation Date
RD		10			GRAVELLY SAND	Water Level Probe
		11				11.90, RL125.10
		12	12.20 124.80		CLAY	12.20, RL124.80
			12.65 124.35		SAND (EXTREMELY WEATHERED SANDSTONE)	Bentonite Seal
		13				13.20, RL123.80
		14	14.00			
			14.20 122.80		SANDSTONE	
NMLC			14.80 122.20		SANDSTONE	
		15				
		16	16.03 120.97		CONGLOMERATE	
		17				
		18				
		19				
		20				

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2203 -

SHEET: 3 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 419239 m E 6952190 m N MGA94 56
SURFACE RL: 137 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.18 m

DRILL RIG: Comacchio MC-T800
CONTRACTOR: Drillpower
LOGGED: RC DATE: 24/8/18
CHECKED: IT DATE: 29/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 10.70 m 126.30 m AHD	Installation Date
NMLC		20			CONGLOMERATE			Backfill
			20.40 116.60		SANDSTONE			
		21						
		22						
		23						
		24						
		25	*25.18* 111.82		END OF BOREHOLE @ 25.18 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 8.10 m DEPTH STANDPIPE INSTALLED		25.00, RL112.00	
		26						
		27						
		28						
		29						
		30						

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF BOREHOLE: 330-01-BH2207

SHEET: 1 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 420000 m E 6951909 m N MGA94 56
SURFACE RL: 141 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 20.53 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 2/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT			0	141.00				SW	TOPSOIL: SAND fine to medium grained, pale grey, brown, with silt, trace rootlets	D		TOPSOIL
				0.50								
	L		1	140.50	SPT 0.50-0.95 m 17, 25, 23 N=48			SC	Clayey SAND fine to coarse grained, brown, medium plasticity clay, with fine to coarse grained, subrounded to angular gravel of siliceous siltstone	M	D	RESIDUAL SOIL (WOOGAROO SUBGROUP)
				2.00								
			2	139.00	SPT 2.00-2.13 m 30/130mm HB			CL-CI	Sandy CLAY low to medium plasticity, red brown, fine to medium grained sand, becoming fine to coarse grained			EXTREMELY WEATHERED sandstone
			3	*3.50*								
RD				137.50	SPT 3.50-3.80 m 18, 30/145mm HB				grading to clayey sand with pale grey sandy clay to 5 m			
			4									
			5	*5.20*	SPT 5.00-5.45 m 15, 24, 26				becoming pale grey, predominately fine grained			
	L-M			135.80	N=50							WOOGAROO SUBGROUP
			6							w ~ PL	H	
				6.60	SPT 6.50-6.65 m							
				134.40	30/150mm HB				becoming brown / orange brown mottled			
			7									
				8.00								
			8	133.00	SPT 8.00-8.12 m 30/120mm HB				becoming medium grained			
			9									
		06/09/18			SPT 9.50-9.76 m 30, 30/110mm HB							
			10									

REPORT OF BOREHOLE: 330-01-BH2207

SHEET: 2 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 420000 m E 6951909 m N MGA94 56
SURFACE RL: 141 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 20.53 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 2/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RD	L-M		10					CL-CI	Sandy CLAY (EXTREMELY WEATHERED sandstone) low to medium plasticity, red brown, fine to medium grained sand, becoming fine to coarse grained	w ~ PL	H	WOOGAROO SUBGROUP
				10.90					(EXTREMELY WEATHERED sandstone)			
			11		SPT 11.00-11.06 m 30/60mm HB				For Continuation Refer to Sheet 3			
			12									
			13									
			14									
			15									
			16									
			17									
			18									
			19									
			20									

REPORT OF BOREHOLE: 330-01-BH2207 -

SHEET: 3 OF 4

CLIENT: FFJV
COORDS: 420000 m E 6951909 m N MGA94 56
DRILL RIG: Commachio 450

PROJECT: Inland Rail, Phase 2
SURFACE RL: 141 m DATUM: AHD
CONTRACTOR: Drillpower

LOCATION: H2C
INCLINATION: -90°
LOGGED: RC DATE: 2/9/18

JOB NO: 1893802
HOLE DEPTH: 20.53 m
CHECKED: IT DATE: 30/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
				10								
				11	11.10		Continuation of Sheet 2					
NMLC		100	100 (100)	12	129.90		SANDSTONE medium to coarse grained, bedded (to 250 mm), brown, red brown and pale brown, lithic	DW		PLI(A)=0.30 PLI(D)=0.43 UCS=4.04		
		100	85 (100)	13	13.73 127.27		becoming interbedded (to 120 mm) with fine grained, pale brown sandstone.			PLI(A)=0.15 PLI(D)=0.06 PLI(A)=1.76 PLI(D)=1.36 UCS=4.12	13.13-13.19 m: DS, 10°, material fine to coarse grained sand, highly to extremely weathered sandstone 13.98-13.99 m: B, 10°, Pl, Sm, Ve/Ct, carbonaceous	
				14	14.50 126.50		becoming thinly bedded (to 100 mm), fine to coarse grained, trace carbonaceous siltstone laminations (to 2 mm)	HW			14.47 m: B, 10°, Pl, Sm, Ct, (2 mm) carbonaceous 14.64 m: B, 10°, Pl-Un, Ro, Ve, carbonaceous 14.67 m: B, 10°, Pl-Un, Ro, Ve, carbonaceous 14.70 m: B, 10°, Pl, Sm, Ve/Ct, carbonaceous 14.75-14.76 m: B, 10°, Pl, Sm, Ve/Ct, carbonaceous	
				15	15.20 125.80		becoming pale grey and pale brown	SW - FR FR		PLI(A)=1.76 PLI(D)=1.36	14.80-14.81 m: DS, 15°, coarse grained clayey sand, extremely weathered bed 14.86 m: B, 10°, Pl, Sm, Ve/Ct, carbonaceous 15.11 m: B, 10°, Pl-Un, Ro, Cn, close 15.14 m: B, 5°, Pl-Un, Ro, Cn, close	
		100	100 (100)	16	16.00 125.00		grading to sandy siltstone, trace gravel size (5 to 20 mm) subrounded clasts of siltstone				15.98 m: C, 15°, Pl-Un, Sm, Cn	
				17	16.55 124.45		SANDSTONE fine to medium grained, pale grey, trace carbonaceous laminea (5 to 10 degrees) faintly cross-bedded			PLI(A)=0.45 PLI(D)=0.23 UCS=17.2		
				18	18.54 122.46		trace subrounded clasts (5 to 30 mm) of sandstone and siltstone (siliceous)					
		100	100 (100)	19	19.60 121.40		trace laminations of carbonaneous siltstone, cross-bedded			PLI(A)=1.56 PLI(D)=0.73	19.67 m: B, 5°, Pl, Sm, Cn, close	
				20								

REPORT OF BOREHOLE: 330-01-BH2207

SHEET: 4 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 420000 m E 6951909 m N MGA94 56
SURFACE RL: 141 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 20.53 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 2/9/18
CHECKED: IT DATE: 30/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER -	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE FREQUENCY (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	100 (100)	20	*20.12*			FR				
					120.83		SILTSTONE fine grained, dark grey					
					20.53		SANDSTONE fine to medium grained, pale grey, trace - carbonaceous laminations, cross-bedded -					
					120.47		END OF BOREHOLE @ 20.53 m TARGET DEPTH - GROUNDWATER ENCOUNTERED @ 9.50 m - DEPTH - STANDPIPE INSTALLED -					
				21								
				22								
				23								
				24								
				25								
				26								
				27								
				28								
				29								
				30								

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for - geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for - information only and do not necessarily indicate the presence or absence of soil or groundwater contamination. -

GAP gINT FN. F02b RL3

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2207

SHEET: 1 OF 1

CLIENT:	FFJV	COORDS:	420000 m E 6951909 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	141 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 2/9/18
JOB NO:	1893802	HOLE DEPTH:	20.53 m	CHECKED: IT	DATE: 30/10/18

This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2207 -

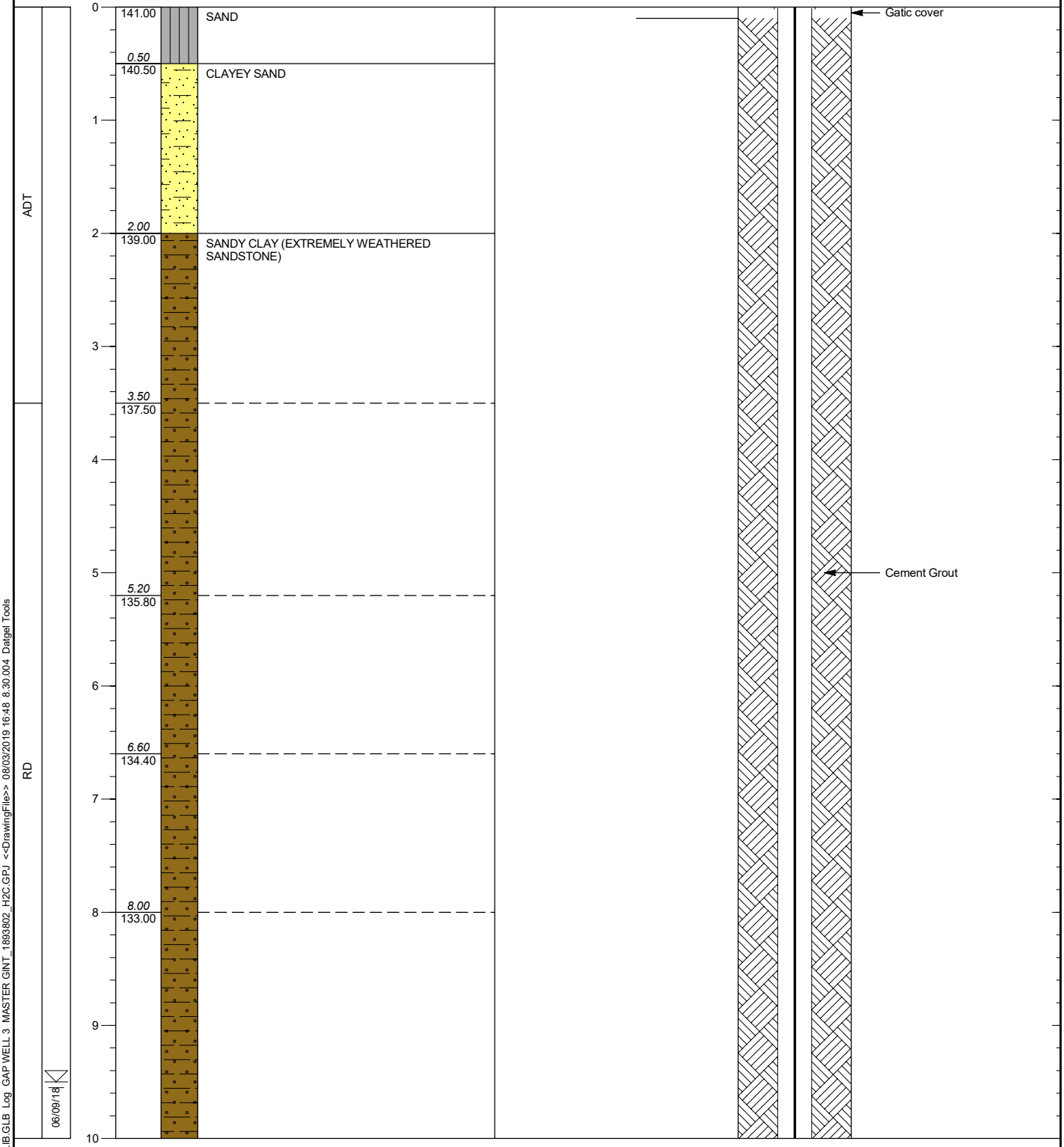
SHEET: 1 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 420000 m E 6951909 m N MGA94 56
SURFACE RL: 141 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 20.53 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 2/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 17.92 m 123.08 m AHD	Installation Date



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2207 -

SHEET: 2 OF 3

CLIENT:	FFJV	COORDS: 420000 m E 6951909 m N MGA94 56	DRILL RIG: Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 141 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 2/9/18
JOB NO:	1893802	HOLE DEPTH: 20.53 m	CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 17.92 m 123.08 m AHD	Installation Date
RD		10			SANDY CLAY (EXTREMELY WEATHERED SANDSTONE)		10.50, RL130.50	
			10.90					
		11	11.10		(EXTREMELY WEATHERED SANDSTONE)			Bentonite Seal
			129.90		SANDSTONE		11.50, RL129.50	
		12						
		13						
			13.73					
			127.27					
NMLC		14						
			14.50					
			126.50					
		15						Filter Pack
			15.20					
			125.80					
		16	16.00					Slotted PVC
			125.00					
			16.55					
			124.45		SANDSTONE			
		17						
		18						Water Level Probe
			18.54					
			122.46					
		19						
			19.60					
			121.40					
		20						

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared - for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are - for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination. -

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2207

SHEET: 3 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 420000 m E 6951909 m N MGA94 56
SURFACE RL: 141 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 20.53 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 2/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 17.92 m 123.08 m AHD	Installation Date
NMLC		20	20.12 120.83		SILTSTONE			
			20.53 120.47		SANDSTONE END OF BOREHOLE @ 20.53 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 9.50 m DEPTH STANDPIPE INSTALLED	20.50, RL120.50		
		21						
		22						
		23						
		24						
		25						
		26						
		27						
		28						
		29						
		30						

REPORT OF BOREHOLE: 330-01-BH2212

SHEET: 1 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 436009 m E 6948601 m N MGA94 56
SURFACE RL: 90 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.40 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 19/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT			0	0.10 89.90	DS 0.00-0.10 m			CI CH	TOPSOIL: CLAY medium plasticity, dark brown, with silt, trace medium grained sand, with rootlets			TOPSOIL ALLUVIUM
		20/09/18			DS 0.40-0.50 m SPT 0.50-0.95 m 4, 6, 6 N=12				CLAY high plasticity, dark brown, with silt	w < PL	St	
			1		DS 1.00-1.10 m							
			2		SPT 2.00-2.45 m 4, 6, 8 N=14							
				2.60 87.40				CH	CLAY high plasticity, brown, faint red brown and pale grey mottling			
RD	L		3		U50 3.50-3.78 m PP = 210-280 kPa							
			4								VSt	
			5		SPT 5.00-5.45 m 3, 3, 3 N=6						F	
			6							w ~ PL		
			7		SPT 6.50-6.95 m 3, 4, 4 N=8						St	
				7.90 82.10					brown and pale grey, trace fine grained, sub-angular to angular gravel			
			8		SPT 8.00-8.45 m 3, 3, 4 N=7							
	M		9									
					U50 9.50-9.96 m PP = 350-450 kPa						VSt	
			10									

REPORT OF BOREHOLE: 330-01-BH2212

SHEET: 2 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 436009 m E 6948601 m N MGA94 56
SURFACE RL: 90 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.40 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 19/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RD	M	▽	10					CH	CLAY high plasticity, brown, faint red brown and pale grey mottling	w ~ PL	VSt	ALLUVIUM
			11		SPT 11.00-11.45 m 4, 7, 8 N=15							
		▽	12									
				12.50 77.50	SPT 12.50-12.95 m 5, 6, 8 N=14				trace nodular calcium carbonate and trace calcite			
			13									
				13.60 76.40					becoming grey, trace sand (coarse grained) clay			
		▽	14		SPT 14.00-14.45 m 6, 7, 9 N=16							
			15	*15.20* 74.80					brown, trace medium grained sand			
					SPT 15.50-15.95 m 5, 7, 10 N=17							
			16									
			17		SPT 17.00-17.45 m 7, 7, 12 N=19							
				17.40 72.60					trace carbonaceous parting (1mm)			
			18									
				18.60 71.40	SPT 18.50-18.95 m 10, 10, 14 N=24				trace calcium carbonate nodules (to 3 mm)		H	
			19									
			20									

REPORT OF BOREHOLE: 330-01-BH2212

SHEET: 3 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 436009 m E 6948601 m N MGA94 56
SURFACE RL: 90 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.40 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 19/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RD	M		20	*20.32* 69.68	SPT 20.00-20.45 m 7, 11, 14 N=25			CH	CLAY high plasticity, brown, faint red brown and pale grey mottling lense of calcium carbonate laminations (to 2 mm), traces of carbonaceous partings, black	w < PL	H	ALLUVIUM
			21	*21.52* 68.48	SPT 21.50-21.74 m 16, 30/85mm				weakly cemented (calcareous), trace fine grained gravel trace medium to coarse grained, sub-rounded, black and pale grey gravel of siliceous sandstone			
			22	*22.60* 67.40				SW	SAND fine and medium grained, yellow-brown, red-brown and brown	M	VD	RESIDUAL SOIL (GATTON SANDSTONE)
	L		23		SPT 23.00-23.21 m 15, 30/55mm							
			24		SPT 24.00-24.09 m 30/85mm				For Continuation Refer to Sheet 4			GATTON SANDSTONE
			25									
			26									
			27									
			28									
			29									
			30									

REPORT OF BOREHOLE: 330-01-BH2212

SHEET: 4 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 436009 m E 6948601 m N MGA94 56
SURFACE RL: 90 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.40 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 19/9/18
CHECKED: IT DATE: 30/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE FREQUENCY (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
				20								
				21								
				22								
				23								
				24	24.16		Continuation of Sheet 3 -					
NMLC		100	95 (95)	25	65.84 65.77 24.60 65.40 25.35 64.65		SANDSTONE fine to coarse grained, orange-brown, bedded	HW		PLI(A)=0.72 - PLI(D)=0.74 - UCS=8.28 - PLI(A)=0.11 PLI(D)=0.10	24.16-27.00 m: GATTON SANDSTONE	
				26	26.03 63.97						25.93 m: B, 10°, Un, Ro, clay, grey and orange-brown Ct, <=5 mm 26.20 m: J, 60°, Pl-Un, Ro, Cn, close/Sn (brown)	
				27	26.40 63.60 27.00		Coring completed at 26.4m, reamed hole to 27m to install well screen. END OF BOREHOLE @ 26.40 m - TARGET DEPTH - GROUNDWATER ENCOUNTERED @ 0.50 m - DEPTH - STANDPIPE INSTALLED -					
				28								
				29								
				30								

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2212

SHEET: 1 OF 1

CLIENT:	FFJV	COORDS:	436009 m E 6948601 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	90 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: CHV	DATE: 19/9/18
JOB NO:	1893802	HOLE DEPTH:	26.40 m	CHECKED: IT	DATE: 30/10/18

This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2212 -

SHEET: 1 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 436009 m E 6948601 m N MGA94 56
SURFACE RL: 90 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.40 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 19/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details			
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 26.60 m 63.40 m AHD		Installation Date
ADT	20/09/18	0	0.10 89.90		CLAY CLAY -			Gatic cover	
		1							
		2	2.60 87.40		CLAY				
RD		3							
		4							
		5							
		6							
		7	7.90 82.10						
		8							
		9							
		10							

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2212 -

SHEET: 2 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 436009 m E 6948601 m N MGA94 56
SURFACE RL: 90 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.40 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 19/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 26.60 m 63.40 m AHD	Installation Date

RD

10
11
12
13
14
15
16
17
18
19
20

CLAY

12.50
77.50

13.60
76.40

15.20
74.80

17.40
72.60

18.60
71.40

Cement Grout

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared - for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are - for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination. -

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2212 -

SHEET: 3 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 436009 m E 6948601 m N MGA94 56
SURFACE RL: 90 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.40 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 19/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL Tip Depth & RL 26.60 m 63.40 m AHD Installation Date
RD		20	20.32 69.68		CLAY	
		21	21.52 68.48 21.66 68.35			
		22	22.60 67.40		SAND	22.00, RL68.00 Bentonite Seal
		23				23.00, RL67.00
		24	24.16 65.84			
NMLC			65.77		SANDSTONE	
		25	24.60 65.40 25.35 64.65			Slotted PVC
		26	26.03 63.97			Filter Pack
			26.40 63.60			
		27	27.00		END OF BOREHOLE @ 26.40 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 0.50 m DEPTH STANDPIPE INSTALLED	27.00, RL63.00
		28				
		29				
		30				

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF BOREHOLE: 330-01-BH2216

SHEET: 1 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 440527 m E 6945222 m N MGA94 56
SURFACE RL: 97 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.50 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 10/10/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
NDD			0	97.00	DS 0.00-0.10 m			CI	FILL: Gravelly CLAY medium plasticity, dark brown, fine grained, angular gravel, with silt, trace rootlets to 0.1m			FILL
			1									
				1.90								
ADT		10/10/18	2	95.10	SPT 2.00-2.45 m 3, 4, 7 N=11			CH	CLAY high plasticity, dark brown			ALLUVIUM
			3		U50 3.50-3.96 m PP = 100-150 kPa						St	
			4									
			5		SPT 5.00-5.45 m 3, 4, 6 N=10							
				5.20								
				91.80					trace fine and medium grained sand, becoming grey			
RD	L		6	*6.10*						w < PL		
				90.90				CH	Sandy CLAY high plasticity, grey, fine and medium gained sand, mottled orange-brown, with lenses clay			
			7		U50 6.50-6.99 m PP = 250-300 kPa							
				7.90								
			8	89.10	SPT 8.00-8.45 m 3, 3, 5 N=8				lenses of high plasticity clay		VSt	
			9									
				9.51								
				87.49	SPT 9.50-9.95 m 4, 5, 8 N=13				trace carbonaceous and dark grey silt			
			10									

REPORT OF BOREHOLE: 330-01-BH2216

SHEET: 2 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 440527 m E 6945222 m N MGA94 56
SURFACE RL: 97 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.50 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 10/10/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RD	L		10					CH	Sandy CLAY high plasticity, grey, fine and medium gained sand, mottled orange-brown, with lenses clay	w < PL	VSt	ALLUVIUM
			11		SPT 11.00-11.45 m 5, 8, 10 N=18							
			12		U50 12.50-12.99 m PP = 300-350 kPa							
			13	*13.50*								
				83.50				CL	Sandy CLAY low plasticity, grey, fine and medium gained sand, mottled orange-brown	M	L	
			14		SPT 14.00-14.45 m 3, 3, 5 N=8							
			15		SPT 15.50-15.95 m 5, 6, 6 N=12							
	M		16								MD	
				16.80 80.20				CI	Sandy CLAY medium plasticity, grey, fine and medium gained sand, mottled orange-brown			
			17		SPT 17.00-17.45 m 7, 9, 10 N=19							
			18		SPT 18.50-18.95 m 6, 7, 10 N=17					w < PL	VSt	
			19									
				19.90 77.10						M	MD	
			20									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: 330-01-BH2216

SHEET: 3 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 440527 m E 6945222 m N MGA94 56
SURFACE RL: 97 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.50 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 10/10/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RD	M		20		SPT 20.00-20.45 m 4, 5, 6 N=11			SC	Clayey SAND fine and medium grained, grey, with medium plasticity clay, mottled orange-brown			ALLUVIUM
			21								MD	
					SPT 21.50-21.95 m 5, 7, 8 N=15							
			22									
				22.70 74.30				SP	SAND medium grained, orange brown, ferruginous stained and pale grey	M		RESIDUAL SOIL (GATTON SANDSTONE)
			23		SPT 23.00-23.09 m 30/90mm							
	H		24		SPT 24.00-24.09 m 30/90mm						VD	
			25		SPT 25.00-25.02 m 30/20mm							REAMED HOLE TO 25.5m
				71.50					END OF BOREHOLE @ 25.50 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 3.10 m DEPTH STANDPIPE INSTALLED			
			26									
			27									
			28									
			29									
			30									

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2216 -

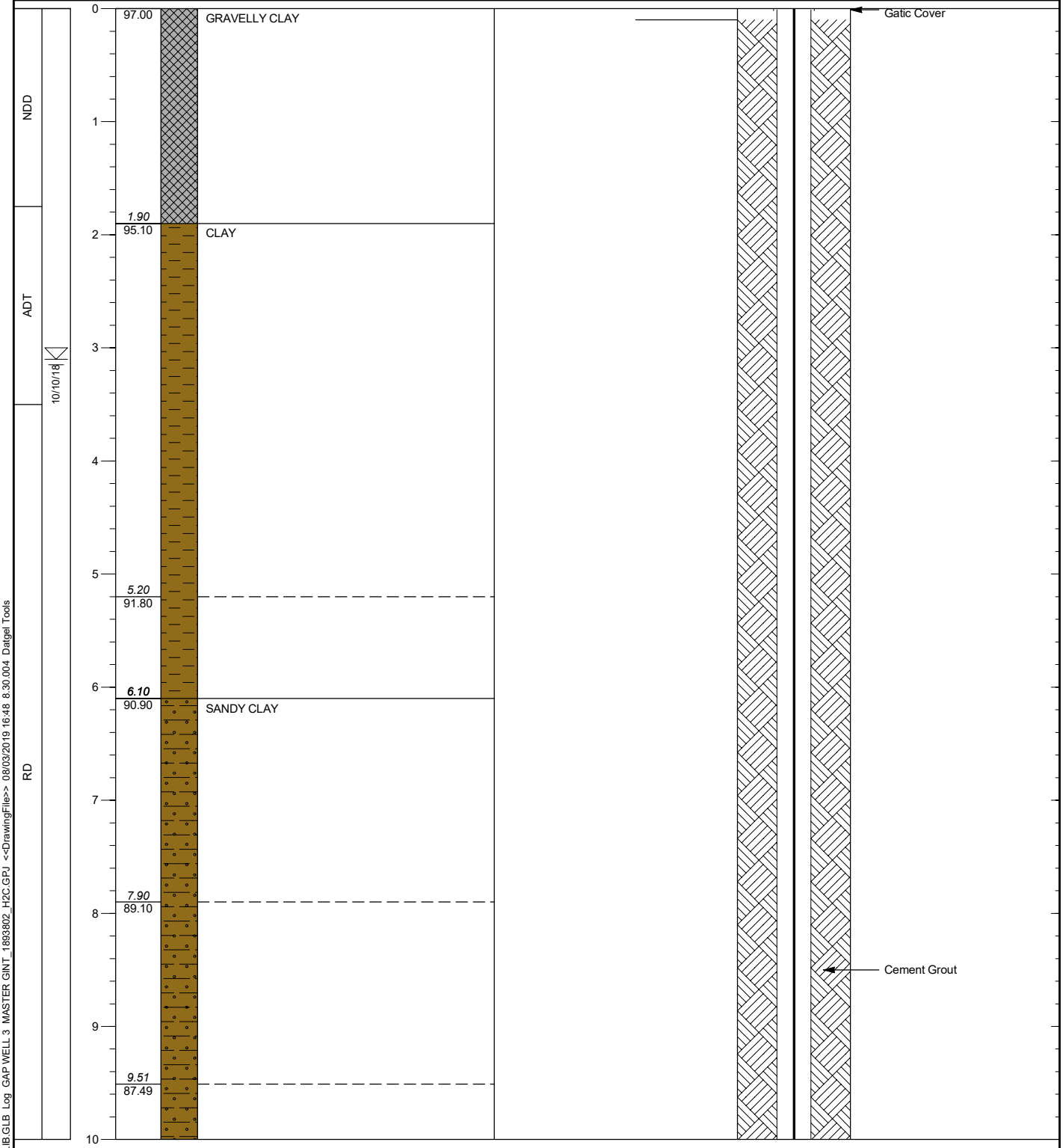
SHEET: 1 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 440527 m E 6945222 m N MGA94 56
SURFACE RL: 97 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.50 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 10/10/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details			
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 24.13 m 72.87 m AHD		Installation Date



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared - for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are - for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination. -

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2216 -

SHEET: 2 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 440527 m E 6945222 m N MGA94 56
SURFACE RL: 97 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.50 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 10/10/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type	Tip Depth & RL	Installation Date
						LevelTROLL	24.13 m 72.87 m AHD	

RD

10
11
12
13
13.50
83.50 SANDY CLAY
14
15
16
16.80
80.20 SANDY CLAY
17
18
19
19.90
77.10
20

SANDY CLAY

16.50, RL80.50

Bentonite Seal

18.50, RL78.50

Filter Pack

19.50, RL77.50

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2216 -

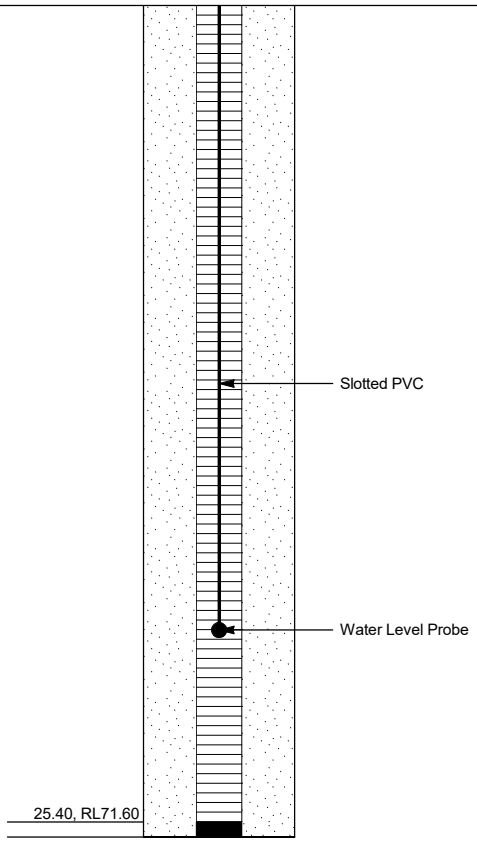
SHEET: 3 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 440527 m E 6945222 m N MGA94 56
SURFACE RL: 97 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 25.50 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 10/10/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type Tip Depth & RL Installation Date LevelTROLL 24.13 m 72.87 m AHD
RD		20			CLAYEY SAND	
		21				
		22				
			22.70 74.30		SAND	
		23				
		24				
		25				
			25.50 71.50		END OF BOREHOLE @ 25.50 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 3.10 m DEPTH STANDPIPE INSTALLED	
		26				
		27				
		28				
		29				
		30				



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF BOREHOLE: 330-01-BH2224

SHEET: 1 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 446973 m E 6940047 m N MGA94 56
SURFACE RL: 86 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.43 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 21/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
NDD			0	0.10 85.90	DS 0.00-0.10 m			CI-CH CH	TOPSOIL: Sandy CLAY medium to high plasticity, dark brown, fine to medium grained sand, with rootlets			TOPSOIL ALLUVIUM
			1					CH	Sandy CLAY high plasticity, dark brown, fine to medium grained sand			
ADT				1.80 84.20				CH	CLAY high plasticity, brown			
			2		SPT 2.00-2.45 m 8, 10, 11 N=21						VSt	
			3							w < PL		
					SPT 3.50-3.95 m 5, 5, 7 N=12						St	
		24/09/18	4	4.50 81.50					with fine and medium grained sand			
RD	L		5		U50 5.00-5.42 m PP = 300-350 kPa							
			6							w < PL - w ~ PL		
				6.55 79.45	SPT 6.50-6.95 m 4, 6, 7 N=13				traces of nodular calcium carbonate, pockets of pale grey clay		VSt	
			7	7.60 78.40					becoming pale grey			
			8		SPT 8.00-8.45 m 3, 2, 5 N=7						St	
				8.50 77.50				SC	Clayey SAND fine to coarse grained, brown			
			9							D - M	L	
					SPT 9.50-9.95 m 2, 5, 4 N=9							
			10									

REPORT OF BOREHOLE: 330-01-BH2224

SHEET: 2 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 446973 m E 6940047 m N MGA94 56
SURFACE RL: 86 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.43 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 21/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RD	L		10					SC	Clayey SAND fine to coarse grained, brown	D - M	L	ALLUVIUM
			11		SPT 11.00-11.45 m 2, 3, 2 N=5							
			12	12.30 73.70	SPT 12.50-12.95 m 3, 5, 11 N=16				becoming pale grey		MD	
			13	12.90 73.10 13.20 72.80				GW	trace fine and medium grained, rounded to sub-rounded gravel GRAVEL fine and medium grained, rounded to sub-rounded, brown and orange-brown, gravel of siliceous sandstone			
				13.50 72.50				CL-CI	Sandy CLAY low to medium plasticity, brown, fine to medium grained sand, trace fine and medium grained, rounded to sub-rounded gravel		St	
			14		SPT 14.00-14.45 m 3, 4, 4 N=8							
			15	15.00 71.00					becoming grey and brown	w < PL - w ~ PL	F	
			16		SPT 15.50-15.95 m 2, 2, 3 N=5							
			17	16.90 69.10	SPT 17.00-17.45 m 16, 16, 20 N=36			GC	Clayey GRAVEL fine and medium grained, rounded to sub-rounded, grey and yellow brown, gravel of siliceous sandstone		D	
			18	18.00 68.00				SC	Clayey SAND fine and medium grained, pale grey, mottled orange-brown	D - M		RESIDUAL SOIL (GATTON SANDSTONE)
					SPT 18.50-18.61 m 30/105mm							
	M		19								VD	
				19.50 66.50					trace laminations of carbonaceous silt			
			20	20.00					Continuation of Sheet 4			

REPORT OF BOREHOLE: 330-01-BH2224

SHEET: 3 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 446973 m E 6940047 m N MGA94 56
SURFACE RL: 86 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.43 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 21/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RD	M		20	66.00	SPT 20.00-20.45 m 14, 17, 30 N=47			SC	Clayey SAND fine and medium grained, pale grey, mottled orange-brown trace lenses of clay	D - M	VD	RESIDUAL SOIL (GATTON SANDSTONE)
	H		21	*21.00* 65.00					yellow-brown			
									For Continuation Refer to Sheet 4			
			22									
			23									
			24									
			25									
			26									
			27									
			28									
			29									
			30									

REPORT OF BOREHOLE: 330-01-BH2224

SHEET: 4 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 446973 m E 6940047 m N MGA94 56
SURFACE RL: 86 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.43 m

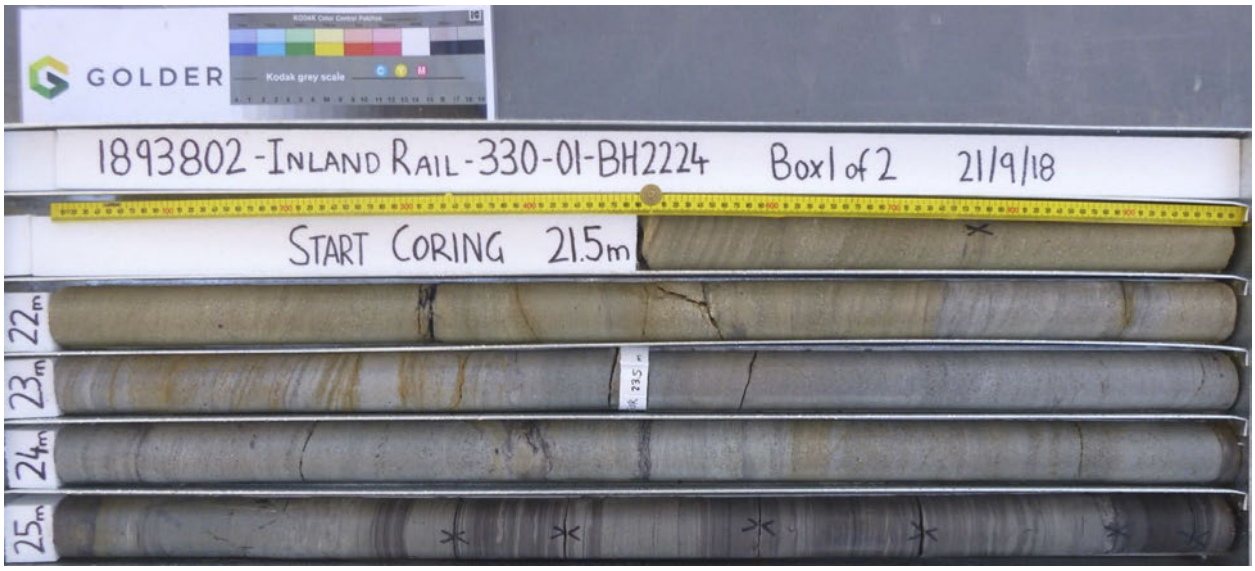
DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 21/9/18
CHECKED: IT DATE: 30/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
				20								
				21								
					21.50		Continuation of Sheet 3					
NMLC		100	100 (100)	22	64.50		SANDSTONE fine and medium grained, bedded (to 600 mm), orange brown grading to grey. cross bedded	HW		PLI(A)=0.44 PLI(D)=0.31 UCS=6.05	SPT 21.50-21.54 m; 30/40mm	
					22.31 63.69		carbonaceous seam (20mm)				22.40 m: Bx2, 20°, sp = 210 mm, Pl-Un, Ro, Sn, close	
					22.56 63.44		grading to coarse grained sandstone				22.50 m: Bx2, 10°, sp = 400 mm, Un, Ro, Sn (brown), close	
				23	*22.73* 63.27						23.25 m: Bx9, 10-20°, sp = 100-150 mm, Un, Ro, close	
		100	100 (100)					MW		PLI(A)=6.41 PLI(D)=4.27		
				24						UCS=5.01	23.87 m: Bx2, 10°, sp = 110 mm, Pl-Un, Ro, close	
					24.40 61.60		irregular carbonaceous laminations	HW				
					24.98							
		100	100 (100)	25	61.02		fine grained, becoming fine grained, interbedded (to - 50 mm) with sandy siltstone -					
								MW		PLI(A)=0.36 PLI(D)=0.11		
				26						UCS=7.04		
					26.43							
					59.57		END OF BOREHOLE @ 26.43 m - TARGET DEPTH - GROUNDWATER ENCOUNTERED @ 4.30 m - DEPTH - STANDPIPE INSTALLED					
				27								
				28								
				29								
				30								

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2224

SHEET: 1 OF 1

CLIENT:	FFJV	COORDS:	446973 m E 6940047 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	86 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: CHV	DATE: 21/9/18
JOB NO:	1893802	HOLE DEPTH:	26.43 m	CHECKED: IT	DATE: 30/10/18



This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F28
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2224 -

SHEET: 1 OF 3

CLIENT:	FFJV	COORDS:	446973 m E 6940047 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	86 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: CHV	DATE: 21/9/18
JOB NO:	1893802	HOLE DEPTH:	26.43 m	CHECKED: IT	DATE: 30/10/18

Drilling | **Field Material Description** | **Instrumentation Details**

METHOD | WATER | DEPTH (metres) | DEPTH RL | GRAPHIC LOG | SOIL/ROCK MATERIAL - DESCRIPTION -

ID LevelTROLL | Type | Tip Depth & RL 20.39 m 65.61 m AHD | Installation Date

NDD

ADT

RD

24/09/18

0 — 0.10 / 85.90 — SANDY CLAY

SANDY CLAY

1

1.80 / 84.20 — CLAY

2

3

4

4.50 / 81.50

5

6

6.55 / 79.45

7

7.60 / 78.40

8

8.50 / 77.50 — CLAYEY SAND

9

10

LevelTROLL

7.50, RL78.50

8.50, RL77.50

Gatic Cover

Cement Grout

Bentonite Seal

Filter Pack

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

GAP 8_16.7 LIB.GLB Log GAP WELL 3 MASTER GINT_1893802_H2C.GPJ <<DrawingFile>> 08/03/2019 16:48 8.30.004 Datgel Tools

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2224 -

SHEET: 2 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 446973 m E 6940047 m N MGA94 56
SURFACE RL: 86 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.43 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 21/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 20.39 m 65.61 m AHD	Installation Date
RD	▽	10			CLAYEY SAND			
		11						
		12						
			12.30 73.70					
			12.90 73.10					
		13	13.20 72.80		GRAVEL			
			13.50 72.50		SANDY CLAY			
		14						
		15	15.00 71.00				15.50, RL70.50	
		16						
			16.90 69.10		CLAYEY GRAVEL			
		17						
		18	18.00 68.00		CLAYEY SAND		Slotted PVC	
		19						
			19.50 66.50					
		20	20.00					

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared - for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are - for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination. -

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2224 -

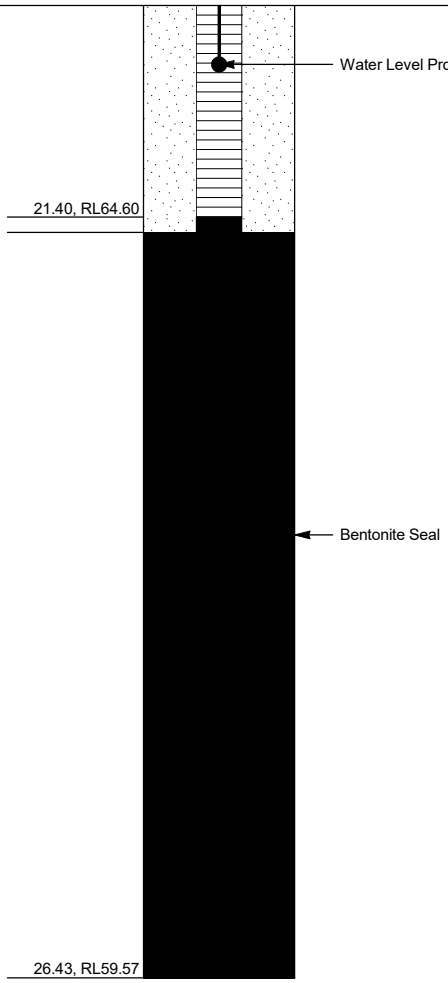
SHEET: 3 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 446973 m E 6940047 m N MGA94 56
SURFACE RL: 86 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 26.43 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 21/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type Tip Depth & RL Installation Date LevelTROLL 20.39 m 65.61 m AHD
RD		20	66.00		CLAYEY SAND	
			21.00 65.00			
		21	*21.50* 64.50		SANDSTONE	
NMLC		22	*22.31* 63.69			
			22.56 63.44			
			22.73 63.27			
		23				
		24	*24.40* 61.60			
		25	*24.98* 61.02			
		26	*26.43* 59.57		END OF BOREHOLE @ 26.43 m - TARGET DEPTH - GROUNDWATER ENCOUNTERED @ 4.30 m - DEPTH - STANDPIPE INSTALLED	
		27				
		28				
		29				
		30				



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared - for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are - for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination. -

GAP gINT FN. F17
RL1

REPORT OF BOREHOLE: 330-01-BH2227

SHEET: 1 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 448659 m E 6939820 m N MGA94 56
SURFACE RL: 78 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 20.09 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 30/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT			0	78.00				SC	Sandy CLAY medium plasticity, brown, fine grained sand, with silt, trace woody organics			TOPSOIL
				0.50								
				77.50	SPT 0.50-0.95 m 12, 15, 16 N=31			CH	CLAY high plasticity, dark brown, with fine grained sand, with silt, trace sand/nodular calcium carbonate			ALLUVIUM
			1								VSt	
			2		SPT 2.00-2.45 m 5, 5, 8 N=13							
			3								H	
					U50 3.50-3.90 m PP >600 kPa							
			4									
RD	L	GROUNDWATER NOT OBSERVED	5		SPT 5.00-5.45 m 4, 6, 10 N=16					w < PL		
			6								VSt	
					SPT 6.50-6.95 m 4, 5, 8 N=13							
			7									
				7.80								
			8	70.20	SPT 8.00-8.45 m 5, 7, 9 N=16			CH	CLAY high plasticity, brown, with fine to medium grained sand, with fine to coarse grained gravel, trace carboneaous inclusions/flecks			
				9.00								
			9	69.00				CH	CLAY high plasticity, brown, trace fine to medium grained sand		St	
					SPT 9.50-9.95 m 4, 6, 6 N=12							
			10									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01a
RL3

REPORT OF BOREHOLE: 330-01-BH2227

SHEET: 2 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 448659 m E 6939820 m N MGA94 56
SURFACE RL: 78 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 20.09 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 30/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RD	L	GROUNDWATER NOT OBSERVED	10					CH	CLAY high plasticity, brown, trace fine to medium grained sand	w < PL		ALLUVIUM
			11		SPT 11.00-11.45 m 3, 3, 5 N=8						St	
				11.50 66.50	U50 11.50-11.95 m PP = 150 - 250 kPa			CL-CI	Sandy CLAY low to medium plasticity, brown, orange brown and grey, fine to medium grained sand, trace carbonaceous streaks			
			12									
					SPT 12.50-12.95 m 1, 2, 2 N=4							
			13							w ~ PL	F - St	
			14		U50 14.00-14.45 m PP = 140 - 200 kPa							
			15									
					SPT 15.50-15.95 m 4, 6, 8 N=14							
			16								VSt	
				17.00 61.00	SPT 17.00-17.27 m 12, 30/120mm HB			CI	Sandy CLAY medium plasticity, pale grey and orange brown, fine to coarse grained sand			RESIDUAL SOIL (KOUKANDOWIE FORMATION)
			18							M - W	VD	
					SPT 18.50-18.56 m 30/60mm HB							
			19	*19.00* 59.00					becoming orange brown to grey brown			
			20									

REPORT OF BOREHOLE: 330-01-BH2227

SHEET: 3 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 448659 m E 6939820 m N MGA94 56
SURFACE RL: 78 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 20.09 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 30/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			20	57.91	SPT 20.00-20.09 m 30/90mm HB				END OF BOREHOLE @ 20.09 m TARGET DEPTH GROUNDWATER NOT OBSERVED STANDPIPE INSTALLED			
			21									
			22									
			23									
			24									
			25									
			26									
			27									
			28									
			29									
			30									

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2227

SHEET: 1 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 448659 m E 6939820 m N MGA94 56
SURFACE RL: 78 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 20.09 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 30/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details			
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type RuggedTROLL	Tip Depth & RL 18.00 m 60.00 m AHD	RuggedTROLL	Installation Date
ADT	GROUNDWATER NOT OBSERVED	0	78.00		SANDY CLAY			Gatic Cover	
			0.50 77.50		CLAY				
		1							
		2							
		3							
RD		4							
		5							
		6							
		7						Cement Grout	
			7.80 70.20		CLAY				
		8							
			9.00 69.00		CLAY				
		9							
		10							

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2227 -

SHEET: 2 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 448659 m E 6939820 m N MGA94 56
SURFACE RL: 78 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 20.09 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 30/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type RuggedTROLL	Tip Depth & RL 18.00 m 60.00 m AHD	Installation Date
RD	GROUNDWATER NOT OBSERVED	10			CLAY			
		11	11.50 66.50		SANDY CLAY			
		12						
		13						
		14						
		15					15.00, RL63.00	
		16					16.00, RL62.00	
		17	17.00 61.00		SANDY CLAY			
		18						
		19	19.00 59.00					
		20					20.00, RL58.00	

Bentonite Seal
Water Level Probe
Slotted PVC
Filter Pack

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

GAP 8_16.7 LIB.GLB Log GAP WELL 3 MASTER GINT_1893802_H2C.GPJ <<DrawingFile>> 08/03/2019 16:48 8.30.004 Datgel Tools

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2227

SHEET: 3 OF 3

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 448659 m E 6939820 m N MGA94 56
SURFACE RL: 78 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 20.09 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 30/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type	Tip Depth & RL	Installation Date
		20	20.09 57.91		END OF BOREHOLE @ 20.09 m TARGET DEPTH GROUNDWATER NOT OBSERVED STANDPIPE INSTALLED	RuggedTROLL	18.00 m 60.00 m AHD	
		21						
		22						
		23						
		24						
		25						
		26						
		27						
		28						
		29						
		30						

REPORT OF BOREHOLE: 330-01-BH2301

SHEET: 1 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 414866 m E 6953376 m N MGA94 56
SURFACE RL: 188 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.99 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 16/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L		0	188.00	SPT 0.50-0.95 m 9, 9, 9 N=18			SC	Clayey SAND fine to medium grained, brown mottled orange red, medium plasticity clay	M	MD	RESIDUAL SOIL (GATTON SANDSTONE)
			1	*1.50* 186.50								
	M		2		SPT 2.00-2.06 m 30/60mm				SAND (EXTREMELY WEATHERED sandstone) fine to medium grained, orange brown and pale grey		VD	GATTON SANDSTONE
									For Continuation Refer to Sheet 2			
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: 330-01-BH2301

SHEET: 2 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 414866 m E 6953376 m N MGA94 56
SURFACE RL: 188 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.99 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 16/9/18
CHECKED: IT DATE: 30/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
				0								
				1								
				2								
					2.40		Continuation of Sheet 1					
NMLC		100	90 (100)	3	185.60		SANDSTONE fine and medium grained, orange brown, red orange and dark red, grading to pale grey and white fine grained beds (truncated fining upward series and cross bedded) 5 to 10 degrees. (GATTON SANDSTONE)	DW		PLI(A)=0.24 PLI(D)=0.23 PLI(A)=0.13 PLI(D)=0.03	2.93 m: B, 5-10°, sp = 5 mm, Un, Ro, Cn 3.14-3.22 m: B 5x, 5-15°, Un, Ro, Clayey SAND 3.37 m: B, 5-10°, sp = 5-7 mm, Un, Ro	
		100	100 (100)	4	3.95 184.05		medium to coarse grained (quartzose and lithic fragments) between 3.95 and 4.2 m			UCS=6.15 PLI(A)=0.54 PLI(D)=0.08	3.75 m: B, 5°, Un, Ro 3.80 m: B, 5-10°, Un, Ro 3.88-3.90 m: IS, 10°, sp = 15 mm, Un, Ro, infilled with dark red Clayey SAND	
				5	4.90 183.10		becoming pale grey					
		100	95 (100)	6	5.61 182.39		pale grey fine grained sandstone between 5.61 and 5.72 m			PLI(A)=1.01 PLI(D)=0.78	5.61 m: B, 5°, Un, Ro, interface orange brown and pale grey sandstone 5.84 m: B, 5°, Un, Ro 5.90 m: B, 5°, Un, Ro 6.20-6.24 m: B 2x, 5°, Pl-Un, Ro	
				7	7.30 180.70		clayey sand (Extremely Weathered sandstone), fine grained, pale grey (to 100mm)	XW		UCS=0.491	7.26 m: B, 5°, Un, Ro 7.42 m: B, 5°, Pl-Un, Ro 7.49 m: B, 5°, Un, Ro	
					7.52 180.48		pale brown/pink, coarse grained sandstone between 7.52 and 7.84 m	DW		PLI(A)=1.11 PLI(D)=0.89 UCS=14.7		
				8							8.19 m: B, 5°, Un, Ro	
		100	100 (100)	9							9.42 m: B, 5°, Un, Ro, Sn (Red), closed	
				10								

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF BOREHOLE: 330-01-BH2301

SHEET: 3 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 414866 m E 6953376 m N MGA94 56
SURFACE RL: 188 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.99 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 16/9/18
CHECKED: IT DATE: 30/10/18

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200) / LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	100 (100)	10			SANDSTONE fine and medium grained, orange brown, red orange and dark red, grading to pale grey and white fine grained beds (truncated fining upward series and cross bedded) 5 to 10 degrees. (GATTON SANDSTONE)	DW			
				11	11.30 176.70		becoming fine and medium grained, stained (concentric banding) between 11.3 and 11.95 m depth		PLI(A)=1.01 PLI(D)=1.08 UCS=13.0	11.60 m: B, 5°, Un, Ro	
					11.95 176.05		fine grained white between 11.95 and 12.08 m			11.82 m: B, 5°, Un, Ro	
				12	12.30 175.70		becoming pale grey			12.15 m: B, 5°, Pl-Un, Ro 12.26 m: B, 5-10°, Pl-Un, Ro	
		100	100 (100)	13						12.82 m: B, 5°, Un, Ro, Clayey SAND 12.87 m: B, 5°, Pl-Un, Ro, along very thin carbonaceuos band	
										13.44 m: B, 10°, Pl, Ro 13.54 m: J, 15-20°, Pl-Un, Ro	
				14	13.95 174.05		becoming fine grained, intensely stained red between 13.95 and 14.12 m			14.08 m: J, 10-15°, Un, Ro	
					14.50 173.50		with some quartz and lithic fine grained clasts between 14.5 and 14.6 m		PLI(A)=1.05 PLI(D)=1.07	14.50 m: B, 10°, Un, Ro	
				15	15.10 172.90		purple stained	SW		14.82 m: B, 10°, Un, Ro, Clayey SAND	
								DW		15.55 m: B, 5-10°, Un, Ro	
		100	95 (100)	16				SW		15.74 m: B, 5-10°, Un, Ro	
									PLI(A)=0.83 PLI(D)=1.35		
								DW		16.28 m: J, 10°, Un, Ro	
				17				SW		16.82 m: B, 10°, Un, Ro	
										17.14-17.30 m: J, 80°, Pl-Un, Ro	
										17.43-17.63 m: J, 80°, Pl-Un, Ro	
				18					PLI(A)=1.98 PLI(D)=2.25		
								DW		18.19 m: B, 10°, Un, Ro 18.31 m: B, 15-20°, Un, Ro, Clayey SAND	
		100	95 (100)		18.82 169.18					18.55-18.57 m: CS, 5-10°, sp = 20 mm, Un, Ro, Clayey SAND 18.66 m: B, 10°, Un, Ro	
				19			SANDSTONE apparently cross bedded, orange brown and red mottled, fine to medium lathic clasts to 5 mm subangular to angular		PLI(A)=3.01 PLI(D)=1.55	19.14 m: B, 10°, Un, Ro 19.19 m: B, 15°, Un, Ro 19.30 m: B, 5°, Un, Ro	
					19.26 168.74			SW			
	16/09/18				19.58 168.42		CONGLOMERATE fine to coarse grained, mottled orange and purple, fine, medium and coarse grained sandstone matrix; clasts of pale grey and dark red siltstone and sandstone (to 30 mm, typically to 6 mm); mottled	DW			
				20							

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F02b RL3

REPORT OF BOREHOLE: 330-01-BH2301

SHEET: 4 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 414866 m E 6953376 m N MGA94 56
SURFACE RL: 188 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.99 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 16/9/18
CHECKED: IT DATE: 30/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	95 (100)	20			orange and purple red staining and mottling CONGLOMERATE fine to coarse grained, mottled orange and purple, fine, medium and coarse grained sandstone matrix; clasts of pale grey and dark red siltstone and sandstone (to 30 mm, typically to 6 mm); mottled orange and purple	DW			20.08 m: B, 15°, Pl-Un, Ro 20.19 m: B, 15°, Pl-Un, Ro 20.33 m: B, 15°, Pl-Un, Ro	
					20.60 167.40							
				21							20.73 m: J, 5°, Un, Ro	
							becoming pale grey/pink and purple stained				21.08 m: J, 15-20°, Pl-Un, Ro 21.23 m: J, 10°, Pl-Un, Ro, Sn (red), closed	
										PLI(A)=5.87 PLI(D)=5.67		
											21.58 m: J, 5°, Un, Ro	
		100	95 (100)	22	*22.00* 166.00					UCS=105	21.89 m: J, 15-20°, Pl-Un, Ro	
							becoming fine and medium grained, pale grey and pale orange					
											22.45 m: B, 5-10°, Pl, Sm-Ro 22.53-22.60 m: J, 55°, Pl-Un, Ro 22.53 m: J, 15-20°, Pl-Un, Ro 22.53-22.60 m: J, 55°, Pl-Un, Ro 22.53 m: J, 15-20°, Pl-Un, Ro 22.90 m: B, 10°, Un, Ro	
				23							23.37 m: J, 5-20°, Un, Ro	
					23.70 164.30		SANDSTONE (POSSIBLE WOOGAROO SUBGROUP) fine to coarse grained, grey and orange brown, truncated fining upward sequences (to 400 mm)					
				24							24.27 m: B, 20°, Pl, Sm-Ro 24.44 m: B, 20°, Pl-Un, Ro 24.48-24.68 m: J, 85°, Pl-Un, Ro	
		100	85 (100)	25							25.07-25.30 m: J, 70-85°, Pl-Un, Ro	
					25.60 162.40		becoming fine to coarse grained, bedded (10 degrees) speckled			PLI(A)=1.17 PLI(D)=7.05	25.52 m: J, 20°, Pl-Un, Ro 25.55 m: J, 35°, Pl-Un, Ro	
				26								
											26.68 m: B, 5°, Un, Ro, occuring between a interface of fine and coarse grained sand	
				27	*27.00* 161.00		becoming fine grained pale purple and grey				27.11-27.18 m: J, 50-60°, Pl-Un, Ro 27.20 m: B, 10°, Pl-Un, Ro	
											27.71-27.80 m: J, 60-80°, Pl-Un, Ro	
		100	90 (100)	28	*28.00* 160.00		SANDSTONE fine to medium grained, grey, orange and purple stained, bedded (10 degrees) to 80 mm.	SW - FR			28.06 m: J, 30°, Pl-Un, Ro 28.20 m: B, 10°, Pl-Un, Ro	
											28.49 m: B, 5-10°, Pl-Un, Ro	
				29	*28.95* 159.05		becoming grey, red staining on healed joints				28.91-29.00 m: J, 60°, Pl-Un, Ro 29.08-29.24 m: J, 70-80°, Pl-Un, Ro	
										PLI(A)=0.28 PLI(D)=0.21		
		100	100 (100)	30								

REPORT OF BOREHOLE: 330-01-BH2301

SHEET: 5 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 414866 m E 6953376 m N MGA94 56
SURFACE RL: 188 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.99 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 16/9/18
CHECKED: IT DATE: 30/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	100 (100)	30	30.19			SW - FR			30.18 m: B, 10°, Pl-Un, Ro	
					30.39 157.61		SILTSTONE fine grained, dark grey, distinctly laminated (< 2 mm)			PLI(A)=0.89 PLI(D)=0.68	30.38 m: B, 10°, Pl-Un, Ro	
							SANDSTONE fine to medium grained, pale grey, indistinctly laminated, sub-horizontal					
				31	30.99 157.01		END OF BOREHOLE @ 30.99 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 19.60 m DEPTH STANDPIPE INSTALLED					
				32								
				33								
				34								
				35								
				36								
				37								
				38								
				39								
				40								

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2301

SHEET: 1 OF 3

CLIENT:	FFJV	COORDS:	414866 m E 6953376 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	188 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 16/9/18
JOB NO:	1893802	HOLE DEPTH:	30.99 m	CHECKED: IT	DATE: 30/10/18

This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2301

SHEET: 2 OF 3

CLIENT:	FFJV	COORDS:	414866 m E 6953376 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	188 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 16/9/18
JOB NO:	1893802	HOLE DEPTH:	30.99 m	CHECKED: IT	DATE: 30/10/18

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2301

SHEET: 3 OF 3

CLIENT:	FFJV	COORDS:	414866 m E 6953376 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	188 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 16/9/18
JOB NO:	1893802	HOLE DEPTH:	30.99 m	CHECKED: IT	DATE: 30/10/18

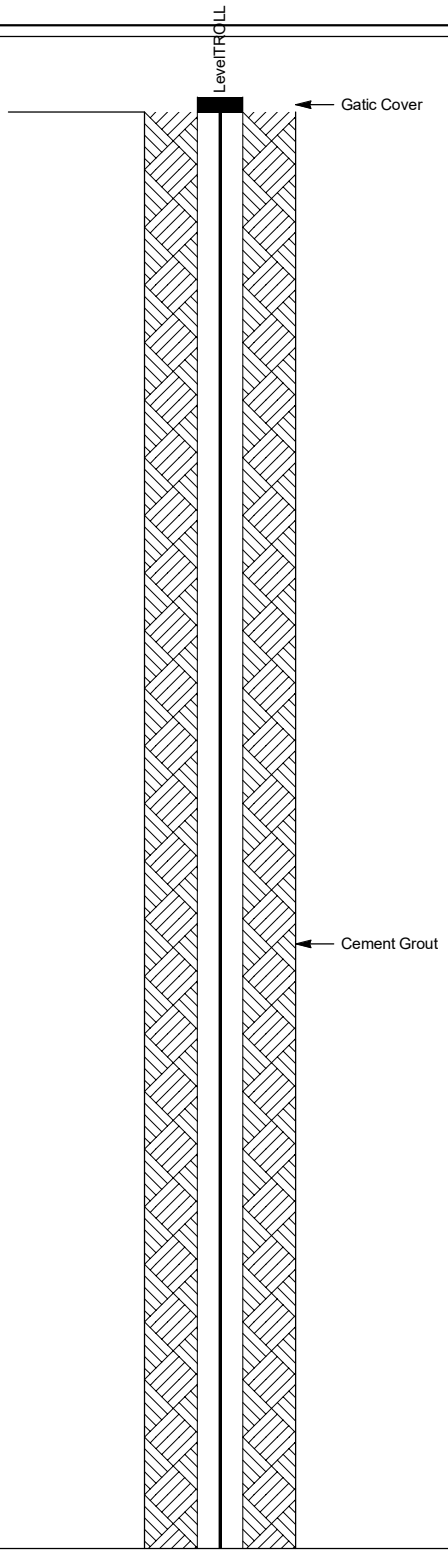
This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2301 -

SHEET: 1 OF 4

CLIENT:	FFJV	COORDS: 414866 m E 6953376 m N MGA94 56	DRILL RIG: Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 188 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 16/9/18
JOB NO:	1893802	HOLE DEPTH: 30.99 m	CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details			
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID	Type	Tip Depth & RL	Installation Date
						LevelTROLL		28.27 m 159.73 m AHD	
		0	188.00		CLAYEY SAND				
ADT		1	1.50 186.50		SAND (EXTREMELY WEATHERED SANDSTONE)				
		2	2.40 185.60		SANDSTONE				
NMLC		3							
		4	3.95 184.05						
		5	4.90 183.10						
		6	5.61 182.39						
		7	7.30 180.70						
		8	7.52 180.48						
		9							



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2301 -

SHEET: 2 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 414866 m E 6953376 m N MGA94 56
SURFACE RL: 188 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.99 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 16/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 28.27 m 159.73 m AHD	Installation Date

NMLC

SANDSTONE

11.00, RL177.00

11.30
176.70

Bentonite Seal

11.95
176.05

12.00, RL176.00

12.30
175.70

13.95
174.05

14.50
173.50

15.10
172.90

18.82
169.18

SANDSTONE

19.26
168.74

CONGLOMERATE

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2301 -

SHEET: 3 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 414866 m E 6953376 m N MGA94 56
SURFACE RL: 188 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.99 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 16/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL Tip Depth & RL 28.27 m 159.73 m AHD Installation Date
NMLC	16/09/18	20	19.58 168.42		CONGLOMERATE	
		21	20.60 167.40			
		22	22.00 166.00			Filter Pack
		23	23.70 164.30		SANDSTONE (POSSIBLE WOOGAROO SUBGROUP)	
		24				
		25	25.60 162.40			
		26				
		27	27.00 161.00			Slotted PVC
		28	28.00 160.00		SANDSTONE	Water Level Probe
		29	28.95 159.05			

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2301

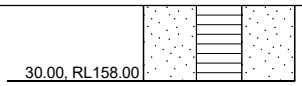
SHEET: 4 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 414866 m E 6953376 m N MGA94 56
SURFACE RL: 188 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.99 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 16/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 28.27 m 159.73 m AHD	Installation Date
NMLC		30	30.19		SANDSTONE			
			30.39 157.61		SILTSTONE			
					SANDSTONE			
		31	30.99 157.01		END OF BOREHOLE @ 30.99 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 19.60 m DEPTH STANDPIPE INSTALLED			
		32						
		33						
		34						
		35						
		36						
		37						
		38						
		39						



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF BOREHOLE: 330-01-BH2303

SHEET: 1 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 417589 m E 6952572 m N MGA94 56
SURFACE RL: 175 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.91 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 3/9/18
CHECKED: IT DATE: 17/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L		0	175.00				SP	TOPSOIL: SAND fine grained, orange brown	D		TOPSOIL
				0.30								
	M			174.70	SPT 0.50-0.61 m 30/110mm				SANDSTONE fine grained, pale brown		VD	GATTON SANDSTONE
									For Continuation Refer to Sheet 2			
			1									
			2									
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: 330-01-BH2303

SHEET: 2 OF 5

CLIENT: FFJV
COORDS: 417589 m E 6952572 m N MGA94 56
DRILL RIG: Commachio 450

PROJECT: Inland Rail, Phase 2
SURFACE RL: 175 m DATUM: AHD
CONTRACTOR: Drillpower

LOCATION: H2C
INCLINATION: -90°
LOGGED: RC DATE: 3/9/18

JOB NO: 1893802
HOLE DEPTH: 30.91 m
CHECKED: IT DATE: 17/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
				0								
					0.65		Continuation of Sheet 1					
NMLC		100	80 (100)	1	174.35 0.94 174.06		SANDSTONE fine grained, layered, pale brown/grey and stained orange brown	DW			0.74 m: B, 0-10°, Pl-Un, Sm, Cn, open (to 1 mm) 0.76 m: B, 0-10°, Pl-Un, Sm, Cn 0.77 m: B, 0-10°, Pl-Un, Sm, clayey SAND, Ct 0.88-0.91 m: B(fracture zone), 0-10°, clayey SAND, Ct 1.00-1.01 m: IS, clayey SAND 1.06-1.09 m: IS, clayey SAND	
					1.45 173.55 1.68 173.32		SANDSTONE fine to coarse grained, pale grey and orange brown, bedded (too 300 mm) 10 degrees, and cross bedded SANDSTONE fine grained, pale brown/grey and orange brown, massive/indistinctly laminated and cross bedded					
				2			orange stained coarse grained sandstone	SW - FR			1.87 m: B, 10°, Pl-Un, Sm, weathered along parting walls	
		100	85 (100)	3						PLI(A)=6.05 PLI(D)=4.00 UCS=45.3	2.71-3.12 m: B, 70-80°, Un-St, Ro, Cn 2.71 m: B, 15-20°, Pl-Un, Sm, Cn, close 2.71-3.12 m: B, 70-80°, Un-St, Ro, Cn 2.71 m: B, 15-20°, Pl-Un, Sm, Cn, close 3.12 m: B, 10°, Un, Sm, Cn, open (to 2 mm)	
				4								
				5				DW			4.91 m: Bx2, 5°, Un, Ro, Cn, close sp. 20 mm	
					5.31 169.69		SANDSTONE fine and coarse grained, pale brown	XW - DW			5.32 m: B, 20°, Pl-Un, Ro, Cn, close 5.50 m: Bx2, 0-5°, Un, Ro, Ct, (to 2 mm) sand and clay sp. 20 mm 5.59 m: B, 10°, Un, Ro, Ct, (to < 2 mm) clayey SAND 5.65 m: Bx2, 5°, Un, Ro, Ct (to 1 mm) clayey sand sp. to 50 mm 5.90 m: B, 10-20°, Un, Ro, Ct (to 1 mm) clayey sand sp. to 50 mm 5.95 m: J, 20-30°, St, Ro, Ct (to 1 mm) clayey sand sp. to 50 mm 6.04 m: J, 50-60°, Pl, Sm, Cn, close	
				6						PLI(A)=0.25 PLI(D)=0.22		
		100	80 (100)	7				SW				
								DW		PLI(A)=3.52 PLI(D)=3.15 UCS=37.1	7.48-7.57 m: J, 60°, Pl, Sm, Cn, close 7.72 m: B, 30°, Pl-Un, Sm, Cn, close	
				8								
		100	80 (100)	9							8.56-8.73 m: J, 40-60°, Un, Ro, Cn, close 8.79 m: J, 20-30°, Un, Sm, Sm (brown) close and open (to 1 mm) 9.38 m: J, 30-40°, Un, Ro, Cn, close 9.50-9.65 m: J, 60-80°, Un, Ro, Cn, close	
				10	10.00							

REPORT OF BOREHOLE: 330-01-BH2303

SHEET: 3 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 417589 m E 6952572 m N MGA94 56
SURFACE RL: 175 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.91 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 3/9/18
CHECKED: IT DATE: 17/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	80 (100)	10	165.00		SANDSTONE fine and coarse grained, pale brown becoming grey, bedded (typically 150 mm to 550 mm)	DW		PLI(A)=2.38 PLI(D)=1.83 UCS=20.4	10.60 m: B, 20-30°, Un, Ro, Cn, healed/close	
				11							11.00-11.16 m: J, 70-80°, Un, Ro	
		100	70 (100)								11.60 m: J, 70°, Un, Ro, Cn, close	
											11.80 m: J, 10°, Un, Ro, Cn (fractured)	
				12							12.00-12.12 m: J, 60-80°, Un, Sm, Cn, close	
											12.53 m: J, 20°, Un, Ro, Cn, close	
		100	85 (100)	13							13.00-13.36 m: Jx 2, 60-80°, Un, Ro, sp 40 mm, subparallel sandstone fragments, Cn or Sn (brown), fracture zone	
										PLI(A)=0.93 PLI(D)=0.71	13.54 m: Jx3, 5°, Un, Ro, sp. to 32 mm	
				14	*14.00* 161.00		thickly bedded fine and medium grained	SW - FR				
											14.61 m: B, 10-15°, Un, Sm, Cn, close	
					14.90					PLI(A)=2.54 PLI(D)=1.18 UCS=27.1		
				15	*15.02* 159.98		becoming coarse grained SANDSTONE Grading to pebble conglomerate/breccia. Fine grained sandstone and siltstone matrix orange brown and red; coarse grained sand and gravel size (to 20 mm) lithic and quartz clasts	DW MW				
		100	100 (100)									
				16							16.25-16.94 m: Bx12, 5-15°, sp = 10-30 mm, Un, Ro, (highly weathered)	
		95	30 (95)					HW				
				17							17.08 m: B, 10-15°, Un, Ro, Cn, close 17.19 m: B, 20-30°, Un, Ro, Ct sand and clay	
					17.30			MW				
					157.70		SANDSTONE fine and medium grained, pale grey, interbedded (to 250 mm) with fine and coarse grained, red and orange stained and partly bleached sandstone, grading to lithic sandstone; angular clasts of quartzose sandstone (to 4 mm)	HW HW - MW			17.32 m: DS, Un, Ro, Gravelly SAND	
										PLI(A)=0.39 PLI(D)=0.36	17.63-17.65 m: DS, Un, Ro	
				18								
					18.60						18.41 m: B, 15°, Pl, Sm, Ct, sand and clay (to 2 mm)	
		100	100 (100)		156.40		SANDSTONE fine grained, dark and pale grey, massive/indistinctly laminated (Woogaroo Subgroup)			PLI(A)=1.34 PLI(D)=1.66		
				19				DW - FR				
					19.80							
					155.20		becoming fine grained and pale grey					
				20								

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F02b RL3

REPORT OF BOREHOLE: 330-01-BH2303

SHEET: 4 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 417589 m E 6952572 m N MGA94 56
SURFACE RL: 175 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.91 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 3/9/18
CHECKED: IT DATE: 17/10/18

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200) / LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC	06/09/18	100	100 (100)	20			SANDSTONE fine grained, dark and pale grey, massive/indistinctly laminated (Woogaroo Subgroup)	FR			
					20.68 154.32		trace of lithic (siltstone) fragments				
				21	*21.48* 153.52		becoming with some lithic (siltstone) fragments and carbonaceous siltstone/mudstone wisps	DW FR			
		100	100 (100)	22					PLI(A)=0.31 PLI(D)=0.11 UCS=2.19		
				23							
				24							
		100	100 (100)	25							
					25.67 149.33		SANDSTONE fine to coarse grained, pale grey, bedded (to 400 mm) coarse grained sand and fine grained gravel (to 4 mm) lithic and quartz clasts				
				26							
				27						26.93 m: B, 10°, Pl, Sm, Cn, close 27.07 m: B, 10°, Pl, Sm, Cn, close	
		100	100 (100)	28	*28.00*						
					28.20 146.80		SANDSTONE/BRECCIA fine to coarse grained, pale grey				
							SANDSTONE fine to coarse grained, pale grey and dark grey, bedded (to 400 mm) and cross bedded				
				29							
		100	100 (100)	30							

REPORT OF BOREHOLE: 330-01-BH2303

SHEET: 5 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 417589 m E 6952572 m N MGA94 56
SURFACE RL: 175 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.91 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 3/9/18
CHECKED: IT DATE: 17/10/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	100 (100)	30			SANDSTONE - fine to coarse grained, pale grey and dark grey, bedded (to 400 mm) and cross bedded	FR				
					30.91 144.09		END OF BOREHOLE @ 30.91 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 21.20 m DEPTH STANDPIPE INSTALLED					
				31								
				32								
				33								
				34								
				35								
				36								
				37								
				38								
				39								
				40								

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2303

CLIENT:	FFJV	COORDS: 417589 m E 6952572 m N MGA94 56	DRILL RIG: Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 175 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 3/9/18
JOB NO:	1893802	HOLE DEPTH: 30.91 m	CHECKED: IT DATE: 17/10/18

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2303

CLIENT:	FFJV	COORDS:	417589 m E 6952572 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	175 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 3/9/18
JOB NO:	1893802	HOLE DEPTH:	30.91 m	CHECKED: IT	DATE: 17/10/18

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2303

SHEET: 3 OF 4

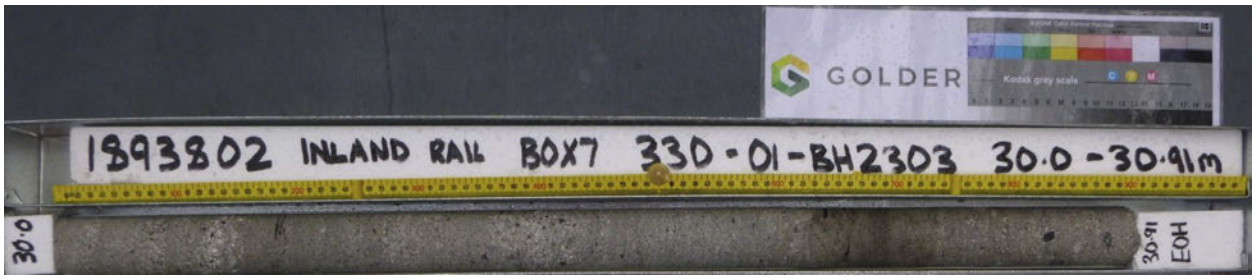
CLIENT:	FFJV	COORDS:	417589 m E 6952572 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	175 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 3/9/18
JOB NO:	1893802	HOLE DEPTH:	30.91 m	CHECKED: IT	DATE: 17/10/18

This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2303

SHEET: 4 OF 4

CLIENT:	FFJV	COORDS:	417589 m E 6952572 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	175 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: RC	DATE: 3/9/18
JOB NO:	1893802	HOLE DEPTH:	30.91 m	CHECKED: IT	DATE: 17/10/18



REPORT OF STANDPIPE INSTALLATION: 330-01-BH2303 -

SHEET: 1 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 417589 m E 6952572 m N MGA94 56
SURFACE RL: 175 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.91 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 3/9/18
CHECKED: IT DATE: 17/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 25.00 m 150.00 m AHD	Installation Date
ADT		0	175.00		SAND			
			0.30					
			174.70		SANDSTONE			
			0.65					
			174.35		SANDSTONE			
			0.94					
		1	174.06		SANDSTONE			
			1.45					
			173.55		SANDSTONE			
			1.68					
			173.32					
		2						
		3						
		4						
			4.85					
NMLC			170.15					
		5	5.31					
			169.69		SANDSTONE			
			169.60					
		6	6.20					
			168.80					
			168.75					
		7						
		8						
		9						
		10	10.00					

LevelTROLL

Gatic Cover

Cement Grout

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared - for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are - for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination. -

GAP gINT FN. F17
RL1

GAP 8_16.7 LIB.GLB Log GAP WELL 3 MASTER GINT_1893802_H2C.GPJ <<DrawingFile>> 08/03/2019 16:48 8.30.004 Datgel Tools

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2303 -

SHEET: 2 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 417589 m E 6952572 m N MGA94 56
SURFACE RL: 175 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.91 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 3/9/18
CHECKED: IT DATE: 17/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 25.00 m 150.00 m AHD	Installation Date
NMLC		10	165.00		SANDSTONE			
		11						
		12						
		13						
		14	*14.00* 161.00				14.00, RL161.00	
			14.90					
		15	***15.02*** 159.98		SANDSTONE		15.00, RL160.00	
		16						
		17	*17.30* 157.70		SANDSTONE			
		18					18.00, RL157.00	
			18.60 156.40		SANDSTONE			
		19						
			19.80 155.20					
		20						

Bentonite Seal

Filter Pack

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared - for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are - for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination. -

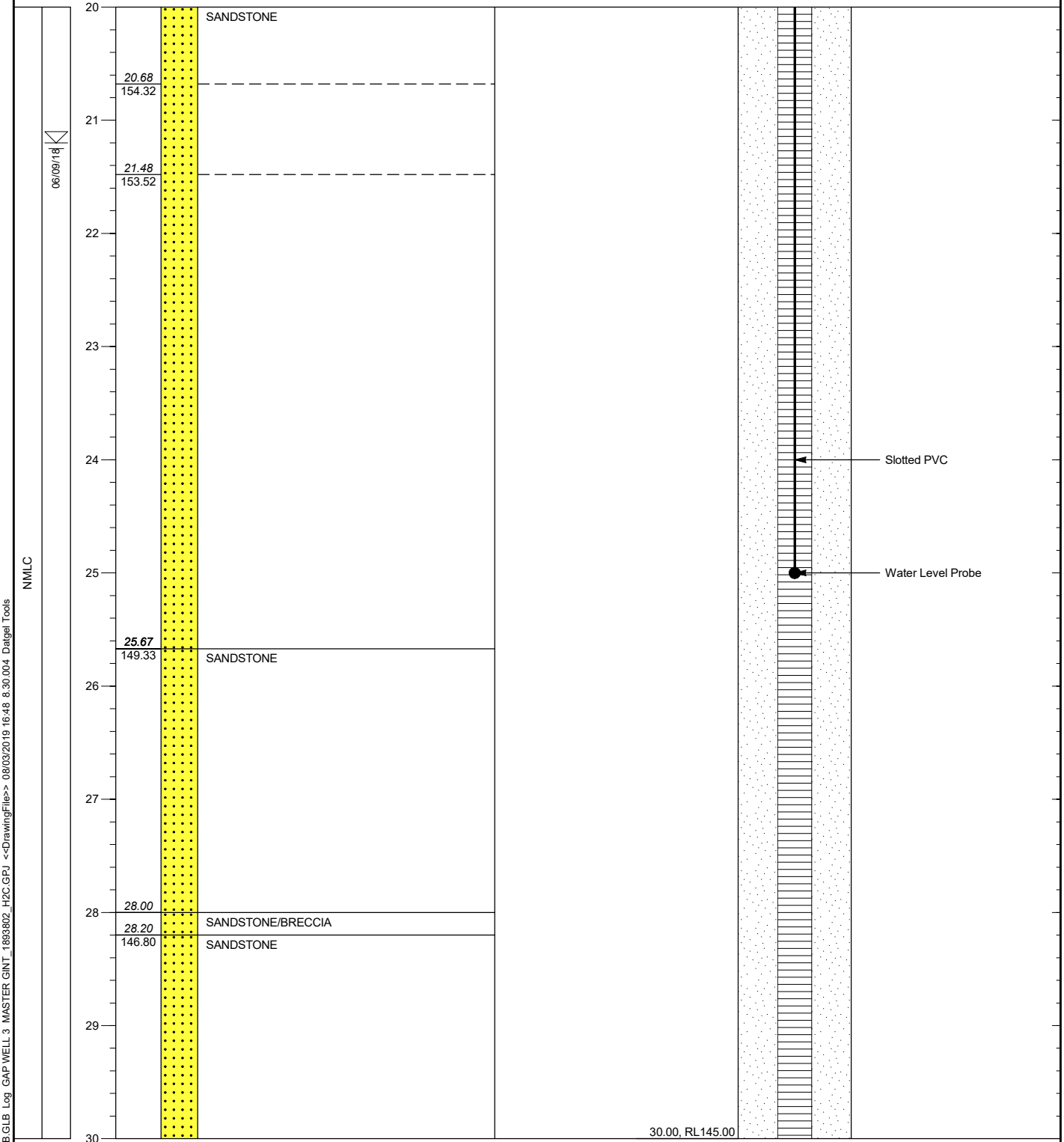
GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2303 -

SHEET: 3 OF 4

CLIENT:	FFJV	COORDS: 417589 m E 6952572 m N MGA94 56	DRILL RIG: Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 175 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: RC DATE: 3/9/18
JOB NO:	1893802	HOLE DEPTH: 30.91 m	CHECKED: IT DATE: 17/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type	Tip Depth & RL	Installation Date
						LevelTROLL	25.00 m 150.00 m AHD	



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2303

SHEET: 4 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 417589 m E 6952572 m N MGA94 56
SURFACE RL: 175 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 30.91 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: RC DATE: 3/9/18
CHECKED: IT DATE: 17/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 25.00 m 150.00 m AHD	Installation Date
NMLC		30			SANDSTONE			
			30.91 144.09		END OF BOREHOLE @ 30.91 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 21.20 m DEPTH STANDPIPE INSTALLED	30.90, RL144.10		
		31						
		32						
		33						
		34						
		35						
		36						
		37						
		38						
		39						
		40						

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF BOREHOLE: 330-01-BH2306

SHEET: 1 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 442390 m E 6943263 m N MGA94 56
SURFACE RL: 163.0 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.06 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 4/12/18
CHECKED: IT DATE: 12/12/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L		0	162.95				CI	TOPSOIL: CLAY medium plasticity, dark brown, trace fine to medium grained sand, with rootlets	W (< PL)		TOPSOIL
				0.40				CI				RESIDUAL SOIL
				162.60	SPT 0.50-0.95 m 6, 8, 9 N=17			CH	CLAY medium plasticity, dark brown			
			1						CLAY (RESIDUAL SOIL) high plasticity, orange brown and brown, trace fine to medium grained sand		VSt	
				1.50								
				161.50					becoming orange brown			
				1.80								
				161.20				CL	Sandy CLAY low plasticity, yellow brown and pale grey, fine to medium grained sand	W (< PL) - W (~ PL)		
RD	M		2		SPT 2.00-2.13 m 30/130mm							
			3								H	
				3.30								
				159.70				SC	Clayey SAND (EXTREMELY WEATHERED Sandstone) fine to medium grained, orange brown, low plasticity clay			KOUKANDOWIE FORMATION
					SPT 3.50-3.62 m 30/120mm							
									For Continuation Refer to Sheet 2			
			4									
			5									
			6									
			7									
			8									
			9									
			10									

REPORT OF BOREHOLE: 330-01-BH2306

SHEET: 2 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 442390 m E 6943263 m N MGA94 56
SURFACE RL: 163.0 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.06 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 4/12/18
CHECKED: IT DATE: 12/12/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE FREQUENCY (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
				0								
				1								
				2								
				3								
					3.63		Continuation of Sheet 1 -					
NMLC		100	85 (100)	4	159.37		SANDSTONE fine to medium grained, orange brown	MW XW MW		UCS=11.9	3.76 m: J, 60°, Pl, Ro, Cn, close 3.84 m: J, 60°, Pl, Ro, clay, orange brown Ct, (to 2 mm) 3.90-3.93 m: DS, 10°, Pl, Sm, clay, orange brown and grey Ct 4.11 m: B, 10°, Pl, Ro, clayey sand Ve 4.26 m: B, 10°, Pl, Ro, clayey sand Ct, (to 8 mm) 4.35 m: J, 40°, Un, Ro, Cn, close 4.72 m: J, 20°, Pl, Ro, Cn, close 4.78 m: J, 40°, Pl-Un, Ro, Cn, close 4.89 m: J, 10°, Un, Ro, Cn, close	
				5	*5.35* 157.65		becoming coarse grained				5.23 m: B, 5°, Un, Ro, clayey sand Ve 5.37 m: J, 20°, Pl-Un, Ro, Cn, close 5.40 m: J, 50°, Pl, Ro, clay, brown Ct, (to 2 mm)	
				6	*6.08* 156.92		SANDSTONE AND SILTSTONE fine to medium grained, orange brown and grey, sandstone, interbedded (to approximately 300 mm), with brown, orange brown and grey laminated siltstone and sandy (fine grained) siltstone	XW HW		PLI(A)=0.15 PLI(D)=0.82	5.44 m: J, 0°, Pl, Ro, Cn, close 5.68 m: J, 30°, Un, Ro, Cn, close 6.06 m: J, 10°, Pl-St, Ro, Cn, close 6.08-6.18 m: DZ, clay, low plasticity, orange and grey 6.26 m: B, 5°, Pl, Sm, Cn, close 6.35 m: J, 50°, Pl, Sm, Cn, close	
		100	75 (100)	7				XW MW			6.73 m: B, 5°, Pl, Ro, sandy clay Ve - 6.79-6.82 m: B x2, 10°, sp = 30 mm, Pl, Sm, Cn close 6.86 m: J, 30°, St, Sm, Cn, close 7.20-7.26 m: DZ, clay, low plasticity, orange and grey 7.40 m: J, 30°, St, Sm, clay, orange brown Ct, (to 2 mm) 7.62 m: J, 50°, Pl, Sm, Cn, close 7.75-7.82 m: B x2, 5°, sp = 70 mm, Pl, Ro, Cn, close	
				8							8.02-8.38 m: B x6, 5°, sp = 50 mm, Pl, Sm, Cn, close 8.07 m: B, 5°, St, Sm, Cn, close 8.45 m: J, 10°, Pl, Sm, Cn, close 8.62 m: J, 5°, Un, Ro, Cn, close 8.74-8.79 m: B x2, 5°, Pl, Ro, Cn, close 8.82 m: J, 10°, St, Ro, clay, orange brown Ve 8.83 m: J, 10°, Pl, Ro, Ct, (to 5 mm) 9.07 m: B, 5°, Pl, Sm, Cn, close	
		100	100 (100)	9	*9.54* 153.46		SANDSTONE fine to medium grained, orange brown and dark grey brown, laminated (to 15 mm)				9.43 m: J, 10°, Un, Sm, Cn, close 9.50 m: B, 5°, Pl, Sm, Cn, close 9.60 m: J, 10°, Pl, Ro, Cn, close 9.79 m: J, 10°, Pl, Ro, clay, orange brown Ct, (to 5 mm)	
				10								

REPORT OF BOREHOLE: 330-01-BH2306

SHEET: 3 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 442390 m E 6943263 m N MGA94 56
SURFACE RL: 163.0 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.06 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 4/12/18
CHECKED: IT DATE: 12/12/18

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200) / LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	100 (100)	10	10.46 152.54		SANDSTONE fine to medium grained, orange brown and dark grey brown, laminated (to 15 mm)	MW		9.97 m: J, 20°, Pl, Ro, clay, orange brown Ve 10.06 m: J, 10°, Pl, Ro, Cn, close 10.28 m: J, 5°, Pl, Ro, Cn, close	
				11			trace carbonaceous flecks (to 3 mm), becoming pale orange brown, feintly laminated, bedded (to 1000 mm)	SW		10.48 m: healed joint, 70 degrees 10.55 m: J, 20°, Un, Ro, Cn, close 10.72 m: J, 20°, Pl, Ro, Cn, close 10.91 m: J, 5°, Pl, Ro, clayey sand Ve 11.09 m: J, 10°, Pl, Ro, clayey sand Ct, (to 4 mm)	
		100	100 (100)	12	12.68 150.32		trace lithic clasts (to 4 mm)	MW	PLI(D)=1.51 PLI(D)=0.83 UCS=22.4	11.82 m: J, 10°, Pl, Ro, clayey sand Cn, (to 2 mm) 12.06-12.20 m: B x2, 5°, Pl, Ro, Cn, close 12.39 m: J, 10°, Pl-St, Ro, Cn, close	
				13						12.86 m: J, 70°, Pl, Ro, Cn, close 13.13 m: B, 5°, Un, Ro, clayey sand Ct, (to 3 mm) 13.51 m: J, 20°, Pl, Ro, Cn, close 13.74 m: J, 40°, Pl, Ro, Cn, close 13.90 m: J, 10°, Pl, Ro, carbonaceous Ve	
				14	14.15 148.85		trace lithic clasts (to 3 mm)				
				15	14.69 148.31		trace carbonaceous laminations (to 2 mm)	SW		14.70 m: B, 0°, Pl, Ro, carbonaceous Ct, (to 2 mm)	
		100	100 (100)	16	15.78 147.22 16.05 146.95		trace carbonaceous laminations (to 2 mm) becoming bedded coarse to fine grained (to 600 mm)	MW	PLI(A)=0.91 PLI(D)=1.28 UCS=2.91	15.52 m: B, 0°, Pl, Ro, Cn, close 15.81 m: B, 5°, Pl, Ro, carbonaceous Ve	
				17						16.75 m: J, 10°, Pl, Ro, carbonaceous Ve	
				18	17.40 145.60 17.57 145.43 17.73 145.27 18.23 144.77		trace lithic (chert) clasts, red and green grey, (to 3 mm) healed joints, 70-80 degrees, red and brown healed joint, 70 degrees, brown irregular red staining			17.54 m: B, 0°, Pl, Ro, clay, brown Ct, (to 2 mm) 18.23 m: J, 70°, Pl, Ro, clay, red Ct, (to 1 mm) 18.35 m: J, 10°, Pl, Ro, red Sn	
		100	100 (100)	19	19.40 143.60		becoming red brown stained/bleached, (intersected sub-vertical persistent healed shear)	HW MW	PLI(A)=0.47 PLI(D)=0.36 PLI(A)=0.13 PLI(D)=0.27	18.61 m: B, 5°, Pl, Ro, clay, orange brown Ve 18.73 m: B, 10°, St, Ro, red Sn 18.98 m: B, 10°, Pl, Ro, red Sn 19.05 m: J, 10°, Pl, Ro, red Sn 19.21 m: J, 10°, Pl, Ro, red Sn 19.27 m: SS, 10°, Pl, healed 19.31 m: J, 10°, Pl, Ro, clay, orange brown Ve 19.37 m: J, 20°, Pl, Ro, Cn, close 19.70 m: SS, 80-90°, Pl, Sm, red brown and bleached Sn, close (healed)	
				20	20.00						

REPORT OF BOREHOLE: 330-01-BH2306

SHEET: 4 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 442390 m E 6943263 m N MGA94 56
SURFACE RL: 163.0 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.06 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 4/12/18
CHECKED: IT DATE: 12/12/18

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	100 (100)	20	143.00		SANDSTONE fine to medium grained, orange brown, laminated and indistinctly bedded; coarse grained lithic sandstone grading to laminated medium and fine grained sandstone	MW			19.94 m: J, 5°, St, Ro, Cn, close 20.28-20.49 m: B x4, 10°, Pl, Ro, Cn, close	
								SW			20.57 m: J, 60°, Un, Ro, Cn, close	
				21								
										UCS=8.39 PLI(A)=0.30 PLI(D)=0.48		
		100	100 (100)	22								
					22.20 140.80		healed joint, 80 degrees, blue grey sandstone/siltstone infill (to 5 mm)				22.10 m: J, 5°, St, Ro, Cn, close 22.27 m: J, 70°, Pl-St, Ro, Cn, close	
				23							22.88 m: J, 5°, Un, Ro, Cn, close	
					23.20 139.80		red stained (concentric) with quartz veins to 24.78m, with healed joints, 20 to 70 degrees, red, to 26.23m	MW			23.10 m: J, 30°, Pl, Ro, red Sn 23.27 m: J, 65°, Pl, Ro, red Sn	
											23.46 m: J, 10°, Pl, Ro, Cn, close 23.53 m: J, 60°, Pl, Ro, Cn, close 23.67 m: J, 50°, Pl, Ro, Cn, close	
				24						UCS=1.67		
											24.03 m: J, 0°, Un, Ro, Cn, close	
					24.50 138.50		becoming red brown stained and grey (stained/impregnated zone in wall of persistent sub-vertical defect, sheared seam)			PLI(A)=0.90 PLI(D)=0.53	24.26 m: J, 40°, Un, Ro, Cn, close 24.32 m: J, 30°, Pl, Ro, Cn, close 24.45 m: J, 30°, Pl, Ro, clay, brown Ct 24.60 m: V, 70°, St, quartz, to 24.77m	
		100	90 (95)	25							25.10 m: B, 5°, Pl, Ro, Cn, close	
											25.42 m: B, 10°, Pl, Ro, clay, orange brown Ve 25.51 m: B, 0°, Un, Ro, Cn, close 25.58 m: J, 30°, Pl, Ro, red Sn 25.71-25.97 m: J x4, 30°, sp = 100 mm, Pl, Ro, Cn, close	
				26							26.00 m: J, 70°, Pl, Ro, Cn, close 26.09 m: J, 40°, Pl, Ro, Cn, close 26.11 m: J, 40°, Pl, Ro, Cn, close 26.20 m: J, 40°, Pl, Ro, Cn, close 26.22 m: healed joint, 50 degrees, red 26.38 m: healed joint, 60 degrees, quartz infill	
								SW				
				27				MW				
											27.22 m: J, 10°, Un, Ro, Cn, close	
					27.43 135.57		lense of very high strength siliceous impregnated sandstone within high strength grey sandstone				27.46 m: J, 5°, St, Ro, Cn, close	
					27.95 135.05						27.87 m: J, 50°, Pl, Ro, Cn, close	
		100	100 (100)	28	28.14 134.86		SANDSTONE AND SILTSTONE fine to medium grained, pale grey and orange brown, irregularly stained sandstone; and (sub-vertical contact) grey irregularly laminated siltstone.	SW			28.00 m: J, 50°, Pl, Sl, carbonaceous Ve 28.10 m: J, 80°, Pl, Ro, Cn, extends to 28.27m, close	
					28.53 134.47		quartz veins, 10 to 50 degrees, to 30 45m concentric red stained bands				28.61 m: J, 30°, Pl, Ro, red Sn 28.69 m: J, 30°, Pl, Ro, red Sn 28.75 m: J, 0°, Un, Ro, red Sn 28.78 m: J, 10°, Pl, Ro, Cn, close 28.89 m: J, 50°, Pl-Un, Ro, Cn, close	
				29							29.20 m: B, 10°, Pl, Ro, red Sn 29.34 m: J, 10°, Un, Ro, Cn, close 29.42 m: J, 30°, Pl, Ro, red Sn	
		100	100 (100)		29.82 133.18						29.60 m: healed joint, 60 degrees, red, to 29.68m 29.84 m: J, 20°, Un-St, Sm, Cn, close	
				30								

REPORT OF BOREHOLE: 330-01-BH2306

SHEET: 5 OF 5

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 442390 m E 6943263 m N MGA94 56
SURFACE RL: 163.0 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.06 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 4/12/18
CHECKED: IT DATE: 12/12/18

Drilling						Field Material Description					Defect Information	
METHOD	WATER	TCR	RQD (SCR) -	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH UCS MPa (VL 0.6, L 2.0, M 6.0, H 20, VH 60, EH 200)	LABORATORY STRENGTH (MPa)	DEFECT DESCRIPTION & Additional Observations	FRACTURE - FREQUENCY - (Defects per unit metre length) (5, 10, 15, 20, 25, 30)
NMLC		100	100 (100)	30			SILTSTONE dark grey, laminated (to 5 mm)	SW			29.88 m: B, 0°, St, Sm, Cn, close 30.10-30.25 m: B x2, 5°, Pl, Sm, Cn, close 30.26 m: J, 70°, Pl, Sm, Cn, close - 30.46 m: IS, 0°, Pl, Sm, clay, pale grey Ct, (to 8 mm)	
					30.75 132.25							
				31	*31.06* 131.94		SANDSTONE fine to medium grained, grey, with siltstone laminations (to 4 mm)					
							END OF BOREHOLE @ 31.06 m - TARGET DEPTH - GROUNDWATER NOT OBSERVED - STANDPIPE INSTALLED -					
				32								
				33								
				34								
				35								
				36								
				37								
				38								
				39								
				40								

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2306

SHEET: 1 OF 3

CLIENT:	FFJV	COORDS:	442390 m E 6943263 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	163.0 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: CHV	DATE: 4/12/18
JOB NO:	1893802	HOLE DEPTH:	31.06 m	CHECKED: IT	DATE: 12/12/18

330-01-BH2306 3.63 - 8.00 m

330-01-BH2306 8.00 - 13.00 m

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2306

CLIENT:	FFJV	COORDS: 442390 m E 6943263 m N MGA94 56	DRILL RIG: Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL: 163.0 m DATUM: AHD	CONTRACTOR: Drillpower
LOCATION:	H2C	INCLINATION: -90°	LOGGED: CHV DATE: 4/12/18
JOB NO:	1893802	HOLE DEPTH: 31.06 m	CHECKED: IT DATE: 12/12/18

330-01-BH2306 13.00 - 18.00 m

330-01-BH2306 18.00 - 23.00 m

REPORT OF CORE PHOTOGRAPHS: 330-01-BH2306

SHEET: 3 OF 3

CLIENT:	FFJV	COORDS:	442390 m E 6943263 m N MGA94 56	DRILL RIG:	Commachio 450
PROJECT:	Inland Rail, Phase 2	SURFACE RL:	163.0 m DATUM: AHD	CONTRACTOR:	Drillpower
LOCATION:	H2C	INCLINATION:	-90°	LOGGED: CHV	DATE: 4/12/18
JOB NO:	1893802	HOLE DEPTH:	31.06 m	CHECKED: IT	DATE: 12/12/18

330-01-BH2306 23.00 - 28.00 m

330-01-BH2306 28.00 - 31.06 m

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2306 -

SHEET: 1 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 442390 m E 6943263 m N MGA94 56
SURFACE RL: 163.0 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.06 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 4/12/18
CHECKED: IT DATE: 12/12/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 29.00 m 134.00 m AHD	Installation Date

DEPTH	RL	SOIL/ROCK MATERIAL - DESCRIPTION -
0	162.95	CLAY
0.40	162.60	CLAY (RESIDUAL SOIL)
1.50	161.50	
1.80	161.20	SANDY CLAY
3.30	159.70	CLAYEY SAND (EXTREMELY WEATHERED SANDSTONE)
3.63	159.37	SANDSTONE
5.35	157.65	
6.08	156.92	SANDSTONE AND SILTSTONE
9.54	153.46	SANDSTONE
10		

ADT
RD
NMLC

LevelTROLL

Gatic Cover
Cement Grout
9.00, RL154.00
Bentonite Seal
10.00, RL153.00

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

GAP 8_16.7 LIB.GLB Log GAP WELL 3 MASTER GINT_1893802_H2C.GPJ <<DrawingFile>> 08/03/2019 16:49 8.30.004 Datgel Tools

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2306 -

SHEET: 2 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 442390 m E 6943263 m N MGA94 56
SURFACE RL: 163.0 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.06 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 4/12/18
CHECKED: IT DATE: 12/12/18

Drilling				Field Material Description		Instrumentation Details			
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type	Tip Depth & RL		Installation Date
						LevelTROLL	29.00 m 134.00 m AHD		
NMLC		10	10.46 152.54		SANDSTONE				
		11							
		12	12.68 150.32						
		13							
		14	14.15 148.85						
			14.69 148.31						
		15						Filter Pack	
			15.78 147.22						
		16	16.05 146.95						
		17							
			17.40 145.60						
			17.57 145.43						
			17.73 145.27						
		18	18.23 144.77						
		19							
			19.40 143.60						
		20	20.00						

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared - for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are - for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination. -

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2306 -

SHEET: 3 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 442390 m E 6943263 m N MGA94 56
SURFACE RL: 163.0 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.06 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 4/12/18
CHECKED: IT DATE: 12/12/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 29.00 m 134.00 m AHD	Installation Date
NMLC		20	143.00		SANDSTONE			
		21						
		22	22.20 140.80					
		23	23.20 139.80					
		24	24.50 138.50				24.00, RL139.00	
		25						
		26						
		27	27.43 135.57				Slotted PVC	
		28	27.95 135.05 28.14 134.86 28.53 134.47		SANDSTONE AND SILTSTONE			
		29					Water Level Probe	
		30	29.82 133.18		SILTSTONE		29.90, RL133.10	

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-BH2306

SHEET: 4 OF 4

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 442390 m E 6943263 m N MGA94 56
SURFACE RL: 163.0 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 31.06 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 4/12/18
CHECKED: IT DATE: 12/12/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 29.00 m 134.00 m AHD	Installation Date
NMLC		30			SILTSTONE			
			30.75 132.25		SANDSTONE			
		31	31.06 131.94		END OF BOREHOLE @ 31.06 m TARGET DEPTH GROUNDWATER NOT OBSERVED STANDPIPE INSTALLED	31.06, RL131.94		
		32						
		33						
		34						
		35						
		36						
		37						
		38						
		39						
		40						

REPORT OF BOREHOLE: 330-01-DH2503

SHEET: 1 OF 2

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 427703 m E 6952700 m N MGA94 56
SURFACE RL: 105 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 15.07 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 24/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT			0	0.10 104.90	DS 0.00-0.10 m			CI CH	TOPSOIL: Sandy CLAY medium plasticity, dark brown, fine and medium grained sand, with silt, with rootlets			TOPSOIL ALLUVIUM
					DS 0.40-0.50 m SPT 0.50-0.95 m 8, 9, 8 N=17				Sandy CLAY high plasticity, brown, fine and trace medium grained sand			
			1		DS 1.00-1.10 m							
				1.50 103.50					becoming orange brown and medium plasticity			
			2		SPT 2.00-2.45 m 6, 11, 10 N=21							
				2.60 102.40				CI	CLAY medium plasticity, brown and orange-brown, with fine to medium grained sand		VSt	
			3		SPT 3.50-3.95 m 4, 5, 8 N=13							
	L		4							w < PL		
			5		SPT 5.00-5.45 m 6, 10, 11 N=21							
			6									
RD				6.40 98.60				CI	Sandy CLAY medium plasticity, grey and yellow-brown, medium and trace coarse grained sand			GATTON SANDSTONE
				6.70 98.30	U50 6.50-6.89 m PP = 550 - 600 kPa				becoming pale grey, mottled orange-brown		H	
			7									
		24/09/18	8	8.05 96.95	SPT 8.00-8.45 m 8, 14, 15 N=29				trace fine grained, sub-rounded gravel of siliceous sandstone			
				9.00 96.00				SC	Clayey SAND (EXTREMELY WEATHERED sandstone) fine and medium grained, pale grey, mottled orange-brown			
	M		9		SPT 9.50-9.90 m 18, 30, 30/95mm					M	VD	
			10									

REPORT OF BOREHOLE: 330-01-DH2503

SHEET: 2 OF 2

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 427703 m E 6952700 m N MGA94 56
SURFACE RL: 105 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 15.07 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 24/9/18
CHECKED: IT DATE: 30/10/18

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RD	M		10					SC	Clayey SAND (EXTREMELY WEATHERED sandstone) fine and medium grained, pale grey, mottled orange-brown	M	VD	GATTON SANDSTONE
			11		SPT 11.00-11.13 m 30/130mm							
			12									
					SPT 12.50-12.55 m 30/50mm HB							
			13									
			14		SPT 14.00-14.07 m 30/70mm HB							
			15									
				89.93	SPT 15.00-15.07 m 30/70mm HB				END OF BOREHOLE @ 15.07 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 8.10 m DEPTH STANDPIPE INSTALLED			
			16									
			17									
			18									
			19									
			20									

REPORT OF STANDPIPE INSTALLATION: 330-01-DH2503 -

SHEET: 1 OF 2

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 427703 m E 6952700 m N MGA94 56
SURFACE RL: 105 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 15.07 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 24/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL Tip Depth & RL 14.57 m 90.43 m AHD Installation Date
ADT		0	0.10 104.90		SANDY CLAY	Gatic cover
					SANDY CLAY	
		1				
			1.50 103.50			
		2				
			2.60 102.40		CLAY	
		3				Cement Grout
		4				
		5				
		6				
			6.40 98.60		SANDY CLAY	
			6.70 98.30			
RD		7				7.00, RL98.00
						Bentonite Seal
						8.00, RL97.00
	24/09/18	8	8.05 96.95			Filter Pack
			9.00 96.00		CLAYEY SAND (EXTREMELY WEATHERED - SANDSTONE) -	9.00, RL96.00
		9				
		10				

LevelTROLL

This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1

REPORT OF STANDPIPE INSTALLATION: 330-01-DH2503 -

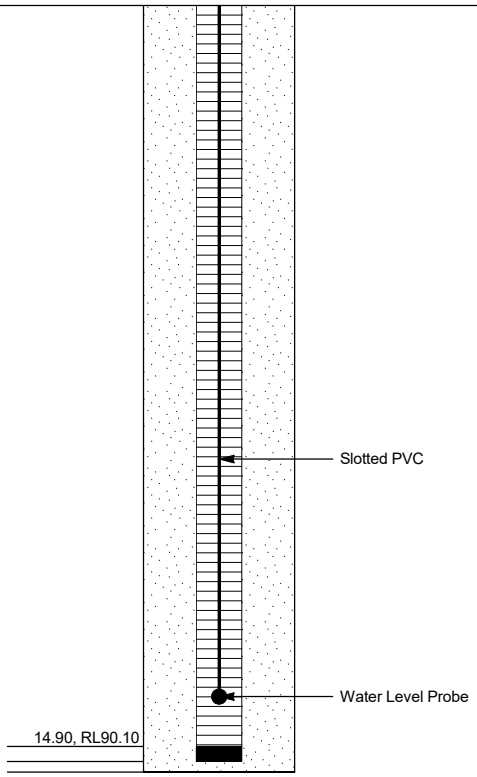
SHEET: 2 OF 2

CLIENT: FFJV
PROJECT: Inland Rail, Phase 2
LOCATION: H2C
JOB NO: 1893802

COORDS: 427703 m E 6952700 m N MGA94 56
SURFACE RL: 105 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 15.07 m

DRILL RIG: Commachio 450
CONTRACTOR: Drillpower
LOGGED: CHV DATE: 24/9/18
CHECKED: IT DATE: 30/10/18

Drilling				Field Material Description		Instrumentation Details		
METHOD	WATER	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	SOIL/ROCK MATERIAL - DESCRIPTION -	ID Type LevelTROLL	Tip Depth & RL 14.57 m 90.43 m AHD	Installation Date
RD		10			CLAYEY SAND (EXTREMELY WEATHERED SANDSTONE)			
		11						
		12						
		13						
		14						
		15	15.07 89.93		END OF BOREHOLE @ 15.07 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 8.10 m DEPTH STANDPIPE INSTALLED			
		16						
		17						
		18						
		19						
		20						



This report of standpipe installation must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F17
RL1