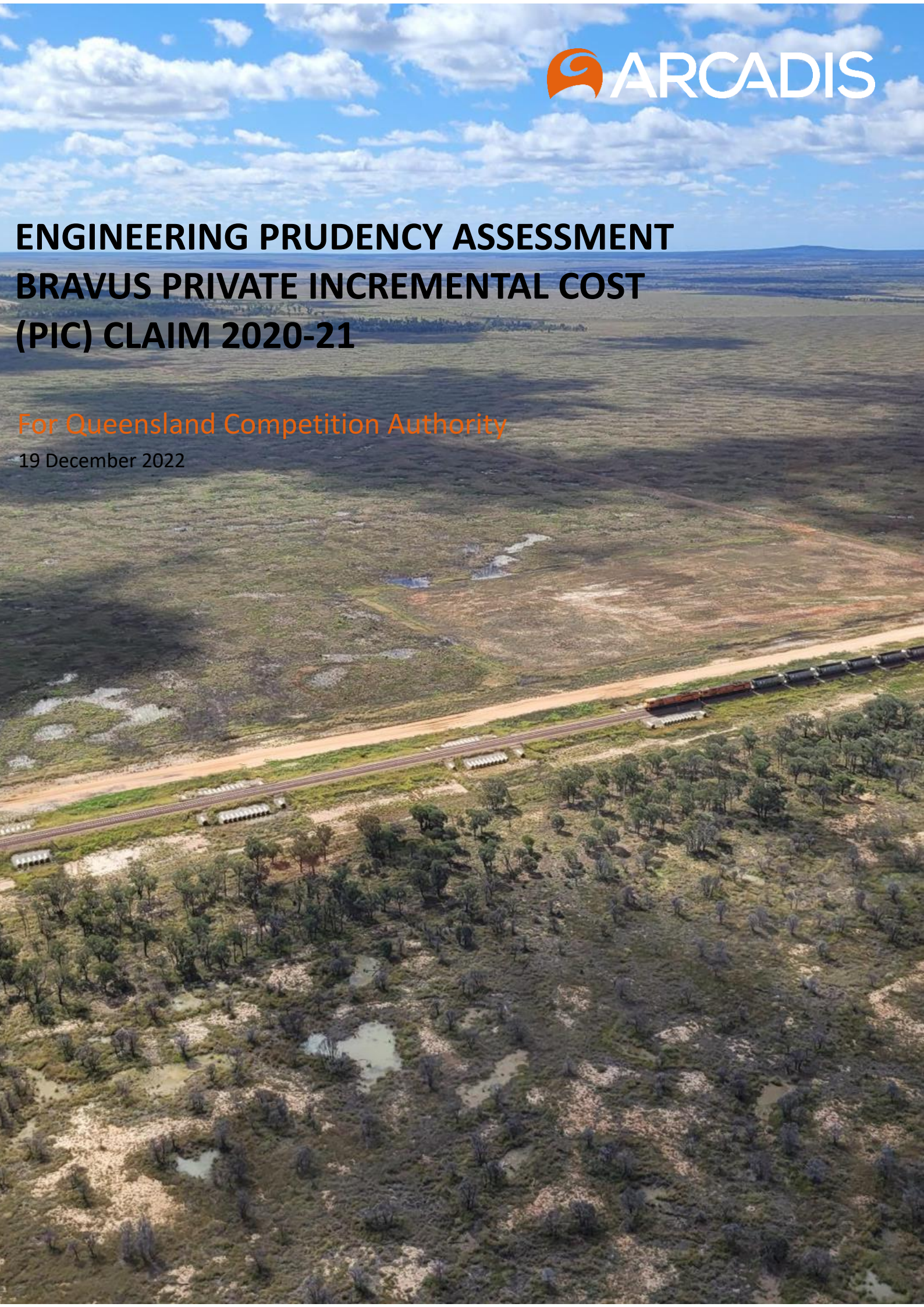


ENGINEERING PRUDENCY ASSESSMENT BRAVUS PRIVATE INCREMENTAL COST (PIC) CLAIM 2020-21

For Queensland Competition Authority

19 December 2022

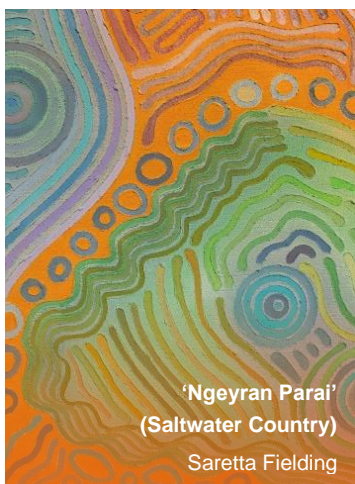




BRAVUS LOOP AND CONNECTION INFRASTRUCTURE Private Incremental Cost (PIC) Claim

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'Ngeyran Parai'
(Saltwater Country)
Saretta Fielding

Arcadis acknowledges the Traditional Custodians of the land on which we work and live throughout Australia and recognize their continuing connection to Lands, Waters and Communities. We pay our respects Aboriginal and Torres Strait Islander Cultures and to Elders past, present and emerging.

Arcadis is committed to driving inclusion and diversity across our business. This includes specific and actionable policies that aim to make a positive impact on Aboriginal and Torres Strait Islander employment, education and a broader cultural change. Approved by Reconciliation Australia, Arcadis' Reconciliation Plan contains detailed and transparent strategies, targets and measurable actions. We continue to build respect, support education and create employment opportunities with Aboriginal and Torres Strait Island employees within our business.

Further information is [available here](#).


REVISIONS

Revision	Date	Details	Prepared by	Reviewed by	Issued to
A	24/08/2022	Draft for review	Pavan Dheram Eshan Gaindhar	C.Owen	QCA
B	29/08/2022	Revised Draft	Eshan Gaindhar C.Owen	C.Owen J.Taylor A.Hogan	QCA
C	30/08/2022	Final Draft	Eshan Gaindhar	C.Owen J.Taylor	QCA
D	10/10/2022	Final Draft (redacted)	Eshan Gaindhar	C.Owen	QCA
E	23/11/2022	Final (Revised)	Eshan Gaindhar	C.Owen	QCA
F	16/12/2022	Final	C.Owen		QCA

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Arcadis has relied on information provided to it by Bravus to produce the report and arrive at its conclusions. The report is based upon information obtained on or before the report's completion (date above). Circumstances and events may occur following this date beyond our control and may affect the findings or projections contained in the report. We may not be held responsible for such circumstances of events and expressly disclaim any responsibility, therefore.

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EXECUTIVE SUMMARY

Background

The Queensland Competition Authority (QCA) is an independent statutory body responsible for implementing competition policy in Queensland. As part of this role, it regulates third-party access to below-rail infrastructure operated by Aurizon Network.

Bravus Mining & Resources (Bravus) owns and operates the Carmichael Mine. The Carmichael Mine is located in the North Galilee Basin, approximately 160km north-west of Clermont in regional Queensland. To export product from their Carmichael Mine, Bravus proposed the construction of a rail loop and connecting infrastructure to Aurizon Network's Newlands system (which forms part of the Central Queensland Coal Network (CQCN)) for export at Abbot Point port facilities.

Following development approval and construction completion, Bravus is requesting the QCA to approve the Private Incremental Costs (PIC) for the Carmichael Rail Loop and connecting infrastructure project under clause 6.3.2 of Aurizon Networks' 2017 Access Undertaking.

Objective

The QCA appointed Arcadis to assess the engineering prudence and efficiency of the claim for the Carmichael Rail Loop and connecting infrastructure project, based on the scope, standard, and cost, as per the terms outlined in Schedule E clause 6.3.2 of the Aurizon Network 2017 Undertaking (UT5), having regard to the more detailed framework that applies to the determination of prudence and efficiency of Aurizon Network's capital expenditure claims (Schedule E clause.2.2. Prudence and Efficiency). Arcadis assessed the Bravus PIC claim against the existing asset condition and performance requirements in the context of the Rail Safety National Law, Aurizon Network's Civil Engineering Track Standards (CETS), Civil Engineering Structural Standards (CESS), Rail Industry Safety and Standards Board (RISSB) and other industry approved standards and approaches by similar operations and good engineering practice. The assessment included a review of key project documentation, visual site inspection of the works and discussions with relevant Bravus staff.

Total capital expenditure submission

In April 2022 Bravus advised QCA it would be seeking approval of \$43,964,000 for Private Incremental Costs for the works associated with Bravus Carmichael Rail Loop and connecting infrastructure. The claim was split into two components; \$38,961,000 for works associated with the Carmichael Loop, and \$5,003,000 associated with the connection works.

Assessment Summary

Overall, Arcadis assessed the Bravus Carmichael Rail Loop and connecting infrastructure works as prudent and efficient in scope and standard with respect to the terms outlined in Schedule E clause 6.3.2 and with regard to the detailed framework for determination of prudence and efficiency of Aurizon Network's capital expenditure as outlined in Schedule E Clause 2.2 of the Aurizon Network 2017 Undertaking (UT5).

Bravus Carmichael Rail Loop

In general, Arcadis assessed the scope, standard and cost for the Bravus Carmichael Rail Loop works prudent and efficient. The team assessed that, considering engineering factors such as:

- the stringent conditions and remoteness of the project (making access to materials and skilled resources more difficult)
- environmental constraints, approval requirements (requiring significant investment in specialised fauna fencing and fauna connectivity culverts)
- difficult geotechnical conditions and construction within flood prone areas
- whole of life considerations in material specifications (for example the application of head hardened 60 kg rail); and
- resource constraints heightened by public controversy which made it difficult to get suitable contractors, thereby generally constraining the procurement process and limiting availability of value for money choices for consideration.

These in combination with activist issues (which disrupted construction works, causing delays and additional costs), high insurance costs, and constraints on material sourcing (i.e., Bravus was obligated to purchase rail from Onesteel) the cost of the loop works as benchmarked against similar projects is considered prudent.

Connecting infrastructure

Arcadis assessed the scope and standard of connecting infrastructure prudent.

However, the team conducted a bottom-up estimate build-up of the connection works which identified an inconsistency of \$80,456 (refer Table 1-1) between the claimed amount and the calculated bottom up from the information and expenditure figures provided to Arcadis for this assessment. From the information provided to date, the team recommend that this discrepancy be removed from the claim. The assumptions and calculation of this figure is provided in further detailed in section 6.1.2 of the report and appendix C.

The above has been detailed in this report and the impact to the claim summarised below.

Table 1-1 Summary of outcomes of prudence assessment

Element	Brief description	PIC Claim	Assessed as prudent			Impact on PIC Claim
			Scope	Standard	Cost	
Carmichael Rail Loop – Below Rail (track) infrastructure	Assessed as prudent	\$38,961,000	✓	✓	✓	-
Carmichael Rail Loop – Environmental			✓	✓		

Element	Brief description	PIC Claim	Assessed as prudent			Impact on PIC Claim
			Scope	Standard	Cost	
Carmichael Rail Loop – Civil works			✓	✓		
Connection works	Greater than bottom-up estimate of prudent and efficient costs. Value for money not realised.	\$5,003,000	✓	✓	x	- \$80,456
Total claim		\$43,964,000				
Value of impact to claim						- \$80,456
Assessed recommended approved value						\$43,883,544

Bravus provided several documents for the assessment. However, Arcadis sought additional information and clarification from Bravus throughout the review to clarify and substantiate the information provided initially. Arcadis acknowledges that Bravus responded to its requests for information, and Arcadis would like to thank Bravus for its cooperation in this respect.

1 INTRODUCTION

1.1 Background

The Queensland Competition Authority (QCA) is an independent statutory body responsible for implementing competition policy and regulating infrastructure owned by state and private entities that requires third-party access. As such, the QCA is responsible for the regulation of third-party access to below-rail infrastructure operated by Aurizon Network Pty Ltd (Aurizon Network).

Aurizon Network is a wholly owned subsidiary of Aurizon Holdings Limited. Aurizon Network's below rail infrastructure comprises a 2,670-kilometre multi-user track network comprising four major coal systems and one connecting system servicing Queensland's Bowen Basin coal region: Newlands, Goonyella, Blackwater, and Moura with Goonyella Abbot Point Expansion - the connecting system link. Collectively this is known as the Central Queensland Coal Network (CQCN). The services provided by Aurizon Network's below rail network are declared for third-party access under the Queensland Competition Authority Act 1997 (the QCA Act).

Bravus Mining & Resources (Bravus) owns and operates the Carmichael Mine. The mine is a surface mine, operated by Bravus and producing up to 10 million tonnes of coal per annum for export. A map showing the location of the Carmichael mine, the Carmichael Rail Network and its connection to the Aurizon Network's rail network is provided in Figure 1-1.

1.2 Objective

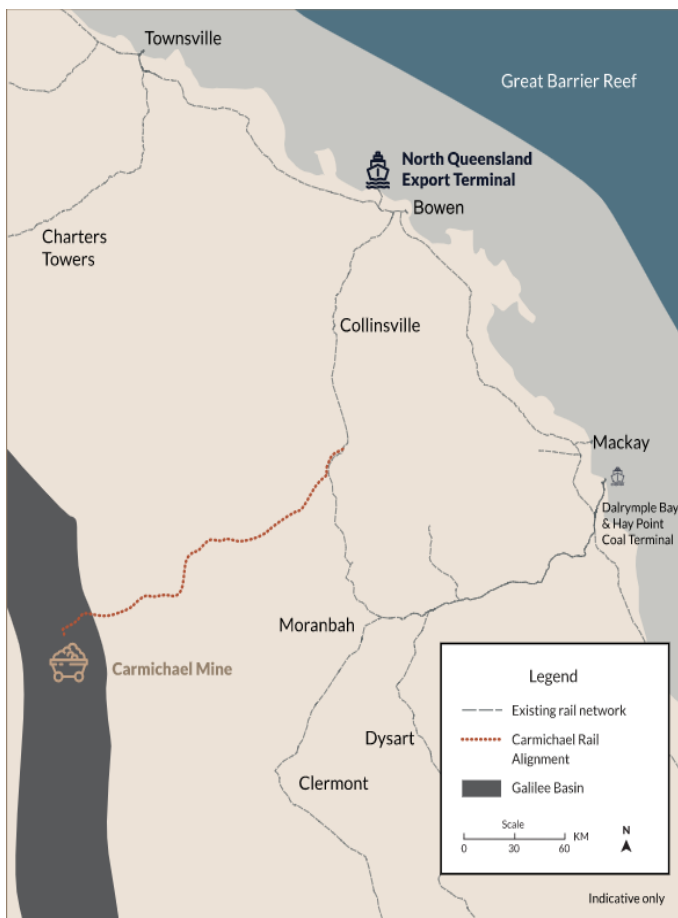


Figure 1-1 Location of Carmichael Rai Network and mine
Source: <https://www.bravusmining.com.au/the-carmichael-rail-network/>

The Queensland Competition Authority (QCA) has approved a Regulatory Asset Base (RAB) for the Central Queensland Coal Network. To ensure that current and future tariffs are charged fairly and for works deemed necessary, infrastructure work expenditure is subject to regulation from the Queensland Competition Authority Act 1997 (QCA Act) and the Queensland Competition Authority Regulation 2007 (QCA Regulation). Under the regulatory process, works must be submitted as a capital expenditure claim to the QCA, subject to the QCA approval process before inclusion in the RAB. An access undertaking, approved by the QCA and developed in accordance with the Act, provides a framework for the provision of access to Aurizon Network's rail network. The current undertaking agreement is the fifth version of this undertaking, *Aurizon Network 2017 Access Undertaking (UT5)*, approved by the QCA – February 2019. UT5 requires maintenance of a RAB reflecting the value of the CQCN infrastructure.

Bravus has requested the QCA approve the Private Incremental Cost Claim (PIC) of its Carmichael rail infrastructure works under clause 6.3.2 of the 2017 undertaking. This is the second application under this clause, in contrast

to the majority of expenditure claim submissions, which have been developed and wholly submitted by Aurizon Network.

QCA has engaged Arcadis to perform a prudence and efficiency assessment of Bravus' Carmichael rail infrastructure works in terms of their scope, standard and cost of the works. The acceptability of this claim will predominantly be based on Schedule E of UT5; specifically, this requires a test of prudence and efficiency of scope, cost and standard. The Carmichael rail infrastructure works include greenfield track work, formation and drainage works, environmental works, special track work, and project management services as necessary to deliver the works in compliance with regulatory and operational requirements.

2 CARMICHAEL MINE LOOP SYSTEM OVERVIEW

2.1 General

The Bravus Carmichael Coal Mine is a relatively new open-cut mining operation located in the north Galilee Basin region, approximately 160 km northwest of Clermont. Mining operations commenced in late 2021.

In line with a required infrastructure development to support export of coal from the mine, the Bravus Carmichael Rail Loop and connecting infrastructure project was constructed to provide the infrastructure necessary to transport up to 15 million tonnes per annum (Mtpa) of coal from the Carmichael Mine, through the Carmichael Network to Aurizon Networks Newland System, and from this system to the coal terminals at the port of Abbot Point.

More broadly, the Bravus Carmichael Mine system requires a rail loop, stockpile and loading facilities (Figure 2-1) for loading trains near the mine operation to transport to Abbot Point port facilities.

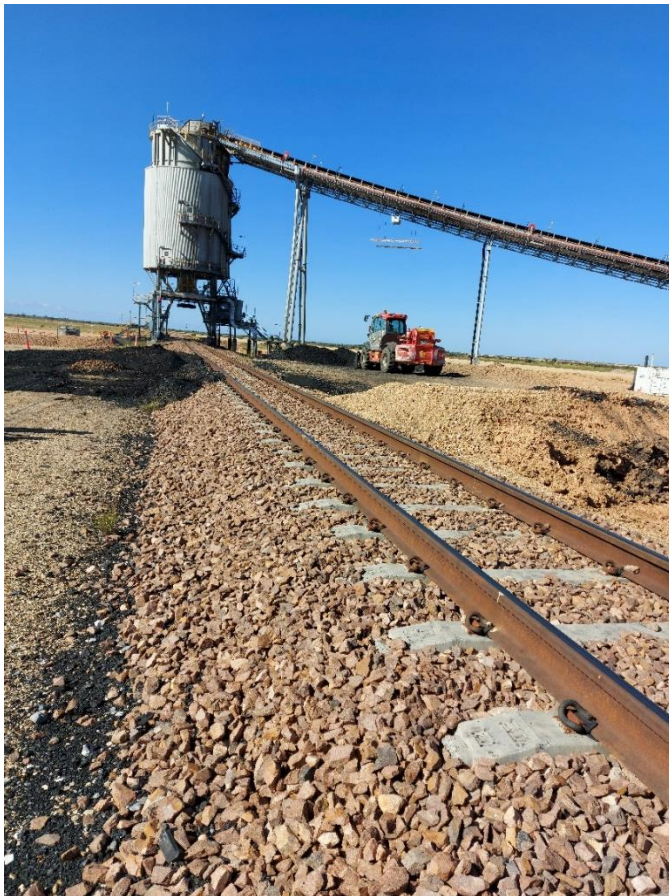


Figure 2-1 Loading facilities and stockpile

2.2 Asset configuration

Taking into account the system operational requirements, the Bravus Carmichael Mine Loop and connecting infrastructure was predominantly designed for 26.5 tal wagons with maximum speeds varying from 60km/h to 80km/h depending on the system. Table 2-1 below shows notable characteristics of the Carmichael Mine rail loop infrastructure solution.

Table 2-1 Key asset characteristics

Characteristic	Bravus Carmichael Loop infrastructure
Total track length (km)	7.8 k
Track construction	60 kg/m rail on concrete sleepers
Maximum axle load	26.5 tal
Electrified	No
Control System	RMS
No of Level Crossings	2 x Occupation Xing
Turnouts	1 x 1 in 16 LH 60 kg
Culvert structures	4 x Culvert structures with a total of 54 Corrugated Metal Pipes (CMP) (varying diameters)

3 PIC PRUDENCY ASSESSMENT METHODOLOGY

3.1 Overall methodology

Arcadis has implemented a five-stage process to assess the Bravus Carmichael Mine Loop and connecting infrastructure PIC claim. Figure 3-1 identifies the key milestones with brief descriptions below.

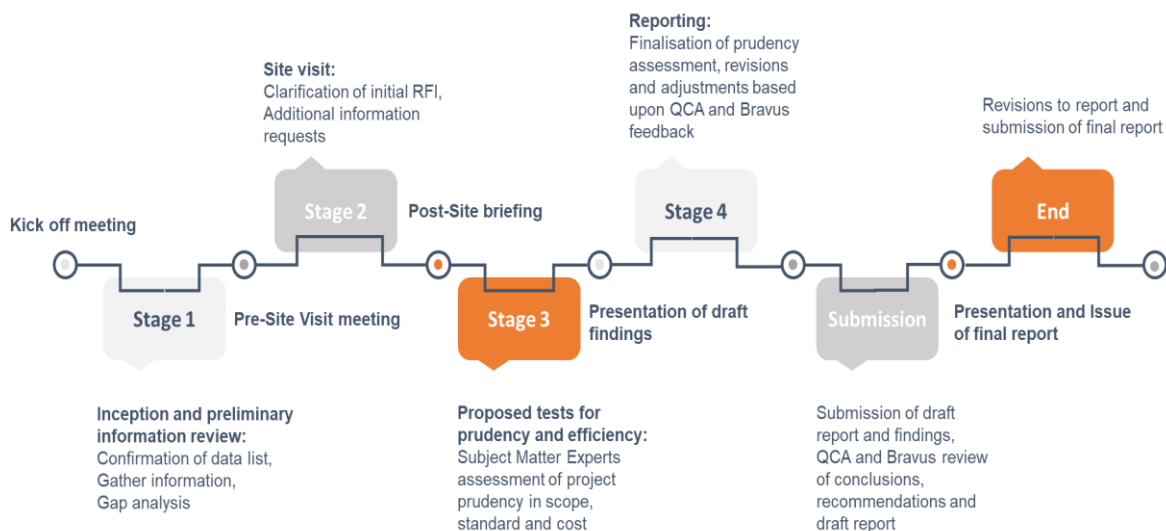


Figure 3-1 Summary of the process for prudency and efficiency assessment

3.1.1 Stage 1 – Preparation

The Arcadis team conducted an internal kick-off meeting to formalise the handover of information/resources required to perform the assessment. During this meeting, the following were confirmed:

- Confirmation of the Request for Information (RFI) process and agreement by all parties
- Communication channels were formalised and agreed
- Bravus staff provided a background summary of the project
- Date holder was confirmed for the site visit

The following table lists the initial documentation submitted for assessment; it is noted that additional documents were requested and acquired for clarification through the RFI process, with a final list of RFI's sent on 28 July 2022 (Appendix B).

Table 3-1 List of preliminary documentation provided

Check list	Documentation Type	Name of document
Essential documents		
Y	Project Management Plan	Details provided
Y	Breakdown of costs	Connection works – “Concept Estimate Summary – CRN Connecting Infrastructure”, Aurizon dated 01/04/2019 CRN Track and Civil works - Note for Approval (NFA), 2910 R1 and 3029 R1, dated 20 th Jan 2022 Earthworks and structures Mine End – Note for Approval 2896 R3, dated 11 Mar 2020
Y	Business Case Justification (IAR)	Details provided
Y	Commissioning data and completion, acceptance, and handover validations.	Red line markup drawings
Y	Completion report	Details provided
Other documents provided		
Refer Appendix D		

3.1.2 Stage 2 – Site Visit

A site visit by representatives of QCA and Arcadis was undertaken on 26 July 2022.

The site visit included a visual inspection of the loop, loading facilities, connection infrastructure, staff and parking area, access road, and sample of drainage structures. The site inspections provided the technical review team with an opportunity to develop an interactive platform to enable quick and efficient clarification on several technical items, which we consider more efficient than multiple email correspondence.

The site visits also facilitated the assessment process by providing visual verification of the compliance of the works with industry standards and safe operations. It was easier to build a more focused set of RFI's and list the critical documentation required to verify what was visually noted at the site through the site visits. For example, project designs and drawings were adequately reviewed and approved by Registered Professional Engineer of Queensland (RPEQ) before

construction had been achieved whilst visual site inspection assured that operations were safely undertaken.

Arcadis would like to thank Bravus for their time and commitment to our team during the site inspections.

3.1.3 Stage 3 – Analysis

After the site visit, Arcadis' engineering Subject Matter Experts requested specific documentation to validate compliance and assure that what had been seen and quoted on-site complied with regulatory requirements and aligned with the business case and IFC drawings. Through this inspection, Arcadis was also able to confirm the works alignment with CETS and CESS standards and hence validate the alignment of Bravus' works with construction and operational requirements and assess the prudence of the scope and standard.

During this stage, Arcadis performed a desktop assessment of prudence and efficiency based upon the visual inspection and preliminary information provided by Bravus. Arcadis used a framework template developed in alignment with the requirements of UT5 Schedule E and approved by the QCA. The key criterion used to create the framework is summarised in the flow chart depicted in Figure 3-2.

Key: Yes No

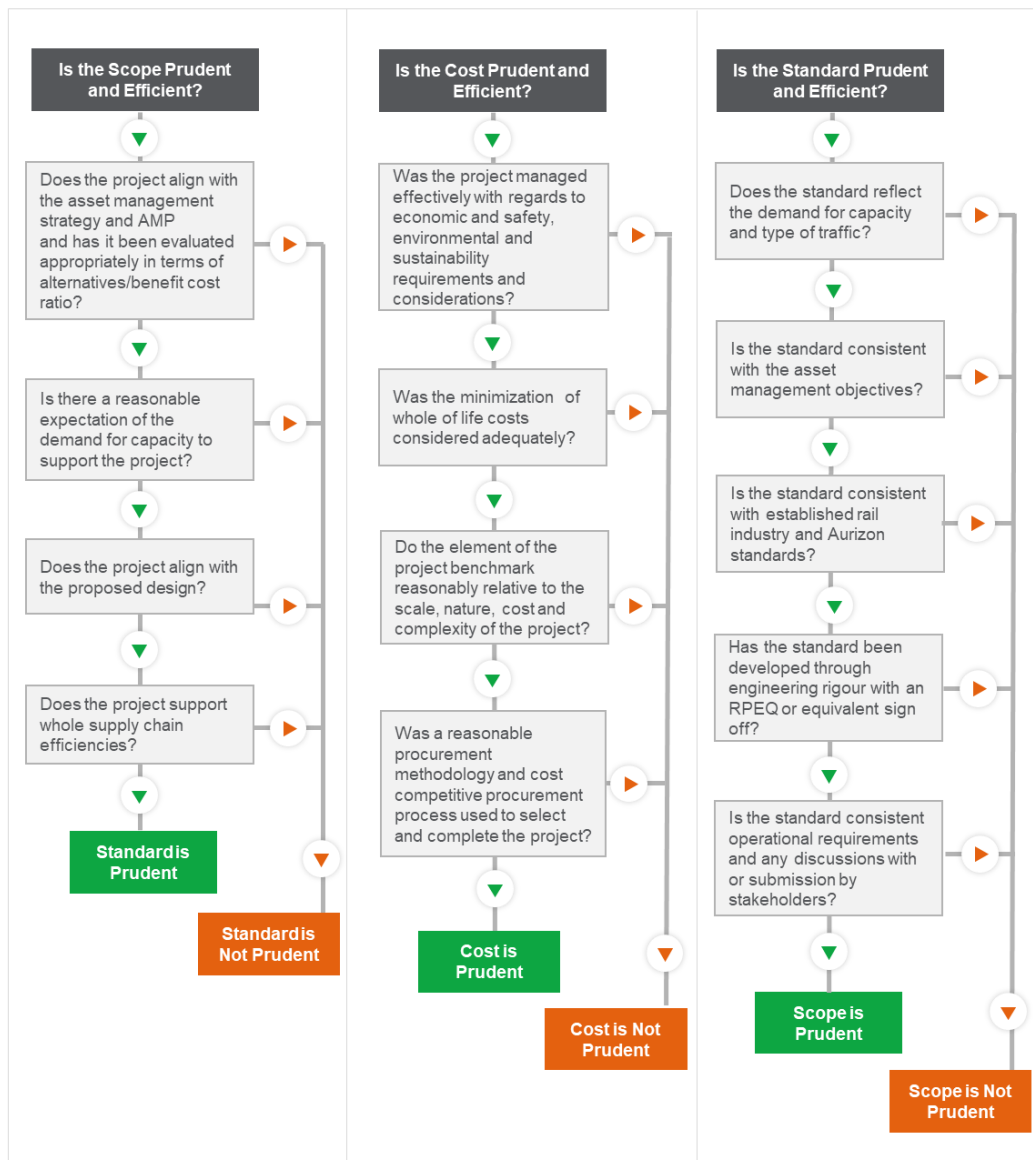


Figure 3-2 Summary of the critical criteria for the assessment of prudence and efficiency

On submitting the draft and following further discussions between the parties, Arcadis received any additional information requested and responses to the RFI's. The list of final RFI's, clarifications and additional information provided is shown in Appendix B.

The majority of RFI's included clarification of cost information, scope, and confirmation of completion certification. Upon clarification of issues raised, the team made revisions accordingly and completed the prudence and efficiency assessment.

3.1.4 Stage 4 and 5 – Reporting and finalisation

Upon completing the prudence and efficiency assessment, Arcadis compiled and submitted this final draft report to the QCA for review.

On receipt of any revisions, Arcadis will revise the draft and submit the final report.

3.2 Extent of review

Bravus advised QCA it would be seeking approval of \$43,964,000 as the prudent and efficient amount of private incremental cost capital expenditure to be refunded through its access obligations in alignment with the 2017 Access Undertaking (UT5).

For this review, key elements of the works were assessed by the Arcadis team in line with the primary discipline aligned with that work. Works were assessed within the breakdown submitted with Bravus Carmichael Rail Loop and connecting infrastructure PIC claim. A summary of the final cost claim breakdown is provided in Table 3-2.

Table 3-2 Summary of PIC claim – breakdown

Element	Total Expenditure Claimed
Carmichael Rail Loop	\$38,961,000
Connection works	\$5,003,000
Total PIC claim total	\$43,964,000

The assessment of these elements was conducted with respect to the Terms of Reference¹ as set by the QCA and the terms and criteria outlined in Schedule E (schedule E, clause 6.3.2) and having regard to the more detailed framework that applies to determination of prudence and efficiency Aurizon Network's capital expenditure claims (Schedule E Clause 2.2. Prudence and Efficiency) of the 2017 Aurizon Network access undertaking (UT5) and summarised in the methodology outlined in Section 3.1.

The following section presents the findings from the Arcadis assessment in detail.

4 BRAVUS PIC CLAIM SUBMISSION

4.1 Bravus PIC submission claim overview

The primary requirement of the Bravus Carmichael Rail Loop and connecting infrastructure project was to enable access from the Bravus Carmichael Mine to the Port of Abbot Point, via the Carmichael Rail Network, Aurizon CQCN Goonyella and Newlands systems. The intent was that this connection would enable access to transport of up to 15 Mtpa of thermal coal from the Carmichael Mine, through the Carmichael Rail Network to Aurizon Network's Newland system, from which the coal is transported to the Port of Abbot Point for export. This claim includes the prudence and efficiency assessment of the Carmichael Loop and connection infrastructure, which connects the Carmichael rail network to the Newlands system, only.

Table 4-1 summarises the information provided to the Arcadis for review; Appendix C provides the complete list of data provided.

¹ Queensland Competition Authority Terms of Reference – 11/03/2019

Table 4-1 Summary of provided documentation for review

Other documents provided	
Name of document	Description
Correspondence	Letter/Email for Bravus' claim of \$43,964,000 estimated total amount of the Private Incremental costs
Drawings	Issued for construction drawings As-built drawings / Red-line markup drawings
Cost breakdowns	Breakdown of Bravus costs for construction Breakdown of Bravus costs for Carmichael Mine Balloon Loop
Reports	Scope of Works Project management plans Operations Environmental Management Plan Notes for Approval (NFA) Earthworks, civil drainage, rail bridges, ballast supply and track construction specification reports CRN change register – extension of loops for longer trains
Other	Business case RFI Register Quality Management Plan and Quality Assurance documentation CRN asset register

4.2 Summary of results

To align costs with a specific scope of works, elements were assessed in line with the Bravus Carmichael Rail Loop and connecting infrastructure PIC cost breakdown provided to Arcadis.

Bravus submitted its expenditure claim in April 2022 for QCA approval. Table 4-2 lists the project element breakdown and summarises the results of the prudence assessment on the Bravus Carmichael Rail Loop and connecting infrastructure.

Table 4-2 Prudence assessment summary

Element	Assessment summary	Assessed as prudent			Impact on PIC Claim
		Scope	Standard	Cost	
Carmichael Rail Loop – Below rail (track) infrastructure	Assessed as prudent	✓	✓	✓	-
Carmichael Rail Loop – Environmental		✓	✓		
Carmichael Rail Loop – Civil works		✓	✓		

Element	Assessment summary	Assessed as prudent			Impact on PIC Claim
		Scope	Standard	Cost	
Connection works	Greater than bottom-up estimate of prudent and efficient costs. Value for money not realised.	✓	✓	<input checked="" type="checkbox"/>	-\$80,456
Value of overall claim					\$43,964,000
Value of impact to claim		-\$80,456			
Total revised claim					\$43,883,544

4.3 Overview prudence and efficiency

Overall, Arcadis has assessed the scope and standard for the Bravus' claim to be prudent and efficient for the Carmichael Loop and connection infrastructure.

Arcadis highlights that our assessment was undertaken based upon the financial and engineering information provided to the team. Chainage lengths to estimate kilometre rates and connection work cost boundaries were therefore based upon the drawings provided (refer Dwg AUR-Q-0788-0013 (B)) and were not wholly based on the full length of track specified in the application.

On assessment of costs, the Carmichael loop cost was assessed to be prudent and efficient, while the connection cost claim was not. A deduction of \$80,456 based upon a discrepancy found undertaking a bottom-up calculation of the item costs provided in the supporting documentation has been proposed.

Carmichael Loop

The scope, standard and cost for Carmichael Loop works was assessed as prudent and efficient. To facilitate the assessment, each discipline lead focused their assessment on evaluating the prudence of the works within specific subcomponents – that is, below rail (track) infrastructure, civil works, and environmental works. The Arcadis team assessed that the scope and standard of all three aspects was prudent and efficient.

Assessment of costs included a review of documentation provided by Bravus. From the drawings and information provided claimed a unit rate \$4.995m per kilometre, this was benchmarked against similar projects to determine whether costs claimed were prudent and efficient in relation to accepted industry rates. From professional experience and costs expended on similar projects, Arcadis assesses that the prudent range for similar works is +/-30% of \$4 million per kilometre. On review and analysis of site-specific characteristics and asset configuration, it was found that the relatively high unitised costs within the average benchmark range for the Bravus Rail Loop works is reasonable taking into account the following:

- the stringent conditions and remoteness of the project (making access to materials and skilled resources more difficult);
- environmental constraints, approval requirements (requiring significant investment in specialised fauna fencing and fauna connectivity culverts);
- difficult geotechnical conditions and construction within flood prone areas;
- whole of life considerations in material specifications (for example the application of head hardened 60 kg rail); and
- resource constraints heightened by public controversy which made it difficult to get Tier 1 contractors, thereby generally constraining the procurement process and limiting availability of value for money choices for consideration.

Connection works

From the information provided, and additional advice obtained on site, Arcadis assessed the scope and standard for connection works as prudent and efficient. The team assessed that the level and construction of the works designed were consistent with projected production and export volumes, aligned with proposed design of the infrastructure, and compliant with relevant standards.

However, through a bottom-up estimate build-up of the connection works and based upon the cost data and drawings provided, the team identified an inconsistency of \$80,456 which has been highlighted to be removed from the claim.

5 PRUDENCY ASSESSMENT: GENERIC ITEMS

5.1 Asset Management System

5.1.1 Overview

Aurizon Network has a specific approach to asset management that aims to deliver consistent network performance. The Aurizon Network approach focuses on delivering appropriate service levels throughout the asset life cycle by providing “asset availability and sustained, reliable below rail performance at the most efficient cost of ownership²”.

5.1.2 Whole of life

The whole of life approach typically delivers strategies to optimise the balance between risk, cost and performance as well as having regard to considerations during design of whole of life durability and resilience. The team acknowledged that Bravus has taken into account long term durability considerations in its application of 60 kg head hardened rail throughout the loop and installation of longer turnouts to minimise rail wear.

These choices must be combined with specific interventions (maintenance tasks) that must be performed throughout the asset’s life to fully optimise and maintain the balance of risk, cost and performance.

Scheduled maintenance activities are usually based on design and historical performance characteristics that define standards and best practices and reflect observed deterioration rates through time and tonnage (age and cycle usage).

Interventions should aim to achieve the best performance whilst delivering cost efficiencies and minimising risk. Discussions with Bravus staff on site confirmed that considerations to determine triggers for maintenance work based on optimal load and performance factors are being developed.

5.1.3 Prudency considerations asset management plan (scope)

In respect of the above and upon reviewing the asset maintenance activities and intervention provided by Bravus, Arcadis assesses that the project aligns with the overall system asset management strategy and that there is a reasonable and contracted expectation of demand from Bravus’ mine to support the project.

² Aurizon Network – FY22 Final Draft Maintenance and Renewals Strategies and Budgets, Appendix E Aurizon Network 21 January 2021 Accessed 19 August 2022

6 PRUDENCY ASSESSMENTS

6.1.1 Carmichael Loop

Overview

The Carmichael Loop works claim included the mobilisation and establishment of site facilities to undertake all rail formation and drainage works for the Bravus Carmichael mine loop. The works assessed included all works related to below rail (track) infrastructure, civil works and environmental works.

The following paragraphs provide further detail on the prudence assessment. However, Table 6-1 summarises the outcome of the prudence assessment for scope, standard and cost of the loop works.

Table 6-1 Assessment of prudence rail loop works

In accordance with clause 6.3.2, Schedule E of the Aurizon Network The 2017 Undertaking (UT5), was there sufficient demonstration of prudence and efficiency to satisfy:	Prudent and Efficiency Assessment Outcome		
	<u>Scope</u>	✓	Overall scope and standard were assessed as prudent, claimed cost considered prudent.
	<u>Standard</u>	✓	
	<u>Cost</u>	✓	
Capital Expenditure Claim (total)	\$ 38,961,000		
Impact of findings on Claim	\$ -		
TOTAL ACCEPTED	\$ 38,961,000		

Assessment of scope

The scope of works outlined in the tender documentation included all the rail formation works, including earthworks, stormwater drainage, level crossings, signage and fencing. Arcadis reviewed the scope, as defined in the information provided, including the tender, for construction and as-constructed drawings.

Key requirements for the mine balloon loop included:

- To be constructed to hold 3 Newlands sized trains or 2 Goonyella Length Trains
- Prudence and Efficiency considerations
- Ability to stow 3 Newlands sized trains during a system shutdown
- Ability to accept Goonyella Length trains (GLTs) / optionality to deal with proposed 2019 Concept Study Expansion to GLTs
- The ability to run GLTs provides optionality to more efficiently transport coal out through CQCQ during for example natural disaster

To assess the loop works, the assessment team broke the work elements into three key components, namely below rail (track) infrastructure, civil works, and environmental approvals. Through review of documentation provided combined with visual inspection, it was confirmed that the loop constructed works were consistent with proposed design of the infrastructure.

From the available information, it is noted that the future demand and capacity levels have been taken into account. It is noted³ that the extension of two passing loops and the balloon loop to cater for longer trains to facilitate transfer of 15Mtpa, was approved on consideration of the operational requirements and business impact if not implemented. In consideration that the Carmichael mine

³ Project Change Notice "CCRP-000000-PCN-PC-001005" dated 27/04/2020

has achieved Government approval to produce 60 million tonnes a year⁴ a proposed forecast objective of 15 mtpa appears reasonable. Hence Arcadis considers this a prudent approach taking into account the future capacity and forecast objectives, and the potential impact to infrastructure and disruption to network operations should this upgrade have been required to be implemented in the near future.

Hence for assessing prudence of scope, Arcadis assesses the scope of the Carmichael loop as prudent and efficient, given the reasonable requirements of the operational network and the need to export product from the Bravus mine site.

Below rail (track) infrastructure

Arcadis visited the site and undertook a complete circuit visual inspection of the below rail (track) infrastructure. This included inspection of the rail itself, sleepers, ballast and turnouts. Regarding signalling, it was noted that two train derailleurs (either side of train loadout facility) and signalling and cabling works associated with 1 in 16 turnout (Figure 6-1) were implemented.



Figure 6-1 1 – 16 turnout

The loop construction principally consists of 60 kg head hardened rail throughout (Figure 6-2).

On visual inspection, works aligned with construction proposed design and information provided on the scope of works.

From the information provided, Arcadis assesses that the scope of the below rail (track) infrastructure works is prudent and efficient.

⁴ Rise and rise of Adani: Carmichael mine may triple in size as part of planned expansion (inql.com.au)



Figure 6-2 60 kg head hardened rail on concrete sleepers

Civil works

Arcadis visited the site and undertook a complete circuit visual inspection of all civil works, inclusive of access, drainage and fencing. The project included 59 km of Armco drainage pipes in addition to reinforced concrete culverts, under rail livestock crossings and accommodation crossings. On visual inspection, works aligned with construction proposed design and information provided on the scope of works.



Figure 6-3 Reinforced concrete culvert



Figure 6-4 Armco culverts and structures

From the information provided, Arcadis assesses that the scope of the civil works is prudent and efficient.

Environmental works

Arcadis visited the site and undertook a complete circuit visual inspection of environmental works. On visual inspection, works aligned with construction proposed design and information provided on the scope of works.

On assessment of provided documentation and visual inspection at the site visit, the environmental works were considered prudent and efficient in scope. It was noted that extensive environmental infrastructure was incorporated, in line with requirements of conditions of approval for the project. Of particular note is the extent of fauna structures along the alignment, differing significantly from the inclusion of such structures on neighbouring rail infrastructure corridors. Figure 6-5 shows evidence of fauna connectivity structure (snake fencing and under rail tunnel), in some portions of the Rail Loop the inclusion of snake fencing and tunnelling was noted to be extensive.



Figure 6-5 Fauna connectivity structure – snake fencing and under track tunnel (every 100m in some locations)

Assessment of standard

Below rail (track) infrastructure works

Arcadis has reviewed the tender documentation and noted the requirement for the works to comply with the CETS and CESS, SAI/RISSB Standard specifications, National Rail Safety Law, Australian standards, regulatory requirements and relevant AS/NZS ISO Standards for Quality Management System and Safety regulatory requirements.

Visual inspections on site indicated that standard requirements had been met, and below rail (track) infrastructure are in line with the industry expected construction standards and safe rail operations, including key components of the asset configuration as related to below rail (track) infrastructure, namely:

- The implementation of a 26.5 track axle load
- The use of a maximum design speed of 50km/h (1 in 16 turnout speed) and
- Accommodations for a train length of 124 wagons and 3 locomotives

It was noted the signalling works included:

- Two train derailleurs (either side of train loadout facility)
- Signalling and cabling works associated with 1 in 16 turnout and 2 train derailleurs

All of these characteristics aligned with CRN standards and specifications based on review of documentation and the site visit.

A sample from our site inspection used to assess the standard of below rail infrastructure is provided in Figure 6-6.



Figure 6-6 Looking East towards the connection point on Newlands line

From the information provided, Arcadis assesses that the standard of the below rail (track) infrastructure is prudent and efficient.

Civil works

Arcadis visited the site and undertook a complete circuit visual inspection of civil works. This including construction of the access road and drainage works. On visual inspection, it was determined that the civil works aligned with relevant standards, including state electrical, water, fire and emergency regulations and statute.

From the information provided, Arcadis assesses that the standard of the civil works is prudent and efficient.

Environmental works

On assessment of provided documentation and visual inspection at the site visit, the Carmichael loop works complied with relevant environmental standards. It is noted that the works were undertaken in accordance with the Construction Environmental Management Plan (CEMP). A third-party final compliance audit was undertaken upon completion of the works (and sited) by a suitably qualified person. The audit conclusions outline evidence that the project environmental compliance was considered of a high standard. The final audit identified zero (0) non-conformances and that all relevant conditions were complied with and completed. The final compliance audit also noted implementation of sustainability requirements and presence of a sustainability register throughout the works.

This above noted prudence relevant to standards for environmental infrastructure and implementation of conditions of approval was further supported by the site visit – visual environmental best practice, suitable waterway crossing structures and culverts, extensive koala fencing, and fauna connectivity culverts were noted, for example. Figure 6-7 presents part of the extensive koala fencing present at the northern side of the track.



Figure 6-7 Track structure with Koala fence on the northern side

From the information provided, Arcadis assesses that the standard of the environmental works is prudent and efficient.

Assessment of cost

Arcadis has reviewed all cost information provided by Bravus and note that practical completion was achieved within schedule, with all stage gates and budgets being within approved estimates. It is also evident from the information provided that design and material decisions made would result in minimised whole of life costs based on two components of the asset configuration, namely the use of:

- 1 in 16 turnouts which creates a flatter turnout for a balloon loop track, allowing loaded trains to proceed through the straight section (i.e., through track) of the turnout, and reduces the required maintenance relative to sharper turnouts
- 60kg/m rail on concrete sleepers with minimum ballast below sleeper which increases track stability and minimises long-term wear

Benchmarking has also been used to sense-check the prudence and efficiency of the cost claim. The amount claimed for rail loop works is at a rate of \$4.995m per kilometre. Based on our professional experience, comparator greenfield rail loop projects achieve an average cost of approximately \$4.0m per kilometre – plus or minus 30% to allow for contingency. Where greenfield rail loop projects sit within this range is strongly determined by site-specific factors, the asset configuration and the scope of works.

At \$4.995m per kilometre, the Bravus works sits at the high end of tolerable thresholds type of rail loop works (at \$4.0m per kilometre plus 25% contingency i.e., lower than the +30% upper threshold). Therefore, it is important to consider the site-specific characteristics to appreciate whether they warrant Bravus' unitised costs. On closer inspection, key differences between the typical benchmark project and the Bravus rail loop works are apparent which justify a higher prudent and efficient cost. These include the following characteristics:

- The **remoteness** of the Bravus mine site is atypical, with significant work completed in order to connect it to the nearest transport connection. For the construction of the Carmichael Loop project, the remoteness of the site resulted in higher than benchmark costs for materials and elements such as rails, sleepers, culvert cells and water that needed to be transported over greater distances to complete works.
- **Environment and environmental approval** work was considered far more extensive than the typical similar rail loop project. However as noted previously environmental infrastructure was aligned with the approvals requirements and verified by a third-party auditor as compliant. The cost associated with assessment and approvals elements was necessary to align with environmental compliance, and stringent due to the location and nature of the works. This cost included factors such as the construction/installation of required fauna fencing and connectivity culverts throughout for endangered species such as the Ornamental Black Snake.
- **Labour costs** were also higher than typical due to both the remoteness of the site and political views surrounding the coal mining works reducing the pool of labour available. These factors resulted in a having to pay a premium to attract required labour to complete the rail loop works. In addition, public and environmental controversy surrounding the project, made it hard for Bravus to find contractors and consultants willing to tender for project work, hence minimising competitiveness within the tendering process and constraining the ability to achieve value for money outcomes in the procurement.
- **Track construction** is comprised of entirely 60kg head hardened track. Typical projects are comprised for lower weight track, with 60kg track sometimes reserved for rail connection and balloon loop turnouts.
- **Civil works** such as Armco drainage culverts have a longer than typical barrel length, required due to embankment heights in excess of 3m.

In addition to the above, it is noted from discussions with Bravus staff that additional non-engineering costs such as high insurance costs, activist issues which caused delays to construction work, and constraints and community pressures imposed on acquisition of resources (e.g. Bravus got steel from Onesteel) exacerbated the situation. Together, the team assessed that these factors would result in the higher costs than for less complex works. Hence the team assessed that the cost claim is considered prudent and efficient benchmarked against industry expectations – with the key cost drivers being the remoteness of the site, environmental works and ESG activism.

Based on this analysis of costs, Arcadis assesses that the cost claim for the Carmichael Rail Loop works is prudent and efficient.

6.1.2 Connection Works

Overview

The design of the connection works was developed to enable access to the port of Abbot Point for the proposed export of up to 15 Mtpa of thermal coal. As noted in the “Concept Estimate Summary – CRN Connecting Infrastructure”, the scope of works for the Connection works included the design and construction of a 1 in 25 turnout and all the associated track and civil works, complete IFC designs for the signalling of the new connection point and the required train length.

Table 6-2 provides a summary of the assessment of the connection works.

Table 6-2 Assessment of prudence for connection works

In accordance with clause 6.3.2, Schedule E of the Aurizon Network The 2017 Undertaking (UT5), was there sufficient demonstration of prudence and efficiency to satisfy:	Prudent and Efficiency Assessment Outcome		
	Scope	✓	Overall, the scope and standard for the connection works is considered prudent. However, a bottom-up build-up of costs suggests a lower prudent cost for connection works than which is claimed.
	Standard	✓	
	Cost	x	
Capital Expenditure Claim (total construction)	\$ 5,003,000		
Impact of findings on Claim	-\$ 80,456		
TOTAL ACCEPTED	\$ 4,922,544		

Assessment of scope

The connection works were constructed to enable the Carmichael Mine to export up to 15 million tonnes per annum. The connection works provide a prudent and efficient option to meet the Bravus Mine coal product transport requirements⁵.

In summary the scope requirements included:

- Design and construction of a 1 in 25 turnout and all the associated track and civil works to be constructed within
- Connection point on the current Aurizon owned Newlands Rail Network at 145.679km.
- Signalling infrastructure required for the connection point
- Construction methodologies that minimise disruption to rail traffic
- Ensuring the works are constructed in a safe manner within our Zero Harm Policy, along with minimum impact to the environment

It is also noted that the project scope aligns with the proposed design of the infrastructure. As noted in the Quality Management Plan, appropriate Project Management systems followed during the design, approvals, and construction of the proposed design.

Assessment of standard

The connection works are required to have regard to the required legislation, standards and guidelines, including Aurizon Network’s design and the CETS and CESS, Australian design and construction standards and all other State and Federal relevant legislation, standards and guidelines. The site-visit confirmed the compliance of the connection works with relevant standards (Figure 6-8)

From the available information, it is also noted that the future demand and capacity levels have been taken into account. It is evident from the Project Change Notice “CCRP-000000-PCN-PC-001005” dated 27/04/2020, about the extension of two passing loops and the balloon loop for longer trains to facilitate transfer of 15Mtpa, which was approved.

The information provided, substantiated by the visual inspection on-site, sufficiently demonstrates that the standard of the track works can be expected to fully deliver the operationally necessary system requirements.

⁵ Concept Estimate Summary – CRN Connecting Infrastructure”, Aurizon dated 01/04/2019



Figure 6-8 Rail was constructed in alignment with Aurizon CETS

Assessment of cost

Arcadis has reviewed all cost information provided by Bravus and notes that practical completion was achieved within schedule, with all stage gates and budgets being within approved estimates. It is also evident from the information provided that in completing this project would result in minimised whole of life costs based on two components of the asset configuration, namely the use of:

- **1 in 25 turnouts** which creates a flatter angle and turnout radius for loaded trains, supported a higher design speed and reduces the required maintenance relative to sharper turnouts
- **60kg/m rail on concrete sleepers with minimum ballast below sleeper** which increases track stability and minimises long-term wear

From Bravus' submission it is unclear how the itemised costs provided have been used and aggregated to arrive at the figure of \$5,003,000 pertaining to connection works. Hence, Arcadis has reviewed the itemised costs in Bravus' submission, identifying all costs relevant to connection works where the chainage extent of the connection works was calculated from the provided drawings, and adding these in a bottom-up fashion to obtain an estimate for prudent and efficient costs. Based on this bottom-up assessment, the team identified an inconsistency of \$80,456, which has been put forward to be removed from the claim.

The bottom-up estimate of connection work costs were based on Bravus' own submission, and on the subset of the costs relevant to connecting infrastructure that Bravus provided for in its documentation. The following assumptions were made when performing these calculations to ensure only connection work costs were being calculated:

- Only cost items relevant to the chainage covered by the connection works⁶ were included – hence, costs for several culverts and all formation costs were excluded
- Costs for the relevant culvert, water pipeline, service track/roads, fencing, ballast, and sleeper and rail were estimated on a pro-rata basis, based on a track-length of 500m. This total length was based on the drawings provided by Bravus for the connection works

Based on these assumptions, it appears that there is a calculation discrepancy in Bravus' submission for costs of the connection works totalling \$80,456. The team acknowledges that this discrepancy can either be due to calculation error or omission of an item in the costing spreadsheet provided. The calculations made to identify this calculation discrepancy – including details of the consideration given to each cost item is provided in Appendix C.

Based on these calculations and the information provided, Arcadis assesses that the prudent and efficient cost for connection works totals \$4,922,544, \$80,456 less than Bravus' claim of \$5,003,000, but also acknowledges that this is based upon the drawings and information provided and does not take into account the full chainage specified in the application and the exclusion of some of the total costs provided by Bravus in its claim.

7 CONCLUSION

Overall, Arcadis has assessed the scope and standard for the Bravus Carmichael Loop and connection infrastructure to be prudent and efficient. It is noted that cost of track construction works sit at the higher end of the average benchmark range, but the works' asset configuration and site-specific factors justify this, and these costs are considered prudent and efficient.

The submitted claim for connection works costs was not assessed as prudent and efficient – based on a bottom-up assessment of costs it was assessed that prudent and efficient costs were less than the claimed amount. Hence, Arcadis' assessment suggests the prudent and efficient cost for connection works be revised down by \$80,456.

Table 7-1 summarises the assessed claim amount.

Table 7-1 Summary of Bravus' claim amount and assessment revisions

Item	Bravus' claim amount	Arcadis draft assessment
Carmichael Loop	\$38,961,000	\$38,961,000
Connection works	\$5,003,000	\$4,922,544
TOTAL	\$43,964,000	\$43,883,544

A. SME FORM

BRAVUS (2020/21 CAPEX)

The following provides detail of the prudence assessment:

ASSESSMENT SUMMARY

In accordance with clause 6.3.2, Schedule E of the Aurizon Network The 2017 Undertaking (UT5), was there sufficient demonstration of prudence and efficiency to satisfy:	Prudence of <u>Scope</u>	✓
	Prudence of <u>Standard</u>	✓
	Prudence of <u>Cost</u>	x
Capital Expenditure Claim (total)		\$43.964m
Impact of findings on Claim		\$80,456
TOTAL ACCEPTED		\$43.884m

Check list	Documentation Type	Name of document
Essential documents		
Y	Project Management Plan	Details provided
Y	Breakdown of costs	Connection works – “Concept Estimate Summary – CRN Connecting Infrastructure”, Aurizon dated 01/04/2019 CRN Track and Civil works - Note for Approval (NFA), 2910 R1 and 3029 R1, dated 20 th Jan 2022 Earthworks and structures Mine End – Note for Approval 2896 R3, dated 11 Mar 2020
Y	Business Case Justification (IAR)	Details provided
Y	Commissioning data and completion, acceptance, and handover validations.	Red line markup drawings
Y	Completion report	As built drawings
Other documents		

Details	
Project Name	Bravus
Project Type	Rail Track, Signalling and Civil works
Pre-Approval	Yes
Asset Description and Location (s)	Mainline connection works with Aurizon Network Track and civil construction near Aurizon mainline - from CH 179.800 to CH 181.000 Track and civil construction of the Mine balloon loop - from CH 379.813 to CH 386.441
Expenditure Claimed	\$43.964m

PROJECT OVERVIEW

Scope

Connection works

As noted in the “Concept Estimate Summary – CRN Connecting Infrastructure”, Aurizon dated 01/04/2019, the scope of works for the “connection works” include the following.

- Design and construction of a 1 in 25 turnout and all the associated track and civil works to be constructed within
- Connection point on the current Aurizon owned Newlands Rail Network is at 145.679km.
- Complete IFC designs for the signalling of the new connection point and the required train length
- Construct the signalling infrastructure required for the connection point
- Employment of construction methodologies that minimise disruption to rail traffic
- The aim to ensure works are constructed in a safe manner in line with Bravus’ Zero Harm Policy, along with minimum impact to the environment

Track and civil construction near Aurizon mainline - from CH 179.800 to CH 181.000

Reference Drawing numbers:

- CCRP-ZE065D-DRW-CV-105320
- AUR-Q-0788-0026

Comprised of:

- Construction of the track and associated civil works
- Connection point on the current Aurizon owned Newlands Rail Network is at 145.679km.
- Complete IFC designs for the signalling of the new connection point and the required train length
- to ensure safe exit and entry of the Aurizon Network
- Construct the signalling required for the connection point

Ensuring that:

- Construction methodologies that minimise disruption to rail traffic are employed
- Quality client services to ensure the business objectives of Aurizon are met and our external client CRN can safely access the Aurizon owned and operated CQCN
- Works are constructed in a safe manner in line with Bravus' Zero Harm Policy, along with minimum impact to the environment

Mine Balloon loop construction works (between CH 379.813 to CH 386.441)

Reference Drawing numbers:

- CCRP-ZE065D-DRW-CV-605356_RLM[0]
- CCRP-ZE065D-DRW-CV-605357_RLM_1
- CCRP-ZE065D-DRW-CV-605358_RLM[0]
- CCRP-ZE065D-DRW-CV-605359_RLM[0]
- CCRP-ZE065D-DRW-CV-605360_RLM_1
- CCRP-ZE065D-DRW-CV-605361_RLM[0]
- CCRP-ZE065D-DRW-CV-605362_RLM[0]

Comprised of:

- Construction of the track and associated civil works between CH 379.813 to CH 386.441
- Construction of a new 1 in 16 turnout and associated signalling.
- Construction of two new de-railers (Siemens)
- Mobilisation of personnel to site as required for the duration of the project.
- Mobilisation of all Track Construction Machinery as required (e.g. New Track construction (NTC), Track laying machine, tampers, regulators, grinders, high rails, locomotives, ballast wagons, ballast ploughs, octopus, forklifts and cranes)
- Provision of Rolling Stock Operator (RSO) requirements for construction to the extent that it relates to construction and construction plant
- Quality management plan including all testing, commissioning, and certification requirements

Ensuring that:

- Safety Management System documents are aligned with CRN SMS requirements including all Policy, Procedures, Plans, and Standards, etc
- Safe Work Method Statements are developed prior to commencing the works covered by the SWMS
- Fatigue Management Plan and Health and Fitness Plan are adhered to

Business Case

The construction of a mine spur line and balloon loop is the minimum requirement to connect Bravus mine to the Newlands coal system/ Central Queensland Coal Network.

The spur line consists of the minimum length of track specified in the Rail connection Agreement

Mine Balloon Loop (Total loop length 6.6km - from CH 379.813 to CH 386.441)

- Constructed to hold 3 Newlands sized trains or 2 Goonyella Length Trains
- Prudency and Efficiency considerations
 - o Ability to stow 3 Newlands sized trains during a system shutdown
 - o Ability to accept Goonyella Length trains (GLTs) / optionality to deal with proposed 2019 Concept Study Expansion to GLTs
 - o The ability to run GLTs provides optionality to transport coal out more efficiently through CQCN during for example natural disaster
- Extended passing loops and balloon loop for longer trains consistent with anticipated demand (as reflected in Project Change Notice “CCRP-000000-PCN-PC-001005”)

On site findings and other considerations

Track and civil construction near Aurizon mainline - from CH 179.800 to CH 181.000



20220726_142009 – Looking East towards the connection point on Newlands line



20220726_142425 – Access Road Turn around - Looking East



20220726_142425 – Access Road Turn around - Looking West



20220726_141436 – Track structure near Km 181



20220726_142703 – Culvert C027_1



20220726_142415 – Culvert C027_2_down stream



20220726_142250 – Culvert C027_3_up stream



20220726_142324 – Culvert C027_4_up stream



20220726_142250 – Culvert C027_3_up stream



20220726_142324 – Culvert C027_4_up stream

Photos below show the Track structure with Koala fence on the Northern side of the CRN track



20220726_141057 – Track structure with Koala fence on the Northern side



20220726_141142 – Track structure with Koala fence on the Northern side



20220726_143655 – Cut and drain near CH 180.700



20220726_143655 – Cut and drain near CH 180.700

Photos below show the formation widening for signalling equipment and access road at formation level



20220726_135551 – Signalling Equipment - Looking West



20220726_135551 – Formation widening/access pad Rail In- Looking East

From the information supplied and the site visit, the following key infrastructure identified between CH 179.800 and CH 181.000

- Earthworks along track length between CH 179.800 and CH 181.000 – 1.2Km
- Culvert C027 - 1x2.4x2.4 RCBC at CH 179.758
- Culvert C027a - 2x0.9 RCP at CH 179.920
- Culvert C030 - 5x0.9 RCP at CH 180.041
- Culvert C031 - 10x0.9 RCP at CH 180.224
- Culvert C032 - 1x0.9 RCP at CH 180.563
- Signalling, associated cabling works and communications
- Access Road and formation widening to accommodate signalling equipment and vehicle access
- Fencing
- Track structure that includes 60kg/m Rail, concrete sleepers and minimum ballast depth below sleepers as per standard
- Diversion drains

Mine Balloon loop construction works (between CH 379.813 to CH 386.441)

Turnout, formation widening for signalling equipment and access road at Km 379.813



20220726_092930



20220726_093213



20220726_093052



20220726_093057

Track structure - Rail size, installed ballast depth and formation width near CH 379.813



20220726_093052



20220726_093057



20220726_093057

Culvert No. C483 at CH 384.313 - 26 x 0.9m CMP



20220726_095429



20220726_095554

Occupational crossing ID OCC0606AG at CH 384.176



20220726_100439



20220726_104226

Train derailer (Siemens) near CH 384.000



20220726_101247



20220726_101853

Formation widening near the train loadout for Bad order siding and access at formation level



20220726_104237

Culverts C481 and C482



20220726_103111 – Culvert C481 at CH 382.843 - 25 x 1.2m CMP



20220726_103554 – Culver C482 at CH 382.906 - 2 x 1.2m CMP

Snake fence and culvert within the balloon loop area



20220726_104818 – Snake fence within the balloon loop area



20220726_104827 – Snake fence and culvert

From the information supplied and the site visit, the following key infrastructure identified between CH 379.813 and CH 386.441

- Earthworks along the track length between CH 379.813 and CH 386.441 – 6.6Km
- Culvert C481 - 25x1.2 CMP at CH 382.843
- Culvert C482 - 2x1.2 CMP at CH 382.906
- Culvert C482a - 1x1.2 CMP at CH 383.773
- Culvert C483 - 26x0.9 CMP at CH 384.313
- Signalling, associated cabling works and communications
- 1 in 16 SNX turnout
- Two train derailleurs (CM11A and CM11B)
- Two occupational crossings (OCC0605HR and OCC0606AG)
- Access Road and formation widening to accommodate signalling equipment and vehicle access
- Fencing
- Track structure that includes 60kg/m Rail, concrete sleepers and minimum ballast depth below sleepers as per standard
- Diversion drains
- Water pipeline

Completion Summary

In this section the assessment of prudence and efficiency of the scope, standard and cost of Bravus' capital works is summarised. The summary is split into three sub-sections addressing each area assessed. Namely:

- **Section 1** considers whether the **scope** prudent and efficient,
- **Section 2** considers whether the **standard** is prudent and efficient, and finally
- **Section 3** considered whether the **cost** is prudent and efficient

SECTION 1 - IS THE SCOPE PRUDENT AND EFFICIENT?

Item No.	Question	Response (Y/N)	Comments/Findings	Source	Impact to claim
1.1	Does the project align with proposed design	Y	The project scope aligns with the proposed design of the infrastructure. As noted in the Quality Management Plan, appropriate Project Management systems followed during the design, approvals, and construction of the proposed design.	CCRP-000000-PLN-QA-000001[1], Quality Management Plan.	Nil
1.2	Have there been any additional submissions, requests, or consultations to the QCA that have not been addressed appropriately?	N	All the documents provided to QCA are listed in the “Confidential” section of the SharePoint” section. From the available information, it is noted that the sufficient documents have been submitted to QCA.	All the documents submitted within the “Confidential” folder on QCA SharePoint. <ul style="list-style-type: none"> - Business Case - Scope of work - Specifications - Notes for Approval - Change request - Approvals 	Nil
1.3	Is there a reasonable expectation of the demand for capacity to support the project?	Y	From the available information, it is noted that the future demand and capacity levels have been taken into account. It is evident from the Project Change Notice “CCRP-000000-PCN-PC-001005” dated 27/04/2020, about the extension of two passing loops and the balloon loop for longer trains to facilitate transfer of 15Mtpa, which was approved.	Project Change Notice “CCRP-000000-PCN-PC-001005” dated 27/04/2020	Nil

SECTION 2 - IS THE STANDARD PRUDENT AND EFFICIENT?

Item No.	Question	Response (Y/N)	Comments/Findings	Source	Impact to claim
2.1	Does the standard reflect the current demand and likely future capacity levels and type of traffic?	Y	From the available information, it is noted that the future demand and capacity levels have been taken into account. It is evident from the Project Change Notice "CCRP-000000-PCN-PC-001005" dated 27/04/2020, about the extension of two passing loops and the balloon loop for longer trains to facilitate transfer of 15Mtpa, which was approved.	Project Change Notice "CCRP-000000-PCN-PC-001005" dated 27/04/2020	Nil
2.2	Is the standard consistent with the asset management objectives?	Y	From the available information, it is noted that the project designs were adequately reviewed and approved by Registered Professional Engineer of Queensland (RPEQ) before construction. The applied standard of works aligns with the general rail industry standards, which by the nature of being an approved standard are considered industry leading practice to achieve an optimised and balanced whole of life outcomes.	Scope of work documents CCRP-000000-SOW-SV-000001[0] CCRP-000000-SOW-SV-000002[2] CCRP-CA002A-SOW-CP-000001[0] CCRP-CA004A-SOW-CP-000001[0] CCRP-CC009C-SOW-CP-000001_Track Construction CCRP-CC018B-SOW-CN-000001_Portside Civil CCRP-CC018D-SOW-CN-000001[0] CCRP-CE001C-SOW-DE-000002[1] CCRP-CE001C-SOW-DE-000003[0] Scope of Work_Tie-in SOW-Ch379-Mine-Loop	Nil
2.3	Is the standard consistent with the requirements of established Rail Industry and Aurizon Standard Civil Specifications s?	Y	From the information provided and visual inspection on site, the standard applied is consistent with established and approved rail standards.	CCRP-000000-PLN-QA-000001[1], Quality Management Plan. Redline markup drawings, Issue for construction (IFC) and As-built drawings (Response to RFI dated 28/07/2022)	Nil

Item No.	Question	Response (Y/N)	Comments/Findings	Source	Impact to claim
2.4	Is the standard of works consistent with having regard for the requirements of Australian design and construction standards (including RPEQ or equivalent sign off)? If not, have the appropriate risk assessments and verification processes been implemented in the development of the standard	Y	From the available information, it is noted that the project designs and drawings were adequately reviewed and approved by Registered Professional Engineer of Queensland (RPEQ) before construction.	Redline markup drawings, Issue for construction (IFC) and As-built drawings (Response to RFI dated 28/07/2022) CCRP-000000-PLN-QA-000001[1], Quality Management Plan. Scope of work documents: CCRP-000000-SOW-SV-000001[0] CCRP-000000-SOW-SV-000002[2] CCRP-CA002A-SOW-CP-000001[0] CCRP-CA004A-SOW-CP-000001[0] CCRP-CC009C-SOW-CP-000001_Track Construction CCRP-CC018B-SOW-CN-000001_Portside Civil CCRP-CC018D-SOW-CN-000001[0] CCRP-CE001C-SOW-DE-000002[1] CCRP-CE001C-SOW-DE-000003[0] Scope of Work_Tie-in SOW-Ch379-Mine-Loop	Nil
2.5	Is the standard consistent with the operational requirements and other as per discussions with or submission by stakeholders?	Y	From the information provided, the standard and level of works applied is consistent with operational requirements in that it is deemed necessary to ensure a reliable and safe operational railway.	CCRP-000000-PLN-QA-000001[1], Quality Management Plan.	Nil

SECTION 3 - IS THE COST PRUDENT AND EFFICIENT

Item No.	Question	Response (Y/N)	Comments/Findings	Source	Impact to claim
3.1	Was the project managed effectively with regards to the customer, economic and safety, environmental and sustainability requirements and considerations?	Y	<p>From the available information, the following is noted.</p> <ul style="list-style-type: none"> No major environmental incidents were reported by the principal contractor and a EMP was approved and implemented No LTI's were sustained, and no major incidents reported 	<p>Redline markup drawings, Issue for construction (IFC) and As-built drawings (Response to RFI dated 28/07/2022)</p> <p>CCRP-000000-PLN-QA-000001[1], Quality Management Plan.</p> <p>Site visit and discussions with CRN/BRC representatives</p>	Nil
3.2	Was the project managed effectively with regards to schedule and cost	Y	<p>From the available information, the following is noted.</p> <ul style="list-style-type: none"> Adequate information was included in the scope of works and change request documents Practical completion was achieved within schedule, with all stage gates and budget within approved estimate 	<p>CCRP-000000-PLN-QA-000001[1], Quality Management Plan.</p> <p>Project Change Notice "CCRP-000000-PCN-PC-001005" dated 27/04/2020</p> <p>Scope of work documents:</p> <ul style="list-style-type: none"> - CCRP-000000-SOW-SV-000001[0] - CCRP-000000-SOW-SV-000002[2] - CCRP-CA002A-SOW-CP-000001[0] - CCRP-CA004A-SOW-CP-000001[0] - CCRP-CC009C-SOW-CP-000001_Track Construction - CCRP-CC018B-SOW-CN-000001_Portside Civil - CCRP-CC018D-SOW-CN-000001[0] - CCRP-CE001C-SOW-DE-000002[1] - CCRP-CE001C-SOW-DE-000003[0] - Scope of Work_Tie-in - SOW-Ch379-Mine-Loop 	Nil

Item No.	Question	Response (Y/N)	Comments/Findings	Source	Impact to claim
3.3	Was the minimization of whole of life costs considered adequately and other principles defined in the strategic asset management plan?	Y	<p>From the information provided, achieving the benefits/outcomes by completing this project would result in minimised whole of life costs.</p> <p>One of the examples witnessed on the drawings and during site visit is the use of 60Kg/m Rail throughout the project and use of 60kg/m (HH - Head Hardened) Rails within the sharp curves, to reduce/minimise the rail maintenance works i.e. grinding.</p>	<p>Redline markup drawings, Issue for construction (IFC) and As-built drawings (Response to RFI dated 28/07/2022)</p> <p>CCRP-000000-PLN-QA-000001[1], Quality Management Plan.</p> <p>Project Change Notice “CCRP-000000-PCN-PC-001005” dated 27/04/2020</p> <p>Scope of work documents:</p> <ul style="list-style-type: none"> - CCRP-000000-SOW-SV-000001[0] - CCRP-000000-SOW-SV-000002[2] - CCRP-CA002A-SOW-CP-000001[0] - CCRP-CA004A-SOW-CP-000001[0] - CCRP-CC009C-SOW-CP-000001_Track Construction - CCRP-CC018B-SOW-CN-000001_Portside Civil - CCRP-CC018D-SOW-CN-000001[0] - CCRP-CE001C-SOW-DE-000002[1] - CCRP-CE001C-SOW-DE-000003[0] - Scope of Work_Tie-in - SOW-Ch379-Mine-Loop 	Nil
3.4	Was a reasonable procurement methodology and cost competitive procurement process used to select and complete the project?	Y	<p>Connection works to the Aurizon network on the Newlands line was carried out by Aurizon under a separate agreement/contract.</p> <p>Apart from the connection works, all the other works were awarded to multiple contractors under various contracts. From the available information, it is note that adequate</p>	<p>CCRP-000000-PLN-QA-000001[1], Quality Management Plan.</p> <p>Project Change Notice “CCRP-000000-PCN-PC-001005” dated 27/04/2020</p> <p>Scope of work documents:</p> <ul style="list-style-type: none"> - CCRP-000000-SOW-SV-000001[0] - CCRP-000000-SOW-SV-000002[2] - CCRP-CA002A-SOW-CP-000001[0] 	Nil

Item No.	Question	Response (Y/N)	Comments/Findings	Source	Impact to claim
			information was included in the scope of works and change request documents.	<ul style="list-style-type: none"> - CCRP-CA004A-SOW-CP-000001[0] - CCRP-CC009C-SOW-CP-000001_Track Construction - CCRP-CC018B-SOW-CN-000001_Portside Civil - CCRP-CC018D-SOW-CN-000001[0] - CCRP-CE001C-SOW-DE-000002[1] - CCRP-CE001C-SOW-DE-000003[0] - Scope of Work_Tie-in - SOW-Ch379-Mine-Loop <p>Note for Approval documents</p> <ul style="list-style-type: none"> - NFA 3174 Tie In Works Aurizon_29 06 20 - NFA 3029 for Port-side Civil Earthworks package of Rail project – signed - NFA 2896 R3 (Balloon Loop) BMD Construction Pty Ltd - APPROVED NFA 1229 NFA 2896R5 FOR CRPI CONSTRUCTION CONTRACTS - Amdt. NFA 3029R1 and 2910R1 for Martinus Rail - signed 	
3.5	Do the cost elements of the project benchmark reasonably relative to the scale, nature, cost and complexity of the project?	Y	<p>Connection works to the Aurizon network on the Newlands line was carried out by Aurizon under a separate agreement/contract.</p> <p>The works were awarded to multiple contractors under various contracts. From the available information, it is note that adequate information was included in the scope of works and change request documents.</p>	<p>Note for Approval documents</p> <ul style="list-style-type: none"> - NFA 3174 Tie In Works Aurizon_29 06 20 - NFA 3029 for Port-side Civil Earthworks package of Rail project – signed - NFA 2896 R3 (Balloon Loop) BMD Construction Pty Ltd - APPROVED NFA 1229 NFA 2896R5 FOR CRPI CONSTRUCTION CONTRACTS - Amdt. NFA 3029R1 and 2910R1 for Martinus Rail - signed <p>Project Change Notice “CCRP-000000-PCN-PC-001005” dated 27/04/2020</p>	Nil

Item No.	Question	Response (Y/N)	Comments/Findings	Source	Impact to claim
			<p>During the site visit the following were noted. due to the remote location of the project,</p> <ul style="list-style-type: none"> - transportation of construction material and labour costs were higher than the standard industry - Supply and transportation of water for construction was sourced from longer distances 	<p>CCRP-000000-PLN-QA-000001[1], Quality Management Plan.</p> <p>Site visit and discussions with CRN/BRC representatives</p>	
3.6	Have the works been scheduled and staged to minimise disruption to the operation of users?	Y	<p>Connection works to the Aurizon network on the Newlands line was carried out by Aurizon under a separate agreement/contract.</p> <p>All the construction works outside the Aurizon corridor were greenfield in nature hence no disruptions to rail users were noted. However, these works cross multiple public and private roads where adequate quality and safety measures were undertaken to carry out the work at those locations.</p>	<p>CCRP-000000-PLN-QA-000001[1], Quality Management Plan.</p> <p>Site visit and discussions with CRN/BRC representatives</p> <p>Scope of work documents:</p> <ul style="list-style-type: none"> - CCRP-000000-SOW-SV-000001[0] - CCRP-000000-SOW-SV-000002[2] - CCRP-CA002A-SOW-CP-000001[0] - CCRP-CA004A-SOW-CP-000001[0] - CCRP-CC009C-SOW-CP-000001_Track Construction - CCRP-CC018B-SOW-CN-000001_Portside Civil - CCRP-CC018D-SOW-CN-000001[0] - CCRP-CE001C-SOW-DE-000002[1] - CCRP-CE001C-SOW-DE-000003[0] - Scope of Work_Tie-in - SOW-Ch379-Mine-Loop <p>Note for Approval documents</p>	Nil

Item No.	Question	Response (Y/N)	Comments/Findings	Source	Impact to claim
				<ul style="list-style-type: none"> - NFA 3174 Tie In Works Aurizon_29 06 20 - NFA 3029 for Port-side Civil Earthworks package of Rail project – signed - NFA 2896 R3 (Balloon Loop) BMD Construction Pty Ltd - APPROVED NFA 1229 NFA 2896R5 FOR CRPI CONSTRUCTION CONTRACTS - Amdt. NFA 3029R1 and 2910R1 for Martinus Rail - signed 	

B. RFI REGISTER

Date at publishing: =NOW()

Priority RFI General Note:

All references within these RFIs relate only to the assets being claimed under the PIC scheme

RFI #	Project Reference (i.e. Document name or reference)	Arcadis' Request	Submitted date	Submitted by:	Bravus Response		RFI Status and Close out details		
		Documents Requested	Reasoning/Criteria (refer sheet 2)			Date	Comment	Close out Date	Comment
1	N/A	Project management plan or other documentation for the project which provides information on engineering management for the establishment of: Cost/Schedule/Scope/Quality baselines, including the requirements or standards adopted?	Required for scope, cost and, standard assessment	20/6/2022	Arcadis	27/7/2022	Details provided	30/7/2022	Closed
2	N/A	schedule or program showing planned progress against actual. If there were any significant delays or disruptions, appropriate documentation that explains reasons for the delay and impact to the project	Criteria 2.5	20/6/2022	Arcadis	27/7/2022	Details provided	30/7/2022	Closed
3	N/A	Scope - design and delivered - if there were any significant changes to scope, reasoning and impact to the project	Criteria 1.4, 1.2	20/6/2022	Arcadis	27/7/2022	Details provided	30/7/2022	Closed
4	N/A	Quality baselines, including the requirements or standards adopted - if there was any non-compliance with required standards - documentation and approvals for this non-compliance	Criteria 3.1, 3.3, 3.4	20/6/2022	Arcadis	27/7/2022	Details provided	30/7/2022	Closed
5	N/A	Documentation providing information for any procurement activities, for example <ul style="list-style-type: none"> •How was the works procured? •Was there a competitive tender process? •How was this evaluated? •What was the basis of award? Information Provided should include but not be limited to suitably qualified Construction, Engineering Design Services and Environmental planning/assessment specialists	Criteria 2.3	20/6/2022	Arcadis	27/7/2022	Details provided	30/7/2022	Closed
6	N/A	Breakdown/ more detail is required on what the items that build the costs are made up of (i.e. at next level of WBS). For example, we have a line item for signalling but no breakdown of elements eg x No. of signals or interlocking or level crossing. So no real idea what the costs apply to.	Criteria 2.4	20/6/2022	Arcadis	27/7/2022	Details provided	30/7/2022	Closed
7	N/A	Based on the cost claim not being indicative of the total spent - to assess the breakdown, would it be possible to get the percentage distribution of the costs for major items, i.e.: - track X% of total - environment approvals X% of total - connecting infrastructure X% of total	Criteria 2.4	20/6/2022	Arcadis	22/7/2022	Sufficient detail was provided through additional cost spreadsheet and then supplemented by discussions on site to enable assessment.	30/7/2022	Closed
8	N/A	Is there a baseline estimate for the project, prior to tenders being received?. If so could this be provided under the same basis as the above. That is for the baseline, track was estimated as X% of the total, environmental approvals X% etc.	Criteria 2.4, 2.5	20/06/2022	Arcadis	22/7/2022	Removed - solution from RFI7 applied	30/7/2022	Closed
9	N/A	Is there a WBS breakdown below the top level available? If so could this be provided. If it is easier to do the percentage breakdowns above in line with the WBS - maybe send us this first and we can confirm whether to apply that the breakdown provided above.	Criteria 2.4, 2.5	20/6/2022	Arcadis	22/7/2022	Removed - solution from RFI7 applied	30/7/2022	Closed
10	N/A	Where is the change request information (register) forming the basis and justification for the CRNs for the project?	Criteria 2.1, 2.5	20/6/2022	Arcadis	27/7/2022	Details provided	30/7/2022	Closed
11	N/A	Is there any ITPs, handover documentation, and test reports available?	Criteria 3.2, 3.4, 3.5	20/6/2022	Arcadis	27/7/2022	Details provided	30/7/2022	Closed
12	N/A	Is there a Business Case or Investment Justification document	Criteria 1.2,1.4,1.5, 2.2	20/6/2022	Arcadis	27/7/2022	Details provided	30/7/2022	Closed
13	N/A	Asset Management Plan and Asset Management Strategy	Criteria 1.1, 1.3	20/6/2022	Arcadis	27/7/2022	Details provided in discussions with Bravus staff.	30/7/2022	Closed
14	N/A	Provision of evidence for planning pathway and approvals for the works such as Environmental Impact Statement (EIS)	Criteria 2.1, 2.5	21/6/2022	Arcadis	27/7/2022	Details provided	15/8/2022	Closed
15	N/A	Evidence of conditions of approval and plans supporting the discharge of any obligations such as Construction Environmental Management Plan (CEMP) or MNESMP	Criteria 2.1, 2.5	21/6/2022	Arcadis	27/7/2022	Details provided	15/8/2022	Closed
16	N/A	Identify any evidence of costs associated with planning and approvals	Criteria 2.1, 2.5	21/6/2022	Arcadis	22/7/2022	Removed - solution from RFI7 applied	15/8/2022	Closed
17	N/A	Evidence of any audits and/or inspections conducted during delivery in relation to Environmental obligations	Criteria 2.1	21/6/2022	Arcadis		Details provided	15/8/2022	Closed
18	N/A	Identification and Satisfaction of sustainability objectives for these works	Criteria 2.1	21/6/2022	Arcadis	27/7/2022	Details provided	15/8/2022	Closed
19	N/A	Cross section drawings along the balloon loop and the connection works to assess/estimate earthwork quantities, including access road, diversion drains etc.	Required for scope, cost and, standard assessment	22/7/2022	Arcadis	15/8/2022	Email received from Ian Gibbons on the 15th Aug 2022 confirming that these drawings are uploaded into sharepoint.	15/8/2022	Closed
20	N/A	Typical cross section of the track structure including ballast section, formation and drainage details	Required for scope, cost and, standard assessment	22/7/2022	Arcadis	15/8/2022	Email received from Ian Gibbons on the 15th Aug 2022 confirming that these drawings are uploaded into sharepoint.	15/08/2022	Closed
21	N/A	Culvert drawings including down stream protection works	Required for scope, cost and, standard assessment	22/7/2022	Arcadis	15/8/2022	Email received from Ian Gibbons on the 15th Aug 2022 confirming that these drawings are uploaded into sharepoint.	15/8/2022	Closed
22	N/A	The balloon loop cost breakdown has 2 x derailleurs - please provide drawings with location of these 2-derailleurs	Required for scope, cost and, standard assessment	22/7/2022	Arcadis	15/8/2022	Email received from Ian Gibbons on the 15th Aug 2022 confirming that these drawings are uploaded into sharepoint.	15/8/2022	Closed
23	N/A	Bad order siding - Turnout and Buffer stop for the bad order siding are not in the Mine balloon costs, where are these costs included?	Required for scope, cost and, standard assessment	22/7/2022	Arcadis	15/8/2022	As noted during site visit that the Bad order siding has not been built yet, and is proposed to be built later this year. Based on the conversations with Bravus personnel during the site visit, they have confirmed that costs associated with bad order siding are not included in the total cost/claim.	15/8/2022	Closed
24	N/A	Costs associated with early works carried out (relocating utilities, clearing and grubbing etc) - are these costs included in Formation works?	Required for scope, cost and, standard assessment	22/7/2022	Arcadis	15/8/2022	Scope of works documents and Issue for Construction drawings detail these works	15/8/2022	Closed

C. CONNECTION WORKS CALCULATION

This appendix provides further details on the bottom-up calculations conducted on Bravus' submitted costs to obtain a prudent and efficient estimate for the connection works.

Table 7-2 provides all the cost line items and their costs for the construction specified in the application, which contain all costs pertaining to the connection works, plus additional works completed in the wider Bravus project. Based on the assessment of drawings provided by Bravus, the total works summarised here pertain to 2.8 km of work, while the connection works are 500m of work. The last column in this table provides justification used to either include or exclude the line item in the calculation of the prudent and efficient costs of the connection works, and the basis of this inclusion.

Table 7-3 summarises the calculations made based on the relevant included costs to obtain an estimate of prudent and efficient connection works' costs.

Table 7-2 Cost items and basis of inclusion in prudent and efficient estimate

Asset Type	Level 1 - Asset Class	Level 2 - Asset Descriptions	Total Capitalization	How cost item was incorporated into prudent and efficient estimate of connection works
Buildings	Formation	179.469-182.269 - FORMATION	\$9,365,986	Excluded – formation works were not a component of connection works.
Buildings	RCBC Culverts	179.758 CULVERT C027 1x2.4x2.4 RCBC FC7	\$ 355,552	Included based on per kilometre rate of item multiplied by 500m (scope of connection works)
Buildings	RCBC Culverts	181.405 CULVERT C033Pa 2x1.5x1.2RCBC FC7	\$883,953	Excluded – culvert outside of relevant chainage.
Buildings	RCBC Culverts	181.409 CULVERT C033Pb 2x1.5x1.2RCBC FC7	\$ 883,953	Excluded – culvert outside of relevant chainage.
Buildings	RCBC Culverts	181.413 CULVERT C033Pc 2x1.5x1.2RCBC FC7	\$883,953	Excluded – culvert outside of relevant chainage.
Buildings	RCBC Culverts	181.417 CULVERT C033Pd 2x1.5x1.2RCBC FC7	\$883,953	Excluded – culvert outside of relevant chainage.
Buildings	RCBC Culverts	181.422 CULVERT C033Pe 2x1.5x1.2RCBC FC7	\$883,953	Excluded – culvert outside of relevant chainage.
Buildings	RCBC Culverts	181.426 CULVERT C033FPa 2x1.5x1.2RCBCFC7	\$784,946	Excluded – culvert outside of relevant chainage.
Buildings	RCBC Culverts	181.430 CULVERT C033FPb 2x1.5x1.2RCBCFC7	\$784,946	Excluded – culvert outside of relevant chainage.
Buildings	RCBC Culverts	181.434 CULVERT C033FPc 2x1.5x1.2RCBCFC7	\$784,946	Excluded – culvert outside of relevant chainage.
Buildings	RCBC Culverts	181.438 CULVERT C033FPd 2x1.5x1.2RCBCFC7	\$784,946	Excluded – culvert outside of relevant chainage.
Buildings	RCBC Culverts	181.442 CULVERT C033FPe 2x1.5x1.2RCBCFC7	\$784,946	Excluded – culvert outside of relevant chainage.
Buildings	RCP Culverts	179.920 CULVERT C027a 2 x 0.9 RCP FC7	\$382,638	Excluded – culvert outside of relevant chainage.
Buildings	RCP Culverts	180.041 CULVERT C030 5 x 0.9 RCP FC7	\$927,011	Excluded – culvert outside of relevant chainage.
Buildings	RCP Culverts	180.224 CULVERT C031 10 x 0.9 RCP FC7	\$1,998,661	Excluded – culvert outside of relevant chainage.
Buildings	RCP Culverts	180.563 CULVERT C032 1 x 0.9 RCP FC7	\$158,447	Excluded – culvert outside of relevant chainage.
Buildings	Water Pipeline	179.469-182.269 - WATER PIPELINE	\$1,668,342	Included based on per kilometre rate of item multiplied by 500m (scope of connection works)

Buildings	Service Track/Roads	179.469-182.269 - RAIL SERVICE TRACK	\$995,051	Included – based on per kilometre rate of item multiplied by 500m (scope of connection works)
Buildings	Fencing	179.469-182.269 - FENCING	\$679,079	Included – based on per kilometre rate of item multiplied by 500m (scope of connection works)
Buildings	Ballast	179.469-182.269 - BALLAST	\$3,830,843	Included – based on per kilometre rate of item multiplied by 500m (scope of connection works)
Buildings	Sleeper & Rail	179.469-182.269 - SLEEPERS	\$5,717,267	Included – based on per kilometre rate of item multiplied by 500m (scope of connection works)
Buildings	Sleeper & Rail	179.469-182.269 - TANGENTS & LARGE CURVE RAIL	\$2,827,421	Included – based on per kilometre rate of item multiplied by 500m (scope of connection works)
Buildings	Sleeper & Rail	179.469-182.269 - TIGHT CURVED RAIL	\$2,310,008	Included – based on per kilometre rate of item multiplied by 500m (scope of connection works)
Buildings	Turnout	179.469 TURNOUT 9A	\$259,005	Included in full – turnout is fully contained in the scope of the connection works
Buildings	Signalling	179.469-182.269 - SIGNALLING	\$1,203,495	Included in full – the vast majority of signalling works are at the connection works
Buildings	Communication	179.469-182.269 - TELECOM	\$177,266	Included in full – the vast majority of telecom works are at the connection works

Table 7-3 Bottom-up cost build-up of prudent and efficient cost of connection works

Asset Type	Level 1 - Asset Class	Level 2 - Asset Descriptions	Total Capitalization	\$ per km cost	Prudent and efficient inclusion
Buildings	RCBC Culverts	179.758 CULVERT C027 1x2.4x2.4 RCBC FC7	\$ 355,552	\$126,982.91	\$63,491.45
Buildings	Water Pipeline	179.469-182.269 - WATER PIPELINE	\$1,668,342	\$595,836.27	\$297,918.13
Buildings	Service Track/Roads	179.469-182.269 - RAIL SERVICE TRACK	\$995,051	\$355,375.53	\$177,687.76
Buildings	Fencing	179.469-182.269 - FENCING	\$679,079	\$242,528.16	\$121,264.08
Buildings	Ballast	179.469-182.269 - BALLAST	\$3,830,843	\$1,368,158.08	\$684,079.04
Buildings	Sleeper & Rail	179.469-182.269 - SLEEPERS	\$5,717,267	\$2,041,881.02	\$1,020,940.51
Buildings	Sleeper & Rail	179.469-182.269 - TANGENTS & LARGE CURVE RAIL	\$2,827,421	\$1,009,793.12	\$504,896.56
Buildings	Sleeper & Rail	179.469-182.269 - TIGHT CURVED RAIL	\$2,310,008	\$825,002.95	\$412,501.47
Buildings	Turnout	179.469 TURNOUT 9A	\$259,005	N/A – cost included in its entirety	\$259,004.89
Buildings	Signalling	179.469-182.269 - SIGNALLING	\$1,203,495	N/A – cost included in its entirety	\$1,203,494.58
Buildings	Communication	179.469-182.269 - TELECOM	\$177,266	N/A – cost included in its entirety	\$177,265.52
Total prudent and efficient estimate of connection works					\$4,922,544.00
Bravus submission					\$5,003,000
Discrepancy identified					\$80,456

D. LIST OF DOCUMENTS PROVIDED

The following is a list of all documents provided by Bravus for this assessment:

Initial submission

- Carmichael PIC application cost breakdown
- Carmichael Rail Loop diagram
- Clarification on infrastructure included in Bravus claim
- CRN Newlands Connection diagram
- CRN Newlands Connection - AUR-C-0788-0002#E

RFI references

- Redline markup drawings
- Issue for construction (IFC) As-built drawings
- CRN Asset Register_Summery_R18 CONFIDENTIAL

Scope of work documents

- CCRP-000000-SOW-SV-000001[0]
- CCRP-000000-SOW-SV-000002[2]
- CCRP-CA002A-SOW-CP-000001[0]
- CCRP-CA004A-SOW-CP-000001[0]
- CCRP-CC009C-SOW-CP-000001_Track Construction
- CCRP-CC018B-SOW-CN-000001_Portside Civil
- CCRP-CC018D-SOW-CN-000001[0]
- CCRP-CE001C-SOW-DE-000002[1]
- CCRP-CE001C-SOW-DE-000003[0]
- Scope of Work_Tie-in
- SOW-Ch379-Mine-Loop

PEP

- CCRP-CC009D-PLN-PM-000001_Track Construction
- CCRP-CC013B-PLN-PM-000001_BMD PEP
- CCRP-CE001C-PLN-PM-000001_Siemens PEP

Specifications, QMP

- CCRP-000000-PLN-QA-000001[1]
- CCRP-ZE065D-SPC-CV-000003[5]
- CCRP-ZE065D-SPC-CV-000006[1]
- CCRP-ZE065D-SPC-RL-000001[3]
- CCRP-ZE065D-SPC-RL-000004[1]
- CCRP-ZE065D-SPC-ST-000001[2]

NFA for MR & BMD

- Amdt. NFA 3029R1 and 2910R1 for Martinus Rail – signed
- APPROVED NFA 1229 NFA 2896R5 FOR CRPI CONSTRUCTION CONTRACTS
- NFA 2896 R3 (Balloon Loop) BMD Construction Pty Ltd
- NFA 3029 for Port-side Civil Earthworks package of Rail project – signed
- NFA 3174 Tie In Works Aurizon_29 06 20

Change

- CRN Change Register

Quality – QCA evidence

- CCRP-CC013B-REC-QA-006724[0]
- CCRP-CC018D-REC-QA-003234_A - SBC-P86

Quality – BMD Civil QA - C6.3 Balloon Loop CH379600-386441

- CCRP-CC013B BMD Civil QA Lots C6.3 Mine Loop (99 Lot Conformance reports)
- CCRP-CC013B BMD NCRs C6.3 (3 Non-Conformance reports)
- CCRP-CC013B BMD Civil QA

Quality documentation, including documentation pertaining to

- Martinus QA - CH179745-182545 TPN Tie in
- Martinus Track QA - C6.3 Mine loop
- Siemens Signals QA

Business Case

- Business Case for Spur Line and Loops
- Loop capacity
- PCN-R-01005 (Additional Budget) Extension of Passing and Mine balloon loop RevC – signed
- RCA Private Infrastructure (Blue)

OEMP_CEMP

- CRN OEMP (Revision 1.2A)-combined_1 (1)-1

Planning and approval costs

- CRN Asset Register_Summary_R18 (after workshop) + May22 BVA
- FW PIC application Remaining QCA RFIs

Final audit

- MCU Compliance Final Audit Report 21042022

Sustainability

- Identification and Satisfaction of sustainability objectives for these works

Drawings

- Mine Loop; 1 – Plan & Profiles (8 Plans and Profiles)
- RFI 28_07_22; A – Connection
- RFI 28_07_22; B – Balloon Loop

IMPROVING QUALITY OF LIFE.

