Queensland Rail's 2022-23 Capital Expenditure Claim

For Queensland Competition Authority

29 April 2024

Queensland Rail's 2022-23 Capital Expenditure Claim

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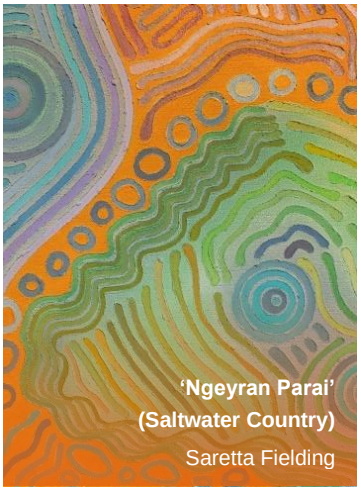

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Arcadis is committed to driving inclusion and diversity across our business. This includes specific and actionable policies that aim to make a positive impact on Aboriginal and Torres Strait Islander employment, education and a broader cultural change. 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	29/04/24	Draft for review	V Thayananthan	C.Owen	QCA
B	08/05/24	Draft for review	V Thayananthan	C.Owen	QCA

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Arcadis has relied on information provided to it by Queensland Rail 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 assisting with implementing competition policy in Queensland, and as part of this role regulates third party access to below-rail infrastructure operated by Queensland Rail. Queensland Rail has advised QCA it would be seeking approval of $43,380,778 (excluding Interest During Construction (IDC)) of capital expenditure on the West Moreton System to be included in the Regulatory Asset Base (RAB). Arcadis were appointed by QCA to provide an assessment of the prudency of the works undertaken in the capital claim, based on the scope, standard and cost, as per the terms outlined in Schedule E clause 3, 4 and 5 of Queensland Rail's 2019 Access Undertaking (AU2).

The West Moreton System is one of seven systems within the Queensland Rail Network. It consists of mainline and loop track between Rosewood in the East to Miles in the West. Based on variations in track configuration due to topography, soil types and traffic, the West Moreton System is split into three segments. These are:

- Rosewood to Jondaryan
- Jondaryan to Macalister; and
- Macalister to Miles.

The system comprises two corridors:

- Rosewood to Jondaryan (combination of dual and single track with Remote Controlled Signalling (RCS) from Rosewood to Toowoomba, then Direct Train Control (DTC) From Toowoomba to Jondaryan); and
- Jondaryan to Columboola (single track with passing loops and DTC).

The West Moreton System is multi-use, with coal, bulk freight and passenger train services using its track. From Rosewood to Toowoomba, coal dominates traffic on the system and is the key driver for asset strategies in the wider system. Bulk freight is also a customer of the system, with Aurizon operating bulk coal services and Watco operating bulk grain services. Lastly, there are passenger services on this line. However, they make up a small proportion relative to freight services that run on this line.

The West Moreton System is a regulated asset, and Access Undertaking 2 (AU2) currently applies.

Objective

QCA appointed Arcadis to provide an assessment of the prudency and efficiency of the works undertaken in the capital claim for 2022-23, taking into account uncertainty in demand, and based on the scope, standard and cost of the works, as per the terms outlined in Schedule E clause 2 of the Queensland Rail The 2020 Undertaking (AU2). Arcadis assessed Queensland Rail's capital claim works against the existing asset condition and performance requirements in the context of the Rail Safety National Law, Queensland Rail's Civil Engineering Track Standards (CETS), Civil Engineering Structural Standards (CESS), industry-approved approaches by similar operations and good engineering practice. The assessment included a review of key project documentation, visual site assessment and discussions with Queensland Rail staff.

Total capital expenditure submission

Queensland Rail has advised QCA that it would be seeking approval for $43,380,778 (excluding IDC) of capital expenditure on the West Moreton System, to be included in the RAB. Arcadis assessed the entirety of this capital expenditure in its review of prudency and efficiency.

Assessment Summary

Overall, Arcadis assessed the projects as prudent and efficient in scope, standard and cost in relation to the terms outlined in Schedule E clause 2 of the Queensland Rail 2020 Undertaking (AU2). The West Moreton system is expecting an increase in tonnage, and although there is uncertainty with future tonnage forecasts, the capital expenditure projects have considered current and future demand in its capital works program. There is a minimum level of maintenance required to ensure safe operational performance, and this is the primary driver for rail maintenance in the system. Arcadis assessed that the Queensland Rail engineering team are experienced in maintaining the System to ensure the safe operation of traffic over what is considered a challenging section of track (due to age, design and the inclusion of difficult terrain such as the Toowoomba Range within the system). Arcadis assesses that considering the prevalent investment drivers (Inland Rail) and demand uncertainty, the current approach is reasonable and prudent.

From the information provided and the site visit undertaken and discussions with relevant QR staff, Arcadis has assessed that the works undertaken that form the 2022-23 expenditure claim were reasonable and necessary to comply with safe operational requirements of the System and meet expected demand.

The table below summarises the output from the assessments of prudency and efficiency undertaken

Project Number	Project Name	2022-23 CAPEX Claim (ex. IDC)	Assessed as prudent Scope	Assessed as prudent Standard	Assessed as prudent Cost
B.04754	West Moreton Minor Signalling Renewals	3,317,304	✓	✓	✓
B.05460	WM Formation Strengthening 18/19 – 20/21	3,113,966	✓	✓	✓
B.05649	Bridge Renewal West Moreton 20/21-24/25	11,933,688	✓	✓	✓
B.05650	Reconditioning West Moreton 20/21-22/23	7,730,683	✓	✓	✓
B.05651	West Moreton Rerail Kingsthorpe to Oakey	5,908,393	✓	✓	✓
B.05653	Culvert Renewal West Moreton	2,026,553	✓	✓	✓

Project Number	Project Name	2022-23 CAPEX Claim (ex. IDC)	Assessed as prudent Scope	Assessed as prudent Standard	Assessed as prudent Cost
B.05655	Level Crossing Upgrades West Moreton	1,287,306	✓	✓	✓
B.06159	Sleepers with gauge issue & Range rerail	3,462,216	✓	✓	✓
B.04075	Level Crossing Upgrades – Regional	1,673,244	✓	✓	✓
B.04764	RMS2 LX System Wide	1,861,541	✓	✓	✓
SUBTOTAL					**43,380,778**
MINUS DEDUCTIONS NOT PRUDENT					**0**
TOTAL					**43,380,778**

In conclusion, Arcadis acknowledges QR's prudence in managing the challenges of a constrained labour and resources market, particularly as the sole state with a narrow-gauge system. Whilst we consider the capital expenditure for 2022-23 prudent and efficient, there are areas where greater efficiencies can be achieved. We recommend the following actions for QR:

- Implement strategies to enhance asset management efficiencies by leveraging data for predictive maintenance to reduce reactive requirements such as ballast undercutting and rerailing.
- Consider lowering structural integrity requirements, such as reducing drainage design integrity from 50 years to 10 years in certain sections, to improve network reliability.
- Whilst we acknowledge constraints from labour and resource availability to undertake larger projects we assess that there is potential to optimise costs and minimise inefficiencies by combining related works to streamline mobilisation and demobilisation processes. For example, in formation strengthening and rerailing programs.

Arcadis emphasises the need to shift from reactive maintenance practices like excessive ballasting which subsequently results in a need to lower ballast to maintain safety, towards sustainable maintenance strategies to enhance system reliability and performance. We advise implementing proactive measures to eliminate this practice and invest in long-term track capacity integrity for future projects.

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 Queensland Rail (QR). Queensland Rail is a state-wide provider and operator of rail services and infrastructure throughout Queensland and is a wholly owned subsidiary of Queensland Rail Limited. Queensland Rail incorporates both passenger and freight rail lines and services and is responsible for the upkeep and maintenance for the Mount Isa, North Coast, Western, West Moreton, South Western, and Central Western rail lines, totalling over 7000kms of track (Figure 1-1).

Figure 1-1 – Queensland Regional Network
Source: Queensland Rail

Queensland Rail is a wholly owned subsidiary of the Queensland Rail Statutory Authority in accordance with the Queensland Rail Transit Authority Act 2013 (QRTA Act). Queensland Rail's rail infrastructure comprises over 6500-kilometre multi-user track network comprising six interconnected regional systems: Western, West Moreton, South Western, Central Western, Mount Isa and North Coast Lines. A map of the West Moreton System is provided in Figure 1-2.

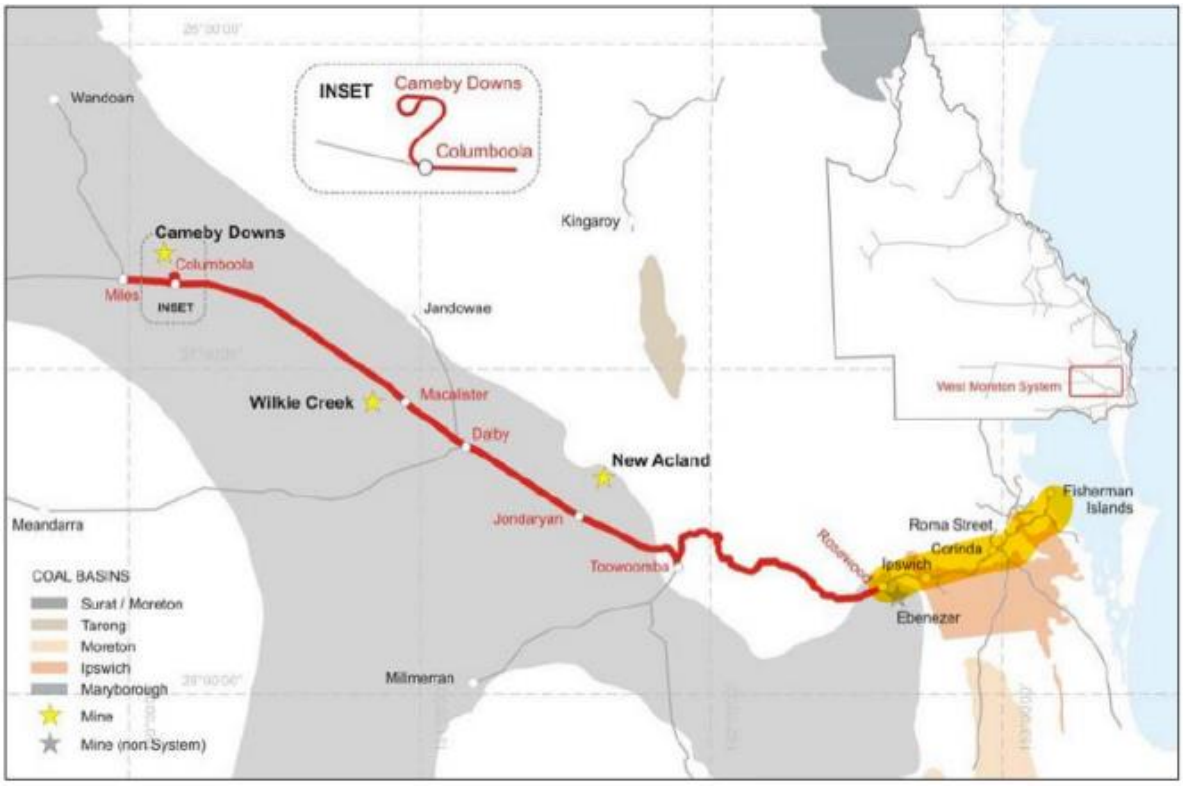

Figure 1-2 – Map of West Moreton System

Arcadis has been engaged by QCA to perform a prudency assessment of the capital projects undertaken by Queensland Rail for the 2022-23 financial year in terms of scope, standard and cost of these works. The works include track upgrade, bridge renewals, rerailing, level crossing upgrades, culvert replacements, formation strengthening, reconditioning, and signalling renewals. These were performed at various sections of track along the West Morton rail network. The West Moreton System has a length of 314kms connecting Columboola in the west and Rosewood in the east (Figure 1-2). The system further extends to Queensland's Western System at Columboola and joins the South-East Queensland urban rail networks via Rosewood. Historically, the line was constructed to connect Brisbane to the agricultural districts of Darling Downs (via Toowoomba), as well as cater for passenger, livestock, and freight. Currently the traffic in the system is predominately generated by coal exports from Camby Downs Mine, New Acland Mine and Wilkie Creek Mine.

Being a critical railway servicing western Queensland, the West Moreton System railway provides a much-needed, crucial service to industry and agricultural rich regions in Western Queensland. The line is used for the freight of livestock and agricultural goods as well as to connect many of the state's mines, particularly coal, with the Port of Brisbane.

1.2 Objective

The Queensland Competition Authority (QCA) has approved a Regulatory Asset Base (RAB) for the West Moreton System. To ensure that current and future tariffs are charged fairly and for works deemed necessary, Queensland Rail 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, Queensland Rail is required to submit a capital expenditure claim to the QCA, which is 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 providing access to Queensland Rail's rail network. The current undertaking agreement is the second version of *Queensland Rail's 2020 access undertaking (AU2),* approved by the QCA – in July 2020. AU2 requires the maintenance of a RAB reflecting the value of the West Moreton System infrastructure.

Queensland Rail has submitted its 2022-23 capital expenditure claim and is seeking approval for the inclusion of $43.4 million of capital projects, which entails 10 projects.

QCA has engaged Arcadis to perform a prudency and efficiency assessment of the projects (as part of the 2022-23 Capital Expenditure Claim) undertaken by Queensland Rail for the 2022-23 financial year in terms of scope, standard and cost of these works. The acceptability of this claim will predominantly be based on Schedule E of AU2; specifically, this requires a test of prudency and efficiency of scope, cost and standard.

2 WEST MORETON SYSTEM OVERVIEW

2.1 Queensland Rail 2022-23 West-Moreton Capex Claim

Queensland Rail is seeking QCA's approval for 11 capital expenditure projects that sum to $43,380,778 excluding interest during construction (IDC). These assets were commissioned during the 2022-23 financial year.

The structure of the capital expenditure claim, broken down by project, is reflected in table 2.

Table 1 Queensland Rail 2022-23 Capex Claim

Project Number	Project Name	Cost (excluding IDC)
100% West Moreton Projects		
B.04754	West Moreton Minor Signalling Renewals	3,317,304
B.05460	WM Formation Strengthening 18/19 – 20/21	3,113,966
B.05649	Bridge Renewal West Moreton 20/21-24/25	11,933,688
B.05650	Reconditioning West Moreton 20/21-22/23	7,730,683
B.05651	West Moreton Rerail Kingsthorpe to Oakey	5,908,393
B.05653	Culvert Renewal West Moreton	2,026,553
B.05655	Level Crossing Upgrades West Moreton	1,287,306
B.06159	Sleepers with gauge issue & Range rerail	3,462,216
System wide/regional projects		
B.04075	Level Crossing Upgrades – Regional	1,673,244
B.04764	RMS2 LX System Wide	1,861,541
Other		
Ballast Undercutting	Ballast Undercutting	1,065,884
Value of overall claim		**43,380,778**

2.2 Asset configuration

All systems are predominantly designed for 15.7 tal wagons with a maximum speed of 80km/h across the West Moreton System. Table 2-2 below summarises notable characteristics of the system.

Table 2-2 Summary of system characteristics

Characteristic	Summary
Total track length (km)	412km narrow gauge
Maximum axle load	15.75 tonne axle load (tal)
Maximum train length	675m
Electrified	No
Main line sleepers	Concrete, interspersed steel and timber sleeper: predominantly 1 in 2 (figure 4-3)
Maximum operating speed	80km/h
Control System	RCS from Rosewood to Willowburn, then DTC. All current systems installed in the West Moreton System include Remote Level Crossing Monitoring Systems, Dragging Equipment Detectors, Hot Bearing Detectors, Environmental Monitoring Stations, and Overload and Imbalanced Detectors.
Telecommunication	The infrastructure supports Train Control Radio and signalling from Rosewood to Toowoomba, as well as Train Control Radio and Signalling in the DTC area of the system. Other supporting telecommunication infrastructure includes Enhanced Radio System.
Stations and Depot Assets	Long-distance passenger services are supported by eight stations in the West Moreton System. Additionally, five depots are utilised for plant staff, track, structures, resurfacing and signals.

2.3 Operational performance and project performance

Queensland Rail's asset management strategy aims to improve the performance, safety, and sustainability of its rail infrastructure to support economic growth and meet user needs. As part of this strategy, Queensland Rail also carries out multiple capital programs and projects annually to ensure the safe and reliable operation and growth of the rail network.

A crucial aspect of maintaining the safety, reliability, efficiency, and customer focus of the West Moreton System involves monitoring and managing Key Performance Indicators (KPIs) and system-specific reports. These metrics reflect the current performance and operation of the West Moreton System, enabling evidence-based decision-making regarding network investments. Queensland Rail strives to minimise rail transit time through efficient capital and maintenance expenditure and to meet access holder and supply chain requirements by reasonably limiting speed restrictions and the total number of unavailable days for rail traffic.

These processes are relevant to the 2022-23 CAPEX submission.

To support the delivery and execution of these works Queensland Rail's project approach is guided by the OnQ Project Management Framework, developed by the Queensland Government Department of Transport & Main Roads (DTMR). This framework ensures consistency, reliability, and transparency in project management and delivery, in addition to providing structured governance for authorizing, approving, and prioritising works.

Arcadis acknowledges the implementation of this structure to all the works assessed in this report and deems its as prudent.

In conducting this assessment, Arcadis acknowledges the considerable uncertainty surrounding potential future coal volumes likely to be moved on the West Moreton system. Despite this uncertainty, Arcadis has noted Queensland Rail's tonnage scenario for high tonnage, which assumes the development of Ackland Stage 3 mine producing 7 Mtpa of coal for hauling from Jondaryan, in addition to the 2.1 Mtpa from Cameby Downs, in assessing scope and standards of projects within this submission for prudency. Considering the scale of works and cost, QR has been prudent in a tight labour market and resources market . QR faces additional challenges in this market as the operator of a narrow gauge system, which differs from the standard gauge systems prevalent in other states. In addition to this, we also observe that 'as part of the QCA AU2 consultation process, Queensland Rail provided the unredacted AU2 West Moreton System reference tariff model to key West Moreton stakeholders under a deed of confidentiality, including to Aurizon, New Hope and Yancoal, enabling stakeholders to assess Queensland Rail's capital claim. Queensland Rail also set out its capital claim for industry consultation in Queensland Rail's Draft Access Undertaking 2 (DAU2) Explanatory Document (14 August 2018) and its DAU2 West Moreton System low volume coal reference tariff 22 November 2019 submission'.

3 CAPITAL EXPENDITURE CLAIM

3.1 Overall methodology

Arcadis has implemented a four-stage process to assess the QR 2022-23 capex claim. Figure 3-1 identifies the key milestones with brief descriptions below.

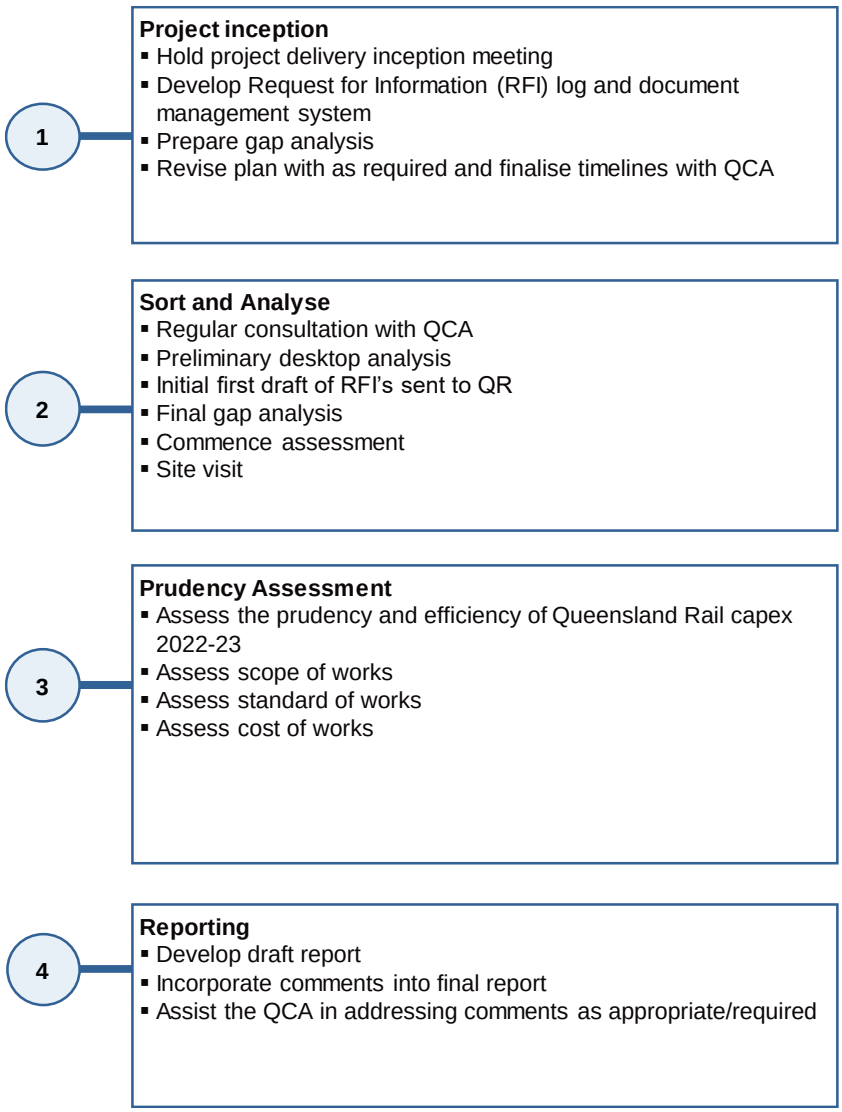

Figure 3-1 Summary of the process for prudency and efficiency assessment

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
- Date 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 17 April 2024.

Table 3-1 List of preliminary documentation provided

Check list	Documentation Type	Name of document
Essential documents		

Partial	Project Management Plan	Far West Moreton Asset Strategy
Y	Breakdown of costs	FY2023 WM Capex QCA breakdown
Y	Business Case Justification (IAR)	Individual project business cases
Y	Commissioning data and completion, acceptance, and handover validations.	As per site visit, we completed a visual inspection of projects within this capex claim
Partial	Completion report	Signalling renewals
Other documents provided		
Refer Appendix B		

3.1.2 Stage 2 – Site Visit

A site visit by representatives of QCA and Arcadis was undertaken on 6 and 7 March 2024.

The site inspections provided the technical review team with an opportunity to develop an interactive platform to enable quick and efficient clarification on several items, which we consider more efficient than multiple email correspondence.

The site visit facilitated the assessment process by providing visual verification of the compliance of the works with industry standards and safe operations. This is far superior to a desktop review, as visual inspections are much more informative, and discussions with the field workers are imperative to our understanding of the works undertaken and the condition of WMS. It was easier, after reviewing documentation, to have a targeted approach to visually verify items. 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.

During the site visit the condition of the track, formation and significant earthworks were showcased. Although asses are sufficient for current traffic levels, Arcadis observed that the assets do not meet the expected condition required to accommodate modern freight and traffic standards. This is typical of aging railways that have been in operation for decades. The efforts of maintenance crews and their ability to keep the railway operating were observed. These crews possess an intimate understanding of the WMS and its challenges, noting that QR as an organisation has managed this challenging system for decades whilst maintaining a service to their customers.

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

3.1.3 Stage 3 – Analysis

After the site visit, Arcadis received specific documentation to validate compliance and was able to provide assurance that what had been seen and quoted on-site complied with regulatory requirements and aligned with documentation.

During this stage, Arcadis performed a desktop assessment of prudency and efficiency based upon the visual inspection and preliminary information provided by QR. Arcadis used a framework template developed in alignment with the requirements of AU2 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.

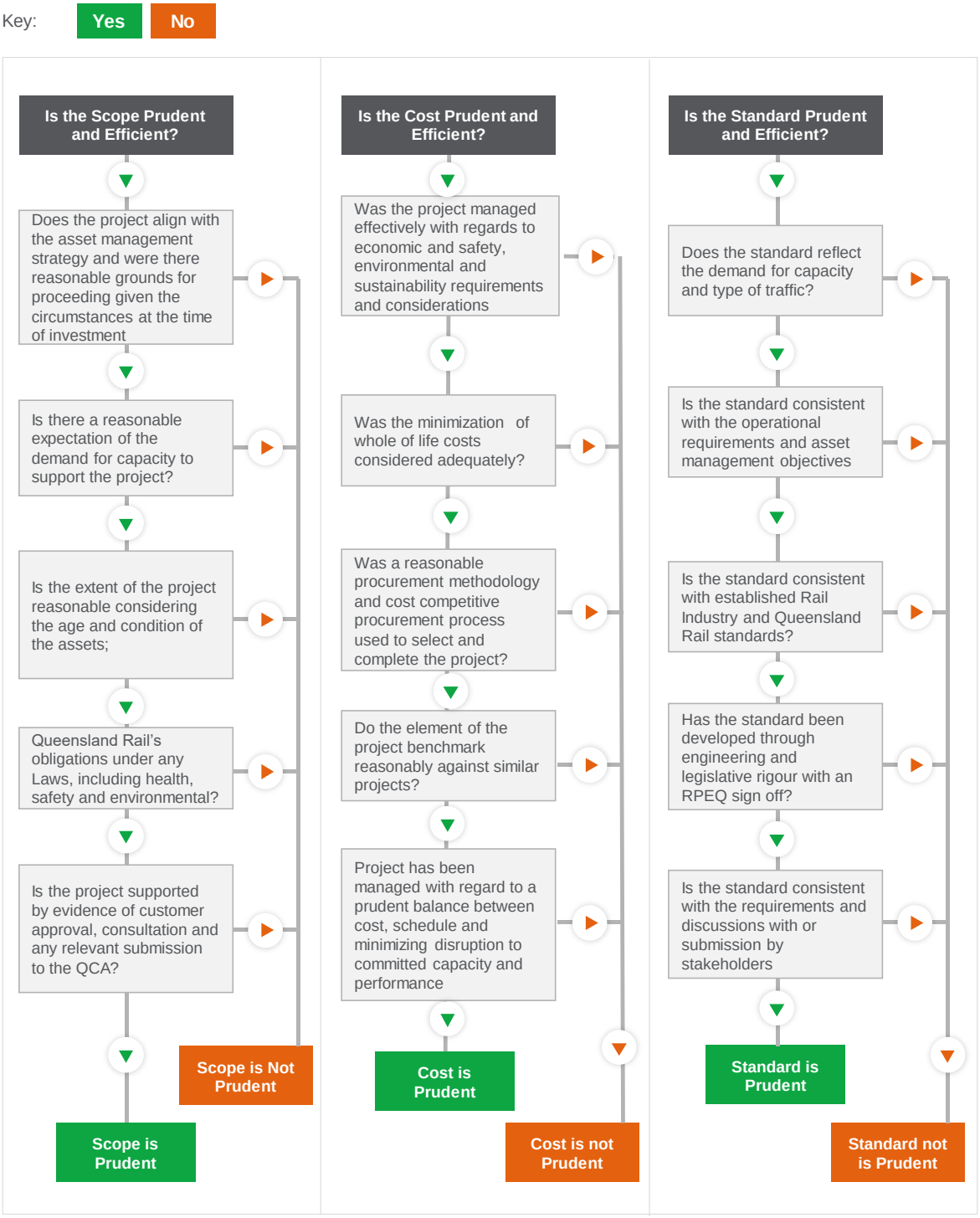

Figure 3-2 Summary of the critical criteria for the assessment of prudency and efficiency

3.1.4 Stage 4 and 5 – Reporting and finalisation

Upon completing the prudency 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 Summary of results

QR advised QCA it would be seeking approval of $43,380,778 as the prudent and efficient amount of private incremental cost related to WMS under schedule E of AU2.

Table 3-2 Summary of prudency review

Project Number	Project Name	2022-23 CAPEX Claim (ex. IDC)	Assessed as prudent Scope	Assessed as prudent Standard	Assessed as prudent Cost
B.04754	West Moreton Minor Signalling Renewals	3,317,304	✓	✓	✓
B.05460	WM Formation Strengthening 18/19 – 20/21	3,113,966	✓	✓	✓
B.05649	Bridge Renewal West Moreton 20/21-24/25	11,933,688	✓	✓	✓
B.05650	Reconditioning West Moreton 20/21-22/23	7,730,683	✓	✓	✓
B.05651	West Moreton Rerail Kingsthorpe to Oakey	5,908,393	✓	✓	✓
B.05653	Culvert Renewal West Moreton	2,026,553	✓	✓	✓
B.05655	Level Crossing Upgrades West Moreton	1,287,306	✓	✓	✓
B.06159	Sleepers with gauge issue & Range rerail	3,462,216	✓	✓	✓
B.04075	Level Crossing Upgrades – Regional	1,673,244	✓	✓	✓
B.04764	RMS2 LX System Wide	1,861,541	✓	✓	✓
SUBTOTAL					**43,380,778**
MINUS DEDUCTIONS NOT PRUDENT					**0**
TOTAL					**43,380,778**

4 CAPITAL EXPENDITURE CLAIM SUBMISSION

4.1 Asset Management System

4.1.1 Overview

Historically Queensland Rail has specific asset management plans, which are a key component of its approach to Strategic Asset Management and management of the value of its assets. They focus on effectively managing assets through the project lifecycle on the optimisation of cost, risk, and performance. This includes assessing if an asset is worth renewing or replacing. This is an efficient approach to the planning of asset management.

The framework applied is Queensland Rail's Asset Planning Framework (APF), underpinned by data stored in its Enterprise Asset Management System (EAMS), which drives decision-making around asset maintenance and renewal. EAMS is a series of interrelated systems and activities that work together to provide a digital representation of the asset life cycle. Applying data from EAMS and the APF ensures optimum rail asset renewal investment is in line with Asset Management Strategies.

4.1.2 Scope and program prioritisation

Queensland Rail's scope identification and selection is an iterative process that determines capital investment required to ensure an asset is operating at its required level of service. This process is based on the Asset Planning Framework (APF) and assigns assets with:

- A **condition rating**, reflecting the asset's likelihood of failure and provides an estimate of where it sits in its lifecycle; and
- A **criticality rating** reflecting the business impact associated with asset failure for the particular asset and based on Queensland Rail's Corporate Risk framework.

These ratings feed into a decision matrix that provides guidance on the preferred intervention – whether an asset should be inspected, maintained, replaced or renewed based on Queensland Rail's asset strategies and plans. An illustrative Decision-Making Matrix is presented in Figure 4-1.

These metrics are stored in the Queensland Rail EAMS based on, which, along with asset degradation lifecycles, are used to forecast expected asset intervention methods and anticipated annual capital expenditure required for asset renewal or refurbishment. Lastly, the information is used to forecast capital spending for the next fiscal year. The overall APF through which scope identification and selection is carried out is presented in Figure 4-2.

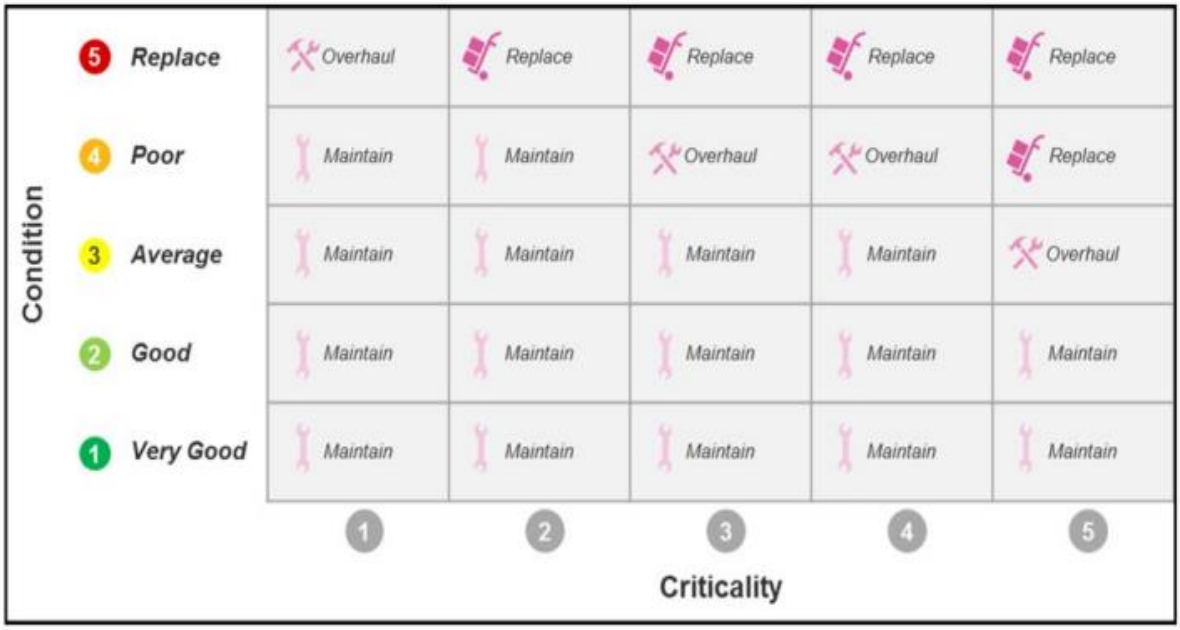

Figure 4-1 Queensland Rail Decision-Making Matrix. Source Queensland Rail FY22-23 Capital Expenditure Report

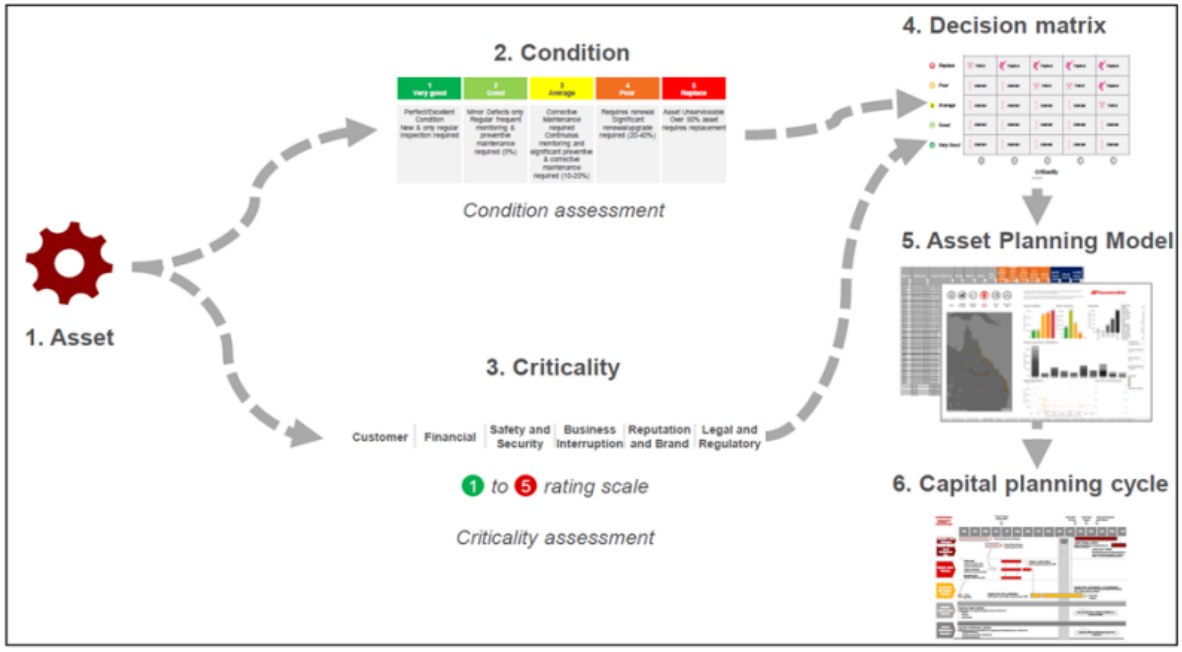

Figure 4-2 Queensland Rail Asset Planning Framework. Source Queensland Rail FY22-23 Capital Expenditure Report

Arcadis considers this approach to be contemporary industry best practice in asset management. Data forms the fundamental source of truth, from which Queensland Rail can make informed decisions on reparation and renewals. To maximise efficiencies throughout the network, Queensland Rail is applying the process summarised above to make informed decisions balancing cost, performance, and risk. This approach will ensure whole-of-life considerations are taken into account for the asset and the system.

Through site discussions, the assessment team noted that in practice it is indicated that Queensland Rail's key strategies for the West Moreton System included:

- A push towards predictive, not reactive maintenance through better collection and utilisation of asset data

- Sustainable considerations in the replacement of asset materials and assets
- A long-term sustainable approach to resourcing through maximisation of in-house capability combined with cost-effective local resourcing

4.2 Overview prudency and efficiency

Overall, Arcadis has assessed the scope, standard and cost for the QR claim to be prudent and efficient for the West Moreton System for the period 2022-23.

Arcadis highlights that our assessment was undertaken based upon the financial and engineering information provided to the team. To facilitate the assessment, each discipline lead focused their analysis on evaluating the prudency of the works per project. The Arcadis team assessed that the scope and standard of all ten projects was prudent and efficient.

5 PRUDENCY ASSESSMENT

5.1 West Moreton System

Overview

Queensland Rail is seeking QCA's approval for 10 capital expenditure projects that sum to $43,380,778 excluding interest during construction (IDC). These assets were commissioned during the 2022-23 financial year.

Figure 6-1 WMS Track and Bridge

5.2 Summary of results

The following table summarises the prudency assessments' results on all projects within Queensland Rail's FY22-23 Capex claim.

Table 5-1 Prudency assessment summary

Project Number	Project Name	2022-23 CAPEX Claim (ex. IDC)	Assessed as prudent Scope	Assessed as prudent Standard	Assessed as prudent Cost
B.04754	West Moreton Minor Signalling Renewals	3,317,304	✓	✓	✓
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B.04764	RMS2 LX System Wide	1,861,541	✓	✓	✓
Other	Ballast Undercutting*	1,065,884	✓	✓	✓
SUBTOTAL					**43,380,778**
MINUS DEDUCTIONS NOT PRUDENT					**0**
TOTAL					**43,380,778**

*Arcadis has observed that Queensland Rail is submitting an expenditure code for “ballast undercutting,” which does not involve replacing fouled or deteriorated ballast. Instead, it pertains to the removal of surplus ballast below track that has undergone multiple resurfacing activities, resulting in the track rails being too high and not complying with the CETS maximum limit of ballast depth. This excessive ballast height poses a risk to the safe passage of trains, necessitating its reduction. It is important to note that this activity has been previously approved as a CAPEX activity in previous submissions whilst fundamentally acknowledging that there are no new asset components involved with this maintenance activity.

5.3 Overview prudency and efficiency

Arcadis’ review of prudency and efficiency for Queensland Rail’s CAPEX in the West Moreton System in FY22-23 found that, in general projects were developed and implemented to ensure minimum standards were adhered to by below-rail infrastructure and to ensure safe operation.

It is acknowledged that Queensland Rail has a responsibility as the accredited Rail Infrastructure Manager to ensure that it is performing the necessary capital expenditure works to ensure that the rail infrastructure is safe and reliable and meets the requirements of Queensland Rail’s Safety Management System.

Through review of reports provided by the QCA and Queensland Rail as well as extensive inspection of sites across the West Moreton System where projects were undertaken, the assessors concluded that the works undertaken were not ‘gold plating’ or reflective of additional unnecessary works on the network. In the professional opinion of the assessor, it is considered that the work undertaken over the 2022-23 was required to maintain a safe and operational railroad.

5.4 Project Assessment Summaries

B.04754 West Moreton Minor Signalling Renewals

Overview

This project entails renewing life-expired signalling infrastructure at four level crossings in the West Moreton System. These level crossing were known to have life expired assets requiring replacement of the Model 10 boom mechanisms and their associated equipment room which were recognised as containing asbestos. The additional works to address the traffic light coordination was undertaken in collaboration with Toowoomba Regional Council which provided [redacted] to develop the agreed solution.

The level crossing signalling infrastructure relates to items beyond the scope of the West Moreton System capex claim for 2022-23. It impacts the following areas:

- LXID:1035 - North St Toowoomba
- LXIB:1034 - Jellicoe St Toowoomba
- LXID:1027 - Bridge St Toowoomba applicable for 22/23 financial year
- LXID:4239 - Patrick St Laidley applicable for 22/23 financial year

The level crossings applicable to this claim are prone to failure as well as the following issues:

- Excessive reactive maintenance required.
- Reduced maintainability due to lack of spare parts for existing equipment (no longer supported by the manufacturer / supplier due to being life expired).
- Low durability of equipment housings.
- Increasing risk of impacts on network performance and integrity due to reducing reliability of signalling equipment.

Renewal of these signalling assets is required to reduce signalling system downtime and reactive maintenance, and to ultimately maintain overall system reliability. Both Bridge St and Patrick St life expired assets were disposed of.

Figure 5-1 Signalling room

In accordance with clause 2, Schedule E of the Queensland Rail The 2020 Undertaking (AU2), was there sufficient demonstration of prudency and efficiency to satisfy:	Prudent and Efficiency Assessment Outcome		
	Scope	Yes	**Renewal of these signalling assets is required to reduce signalling system downtime and reactive maintenance, and to ultimately maintain overall system reliability. This project is deemed prudent in terms of scope, standard and cost.**
	Standard	Yes	
	Cost	Yes	
Capital Expenditure Claim (total)		$3,317,304	
Impact of findings on Claim		$ -	
TOTAL ACCEPTED		$3,317,304	

Assessment of scope

The project provides for the upgrade and renewal of life expired assets that are prone to failure. Overall, the project ensures the network performs safely and, in particular, reliably and is considered a prudent and efficient investment. The renewals of the level crossings were required to reduce downtime and maintain reliability. A key consideration in this was the recent completion of the Toowoomba Second Range Crossing with increased traffic and created congestion and queuing issues and traffic light integration issues. The renewals of the level crossings were required to reduce downtime and maintain reliability.

From the available information, it is noted that the future demand and capacity levels have been taken into account.

From the available information, the following is noted.

- Adequate information was included in the scope of works and change request documents
- A competitive tender process was undertaken
- Stakeholders and users were consulted

Overall, the scope is deemed prudent for this project.

Assessment of standard

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 best practice to achieve an optimised and balanced whole of life outcomes. 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. The specific requirements are documented in each business case. The standard is deemed prudent for this project.

Assessment of cost

Practical completion was achieved within schedule, with all stage gates and budget within approved estimate. We also note that a competitive tender process was undertaken for this project. Adequate information was included in the scope of works and change request documents.

From experience on similar projects and construction cost benchmarking we assess that the costs to undertake the work is in line with industry expectations. Cost is deemed prudent for this project.

B.05460 WM Formation Strengthening 18/19 - 20/21

Overview

The WMS has experienced issues with black-soil conditions since it was first constructed. The 'formation' dictates an increased maintenance regime in order to maintain top and line and thus reduce wear on track and rolling-stock components. The risk of derailment also increases as track defects increase. This increased maintenance is capital intensive and can be argued draws-resources away from other areas of the business, where it may yield a greater return.

These works are a continuation of the 2015–18 formation strengthening works, which previously delivered circa 14km of improved track on the WMS. It had been assumed that a 12-month hiatus would be provided as a result of those previous works, however, defects have continued to accumulate and so this next stage has been brought-forward to arrest the growth-rate of defects.

These works are targeting the next priority areas, which amount to approximately 17km of track identified in the EAMS as requiring rectification within the next five years. A rate of approximately [redacted]km per year is considered adequate to stay ahead of the growth-rate of defects. Some lengths of works are circa 3.5km long, others only a couple of hundred metres long.

The works consist of the removal of track components, the excavation of a 2m wide 700mm deep section of the formation. The new formations are then replaced with layers of compacted engineered soils and geosynthetic materials. Ballast and track are then reinstated and top and line returned.

We note that this project has been previously approved in prior year capex prudency assessments.

In accordance with clause 2, Schedule E of the Queensland Rail The 2020 Undertaking (AU2), was there sufficient demonstration of prudency and efficiency to satisfy:	**Prudent and Efficiency Assessment Outcome**		
	Scope	Yes	**Formation strengthening responds to an integral need for remedial actions to maintain the safety standards of the network and minimise the risk of landslips at critical locations. In line with pre-approvals of QCA in terms of scope and standard, the**
	Standard	Yes	
	Cost	Yes	
Capital Expenditure Claim (total)		$3,113,966	
Impact of findings on Claim		$ -	

TOTAL ACCEPTED	$3,113,966	**program is considered efficient and prudent.**

Assessment of scope

Due to age and heritage, the West Moreton System suffers from legacy issues with capping and formation which potentially result in poor alignment and track conditions. These conditions require operational restrictions or significant maintenance in terms of frequent resurfacing and reconstruction. In addition, the original formation was not constructed for the capacity and to standards required today.

These issues are exacerbated by the presence of black soil throughout the corridor. Eventually these issues result in a need to rebuild the formation, generally with geogrid and geofabric layer in the new profile to provide the loading capacity and performance required for current traffic operations. Where the track asset is still considered in reasonable safe operational condition, this approach is prudent as it provides the opportunity to re-use and prolong the whole-of-life of the existing track asset infrastructure.

The formation strengthening program appears to align with current and future tonnages, forming part of a long-term capital works program. Overall, the team assesses the project scope as prudent and efficient given the reasonable operational and safety requirements of Queensland Rail and its customers.

Assessment of standard

In general, Queensland Rail's standards and practices comply to all applicable requirements for access agreements as well as CETS track geometry limits. Standard is prudent for this project.

Assessment of cost

An allocation of $3.1m over a period of three years is a prudent amount. The requirement to mobilise and demobilise, even for relatively short sections of work is cost intensive. These works do not appear to be combined with others at the same time for efficiency. However, as a standalone project, costs were estimated at $680k per km. The four sections of work being claimed all fall within that approximate rate with some variance.

Arcadis finds that the costs are efficient and prudent. There was opportunity to decrease these costs by combining this project with others. However, despite these short comings which could have created more efficiencies, this is deemed prudent as they fall within the bounds of benchmarked cost per kilometre according to Australian industry expectations. It is suggested that future works could be performed together to increase cost efficiencies of the project.

B.05649 Bridge Renewal 20/21-24/25

Overview

These works are a continuation of the timber bridge replacements of 2016-19 which encompassed 18 bridges in total. These works intend to replace the piers or the entire structures of 21 bridges in total.

Ongoing deterioration of timber bridge elements which may have weakened structural integrity results in TSR's being imposed on the whole structure to mitigate safety risks such as potential collapses or accidents. TSR's can impact sectional running times. An improvement in overall condition will also reduce the inspection burden that the bridges currently demand due to their condition. Overall, replacing deteriorated timber piers is essential for ensuring the safety of the network, structural integrity, compliance, and long-term maintenance of the bridge infrastructure.

A number of timber piers in each structure have been replaced with steel piles, for one instance, there were 11 piers in one long-span bridge. Concrete ground beams have been poured and headstocks have been replaced. Design and construction took place over a period of three years from 2021 to 2024, during a period of unique challenges due to COVID. The works appear to have been undertaken under-traffic. As a result, significant track-protection costs were incurred, in order to maintain train services to customers.

Of the 21 bridges in the program that span across multiple year, the capex 22-23 submission include works for 11 separate structures. It was unclear from the information provided how many structures were completed. However, we note that these works are a second tranche and the first tranche was completed from 2016-19. The second tranche which includes these works was completed between 2020-2024 and includes pier replacements, which were combined with other activities such as culverts. The total funding for all tranches is $33.5m across the period 2020-29.

Melbourne to Brisbane Inland Rail (MBIR) traffic was expected to accelerate the deterioration of QR assets, presumably due to an increase in train numbers at the same axle loads. Because of this, QR anticipated a shorter operational life for these structures. For MBIR impacted bridges, piers were replaced to mitigate the reduction in operational life. Overall, the useful life of the replaced elements of the structures will be 100 years due to Standards requirements.

Figure 5-2 WMS timber bridge

<table>
<tr><td rowspan="4">In accordance with clause 2, Schedule E of the Queensland Rail The 2020 Undertaking (AU2), was there sufficient demonstration of prudency and efficiency to satisfy:</td><td colspan="2">Prudent and Efficiency Assessment Outcome</td></tr>
<tr><td>Scope</td><td>Yes</td><td rowspan="5">Replacement of piers that are deteriorating improve the safety and performance of WMS. Overall, renewal of bridges is considered a prudent and efficient project.</td></tr>
<tr><td>Standard</td><td>Yes</td></tr>
<tr><td>Cost</td><td>Yes</td></tr>
<tr><td colspan="2">Capital Expenditure Claim (total)</td><td>$11,933,688</td></tr>
<tr><td colspan="2">Impact of findings on Claim</td><td>$ -</td></tr>
<tr><td colspan="2">TOTAL ACCEPTED</td><td>$11,933,688</td></tr>
</table>

Assessment of scope

When timber piers deteriorate, they can become weakened and structurally compromised, posing a risk to the integrity and safety of the railway bridge. Timber piers require more frequent inspection relative to non-timber materials. Timber piers are also more difficult to inspect as the below surface portion, which is at risk of deterioration, requires excavation, which is both timely and costly. Non-timber materials such as concrete, significantly reduce inspection frequency.

The bridge renewal project appears to have been designed and delivered with expectations of current and future-tonnages in-mind. This project is a continuation of an ongoing long-term asset replacement program. Where possible, improvements are made to the specifications when assets are replaced, this is positive evidence of a culture of continual improvement. The scope of this project is prudent.

Assessment of standard

The bridge pier renewal works appear to be of a standard consistent with CETS and AS5100 and other relevant standards. This project meets regulatory compliance and technical, reliable, safe network objectives, meeting the requirements. The standard appears to be consistent with QR and industry standard civil specifications and therefore this project is deemed prudent for standard.

Assessment of cost

Events over the past few years have led to a shortage of skilled workers and supply chain challenges. These factors are contributing to escalated costs for ongoing projects such as bridge renewal, which QR will experience, particularly as its assets are 'exotic' compared to the vast majority of the Australian railway network. The rates for pier replacement are consistent across structures. The rates for bank-end replacement are also consistent across structures. An allocation of $11.9m for 11 structures over a period of three years is assessed as a prudent amount.

In addition to this, non-timber materials such as concrete significantly reduce inspection frequency, saving overall time and related inspection costs.

B.05650 Reconditioning West Moreton 20/21-22/23

Overview

These works are a continuation an overall reconditioning strategy, which saw approximately [redacted] km of priority track replaced during the period 2010–2016 and [redacted] km during the period 2016 – 2020.

The works are to replace the light-track which is 41 kg/m rail on a mixture of timber and steel sleepers with 50 kg/m rail and concrete sleepers. Formation reconstruction is also included where required.

Overall, replacing 41kg rail with 50kg rail can address various operational, safety and maintenance challenges, ensuring the long-term viability, efficiency and sustainability of the WMS.

We note that this project has been previously approved in prior year capex prudency assessments.

<table>
<tr><th rowspan="4">In accordance with clause 2, Schedule E of the Queensland Rail The 2020 Undertaking (AU2), was there sufficient demonstration of prudency and efficiency to satisfy:</th><th colspan="3">Prudent and Efficiency Assessment Outcome</th></tr>
<tr><td>Scope</td><td>Yes</td><td rowspan="6">Reconditioning in the West Moreton System is part of a wider program, with priority track targeted as part of an overall strategy. The project is essential in maintaining operational performance and safety in light of future demand levels, with targeted areas critical in carrying loaded coal traffic from all mines in the West Moreton System.</td></tr>
<tr><td>Standard</td><td>Yes</td></tr>
<tr><td>Cost</td><td>Yes</td></tr>
<tr><td colspan="2">Capital Expenditure Claim (total)</td><td>$7,730,683</td></tr>
<tr><td colspan="2">Impact of findings on Claim</td><td>$ -</td></tr>
<tr><td colspan="2">TOTAL ACCEPTED</td><td>$7,730,683</td></tr>
</table>

Assessment of scope

Reconditioning scope is considered prudent to ensure performance and minimise the risk of derailment due to poor track geometry and rail defects.

Track recording information was provided which indicated that the sites selected by Queensland Rail for track reconditioning aligned with sites exhibiting significant twist or alignment issues.

We note from prior period's assessment of this project, that QR selected sites where frequent resurfacing and ballast cleaning, undercutting or lowering were found to be in ineffective. Replacement to 50kg rail in these instances can increase the load capacity to accommodate the increased loading and traffic whilst providing improved durability and wear which can reduce maintenance requirements and extend the lifespan of the track. In addition, concrete sleepers and 50kg rail can provide a more effective distribution of wheel loads and improved load bearing capacity, thereby reducing the risks of deformation and damage on poorly formed heritage formation. This can improve the overall performance and decrease resurfacing and undercutting requirements until such times as formation renewal can be undertaken in these sites. Per discussions with Queensland Rail, they had no alternative to this situation, other than to further reduce speed restrictions or continue resurfacing, and continuing reducing speed restrictions is not a sustainable solution, given the expected increase in demand in future periods.

Considering the information provided and discussions with site staff, the team deem this project scope prudent, given the reasonable operational and safety requirements of Queensland Rail and its customers.

Assessment of standard

Queensland Rail's approach to reconditioning is consistent with CETS, other approved rail standards, and with the necessary operational requirements to ensure a safe operational railway. Arcadis deem the scope of this project as prudent and efficient.

Assessment of cost

An allocation of $7.7m is being claimed for one section of track in the Warra-Brigalow locality. The section is [redacted] kilometres in length and consists of ballast, 50 kg/m rail and full-depth concrete sleepers. Ballast has been given a service life of 30 years whilst rail and sleepers have been given 50 years.

Additionally, concrete sleepers and heavier rail typically require less maintenance compared to timber and steel and light rail. Upgrading to more durable materials can reduce the frequency and costs of track maintenance over the whole of life of the asset, minimising disruptions to operations and improving reliability.

At a rate of $[redacted]m/km, and with whole of life considerations, this amount is considered prudent and efficient when compared to market rates.

B.05651 West Moreton Rerail Kingsthorpe to Oakey

Overview

The works for this project are a legacy issue left-over from previous investment strategies. The works are to replace [redacted]km of worn and defective rail with 50 kg/m rail that has a 50-year service life. Priority areas also receive new ballast with a 30-year service life and FDC sleepers with a 50-year service life.

In total, the works have replaced 8.8km of rail, 900m of ballast and 900m of sleepers. This appears to have occurred at over eight different locations, one section of rerail amounted to 6km whilst others are only a couple of hundred metres in length.

In accordance with clause 2, Schedule E of the Queensland Rail	Prudent and Efficiency Assessment Outcome

The 2020 Undertaking (AU2), was there sufficient demonstration of prudency and efficiency to satisfy:	Scope	Yes	**Project entails rerail of 11km of worn rail and ballast for priority areas. Overall, rerailing of this area is considered a prudent and efficient project.**
	Standard	Yes	
	Cost	Yes	
Capital Expenditure Claim (total)		$5,908,393	
Impact of findings on Claim		$ -	
TOTAL ACCEPTED		$5,908,393	

Assessment of scope

The project aligns with the asset management strategy and there were reasonable grounds for proceeding. Where possible, improvements are made to the specifications when assets are replaced, this is positive evidence of a culture of continual improvement. Scope is deemed reasonable for this project.

Assessment of standard

The standard for this project appears to be consistent with QR and industry standard civil specifications. Standard is deemed prudent.

Assessment of cost

An allocation of $5.9m is a prudent amount, considering the number of times teams would have had to mobilise and demobilise. However, this approach has introduced cost inefficiencies and indicates a fix-on-fail approach which is not where QR should be operating. The defects are of the type not identified by visual inspection, instead relying on the RTI for identification. Ideally, the asset owner would be operating in the predictive space and identify the potential for defects, prior to their manifestation. We suggest that QR investigate long term efficiencies for this project. Despite our recommendations of mobilising a preventative approach to rerailing, the cost is deemed prudent and efficient from the perspective of a reactive response to rerail from Kingsthorpe to Oakey.

B.05653 Culvert Renewal West Moreton

Overview

The works are to completely replace seven end of life culverts with new concrete culverts using open-trench construction techniques and upgrade two other culverts using in-situ techniques. One of these latter culverts is to be relined and one is to only have its inlet upgraded by means of installing a 380mm high Besser-Block headwall plus a walkway above-it, because it is a heritage structure at Spring Bluff.

Inland Rail would likely have rendered two of these culverts redundant and a further five would have experienced a reduction in traffic, if the MBIR had proceeded. All new assets have a service life of 100 years except for the upgraded inlet which has only 50 years.

In accordance with clause 2, Schedule E of the Queensland Rail The 2020 Undertaking (AU2), was there sufficient demonstration of prudency and efficiency to satisfy:	**Prudent and Efficiency Assessment Outcome**		
	Scope	Yes	**Culvert renewal is deemed a proactive management strategy and deemed prudent**
	Standard	Yes	

	Cost	Yes	**and efficient in scope, standard and cost.**
Capital Expenditure Claim (total)		$2,026,533	
Impact of findings on Claim		$ -	
TOTAL ACCEPTED		$2,026,533	

Assessment of scope

Culverts are an essential element to linear infrastructure, railways in particular, where water must be removed from the corridor at the earliest opportunity. Without adequate lateral drainage, flowing water can lead to erosion and scour, standing water can lead to embankment deterioration and a loss of capacity. Water is one of the key threats to a railway's capability.

The project's solution of replacing culverts that would result in risks such as track washouts, embankment failures and disruption to train operations demonstrates that this capital works project has considered demand in regard to current and future capacity levels. Renewal of culverts and drainage systems is considered a proactive asset management practice aimed at maintaining and enhancing the life of the network, hence aligns with Queensland Rail overriding asset management strategy.

In consideration of the above and from the information provided Arcadis assesses the scope of this program to be reasonable and prudent.

Assessment of standard

From the information provided the works are compliant with CESS, AS5100 and all relevant standards inclusive of RISSB and Australian Railway Association guidelines. Works are consistent with previous program and adjacent infrastructure.

From the information provided Arcadis assesses the standard of these works as prudent.

Assessment of cost

An allocation of $2.0m is a prudent amount. Whilst the diameters of most new culverts were relatively small, the costs to remove track, extract old pipes, install the new pipes and reinstate earthworks and track are typically the same, regardless of the pipe diameter. The installation of three new Reinforced Concrete Box Culverts (RCBC) cells incurred the greatest cost which is as expected. The $160,000 cost of installing a 380mm high Besser-block headwall and walkway could be considered high but once mobilisation, access, laydown, materials and labour are added-up, the figure is rapidly realised. Replacing end of life culverts is deemed prudent and efficient in cost.

B.05655 Level Crossing Upgrades West Moreton

Overview

The works are part of a $5.8m capital program to recondition 23 level crossings over five years from 2020 to 2025. The works consist of reconditioning rail-track panels, providing new road surfaces and improving drainage.

Of the 23 in the program, seven are included in this claim. They all appear to have received new 50 kg/m rail and works are between 46m and 88m in length depending on their locations.

Road rail interfaces are one of the highest risk assets from a safety perspective and require significant investment from the RIM, to maintain in accordance with legislative requirements.

We note that this project has been previously approved in prior year capex prudency assessments.

In accordance with clause 2, Schedule E of the Queensland Rail	**Prudent and Efficiency Assessment Outcome**

The 2020 Undertaking (AU2), was there sufficient demonstration of prudency and efficiency to satisfy:	Scope	Yes	**The program brings level crossings in line with current version of the CETS, replacing of the track and level crossing infrastructure. These better manage transitions at level crossings between track structures which have can risk the result in derailments in the West Moreton System. Overall, the project ensures new minimum standards are met and is considered a prudent and efficient investment.**
	Standard	Yes	
	Cost	Yes	
Capital Expenditure Claim (total)		$1,287,306	
Impact of findings on Claim		$ -	
TOTAL ACCEPTED		$1,287,306	

Assessment of scope

Queensland Rail developed its program in a manner that would ensure fit for purpose assets are provided to support service delivery and assist in maintaining required operational performance.

This project, in line with previous years, is deemed prudent and efficient given the reasonable operational and safety requirements of Queensland Rail and its customers.

Assessment of standard

In general, Queensland Rail's standards and practices comply to all applicable requirements for access agreements and the pedestrian level crossing upgrades comply with relevant design standards and codes, with the program developed in a manner consistent with Queensland Rail's Safety and Environmental Safety Systems.

In consideration of the information provided Arcadis deems that the standard of the works is prudent and efficient.

Assessment of cost

An allocation of $1.3m is a prudent amount. The costs are divided proportionately between the seven locations, the longer works requiring larger expenditure. Works on road-rail interfaces require a significant amount of coordination, consultation and communication between stakeholders, this is reflected in the costs. Minor roads would also require less traffic management than those located in more built-up areas, Jellicoe Street in Toowoomba being a good example of the latter. From the information provided and compared with industry expectations for similar works Arcadis deems the cost prudent and efficient for this project.

B.06159 Sleepers with Gauge Issue and Range Rerail

Overview

The works are for the replacement of gauge-widened concrete sleepers, fastenings, rails and ballast in [redacted] identified curves between Toowoomba and Rosewood. The length of works combined create a total of 3,400m.

The existing sleepers have proven unsuitable and are being changed-out halfway through their 50-year design-life due to their deterioration plus propensity to consume track pads, spacers and fasteners, leading to persistent wide-gauge defects. These defects lead to the imposition of TSR's.

They will be replaced with new full-depth-concrete sleepers with a service life of 70 years, spaced at a reduced 550mm instead of the current 685mm. The reduction of sleeper spacing is consistent with a requirement for heavier loads, where closer spacings can help distribute the load more evenly along the track and reduce the risk of track deformation or failure and reducing stress on individual components. New 50 kg/m Head Hardened Rail was installed on six of the [redacted] curves. New ballast will be installed with a service life of 30 years.

There appears to be no entry for steel-rail in the AUC buildup. It is noted the 70-year service life of the sleepers is in excess of other sleepers in this CAPEX claim.

In accordance with clause 2, Schedule E of the Queensland Rail The 2020 Undertaking (AU2), was there sufficient demonstration of prudency and efficiency to satisfy:	Prudent and Efficiency Assessment Outcome		
	Scope	Yes	In line with engineering standards and operational requirements, the project focuses on reducing the risk of TSRs. Consideration of whole-of-life decision-making optimises the track system's operational functionality, minimising disruption risks and optimising performance. Overall, resleepering is considered a prudent and efficient project.
	Standard	Yes	
	Cost	Yes	
Capital Expenditure Claim (total)		$3,462,216	
Impact of findings on Claim		$ -	
TOTAL ACCEPTED		$3,462,216	

Assessment of scope

Overall, Arcadis considered the project scope prudent and efficient given the reasonable operational and safety requirements of Queensland Rail and its customers. The assessment team did not identify any key issues within this program's scope.

Assessment of standard

Unsuitable sleepers need to be replaced or otherwise compromise the safety and standards of the network. Arcadis observes that the CETS permits the RIM to install narrow gauge sleepers at a maximum density of 1408 sleepers per kilometre. The proposed installation aligns with this specification. Overall, Arcadis deem this project prudent and efficient in standard.

Assessment of cost

An allocation of $3.5m is a prudent amount. Concrete sleepers at a reduced spacing extends for [redacted]m and incur a cost of $2.1m. Ballast extends over a length of [redacted]m and incurs a cost of $1.36m. The terrain, topography and accessibility of these works across multiple locations also has to be accounted for. The savings due to reduced maintenance will be significant for the same reasons, terrain, topography and accessibility.

B.04075 Level Crossing Upgrades – Regional

Overview

This project upgrades 16 identified priority level crossings to active protection, with a CAPEX estimate of $17,335,000 (additional $310k provided for OPEX). The Level Crossing Upgrades - Regional Project works will ensure priority level crossings provide a safe passage for vehicles across the rail tracks. This is particularly important with the higher tonnages forecast to come onto the network resulting in higher rail traffic. The upgrades of these level crossings have been based on the risk ranking determined by the ALCAM model and Australian Standards.

We note that the claim of $1,673,244 for 22/23 covers the works undertaken on Devon Park Rd level crossing and associated train detection which is a commissioned asset in 22/23.

In accordance with clause 2, Schedule E of the Queensland Rail The 2020 Undertaking (AU2), was	Prudent and Efficiency Assessment Outcome		
	Scope	Yes	This level crossing upgrade upholds requirements relating

there sufficient demonstration of prudency and efficiency to satisfy:	Standard	Yes	**to safety and reliability. We deem the standard, scope and cost as prudent and efficient.**
	Cost	Yes	
Capital Expenditure Claim (total)		$1,673,244	
Impact of findings on Claim		$ -	
TOTAL ACCEPTED		$1,673,244	

Assessment of scope

The program of works addresses high priority level crossings on the regional rail network to ensure the level of protection assigned to the crossing is aligned with the ALCAM assessment and AS1742.7.

The installation / upgrade works at the selected level crossing sites will:

- allow a safe passage for vehicles over the rail network;
- encourage the public to use designated crossings to prevent unauthorised access into the rail corridor;
- reduce the potential for near miss occurrences and accidents / incidents involving rollingstock and vehicles;
- assist in improving the social and economic impact (caused by level crossing incidents) as well as site specific safety factors;
- improve safety and reliability of the rail network; and
- improve trackside safety.

The level crossing installation and upgrade works will include the provision of the necessary protection control measures that are required to satisfy an acceptable ALCAM risk threshold.

Assessment of standard

The upgrades of these level crossings have been based on the risk ranking determined by the ALCAM model and Australian Standards.

In consideration of the above and to ensure the safety integrity of the network Arcadis deems the standard of the Level Crossing Upgrades, regional works as prudent.

Assessment of cost

An allocation of $1.6m is a prudent amount. The typical costs associated with the provision of active protection such as lights, booms, audible warning, modification to the train detection and signalling interlocking is prudent and efficient.

From the information provided and in consideration of market expectation on costs for similar works the Arcadis team has assessed the cost of the Level Crossing Upgrades, regional works as prudent.

B.04764 RMS2 LX System Wide

Overview

This project involves the replacement of [redacted] life expired RMS level crossing monitors from RMS1 to RMS2 systems and narrowband 18 RMS1 monitors to allow for analogue radio decommissioning and compliance with the 400MHz band changes.

The overall business case for the system wide project entails $4.7m for [redacted] sites and [redacted] additional sites for stage 1 and an additional $4.203 to address the remaining [redacted] sites. In addition to the non-conforming communications network, the existing RMS1 systems in place are no longer manufactured and have limited spares or supported software application.

Whilst there is reference within each of these projects in relation to the tonnage increase to 9.6Mtpa this has no real consideration for the signalling assets. Project B.04754 and B.04764 were required to replace non-conforming or life expired assets with B.04075. QR are claiming $1.9m in the capex 2022-23 submission.

In accordance with clause 2, Schedule E of the Queensland Rail The 2020 Undertaking (AU2), was there sufficient demonstration of prudency and efficiency to satisfy:	Prudent and Efficiency Assessment Outcome		
	Scope	Yes	Necessitated by regulations and approaching redundancy without, the investment is considered prudent and efficient.
	Standard	Yes	
	Cost	Yes	
Capital Expenditure Claim (total)		$1,861,541	
Impact of findings on Claim		$ -	
TOTAL ACCEPTED		$1,861,541	

Assessment of scope

The program of works will replace the life expired RMS1 level crossing monitors with RMS2 and narrow band 18RMS1 level crossing monitors within the digital radio area to enable existing wideband analogue radio to be decommissioned. The existing RMS1 technology has life expired with the existing senders and receivers no longer being manufactured.

The replacement of life-expired and discontinued assets is considered prudent in scope.

Assessment of standard

The project proposes to replace Model 10 boom mechanisms and upgrade location cases containing asbestos at all four locations. This is an essential project to ensure required compliance obligations as well to maintain the safety and reliability of the rail network. The RMS2 LX System Wide Project works are essential for the safety and reliability of the rail network. This is particularly important with the higher tonnages forecast to come onto the network resulting in higher rail traffic.

Arcadis assesses the standard prudent and efficient for this project in consideration of regulatory compliance requirements and well as whole of life considerations to maintain safety and reliability of the network.

Assessment of cost

Arcadis assesses that an allocation of $1.8m is a prudent amount. The design was outsourced to the Signalling Engineering Panel with installation and commissioning delivered internally with the provision of RMS2, recovery of Eurotrack units and installation of SafeFlash which has been considered in the cost.

Ballast Undercutting (track lowering)

Queensland Rail's capital expenditure proposal for 2022-23 includes $1,065,884 allocated for track lowering (ballast undercutting). This program aims to address excessive ballast depth, which leads to stability issues, poor vertical alignment, and potential non-compliance with the maximum 600mm ballast depth specified in CETS.

Prudency of scope

Arcadis acknowledges that the West Moreton system faces specific challenges in this area due to legacy formation issues and geological characteristics. While industry best practice recommends phasing out these activities and replacing them with track reconstruction or formation rebuild to

reduce risk and maintenance over the system's lifespan, Arcadis notes that there may be a current requirement for track lowering due to safety and compliance reasons until the underlying issues are addressed.

Arcadis considers this activity to be inefficient in that the excessive ballast often results from reactive maintenance activities to attempt to rectify top and line and alignment, pumping issues or other track issues affecting reliability and performance of the system. The process is “damage rectification” as opposed to being a sustainable maintenance practice or a renewal activity. Arcadis notes that in Systra’s Review of Proposed Maintenance, Capital & Operations Expenditure DAU2 report, the Consultant has assessed that this practice is considered as the” last resort measure to maintain top and line” and recommends “phasing out of this practice in favour of track reconstruction or formation rebuild”. Despite this the Consultant acknowledged that as it is a damage rectification activity some allowance for ballast undercutting is required to minimise safety, performance, and reliability risk of the system.

In consideration of all the above the Arcadis team acknowledges that the amount allocated appears to align with the necessary allowance for rail safety, hence whilst acknowledging this practice as inefficient, accept that damage rectification for the scope submitted is required for operational safety reasons. Nevertheless, we recommend implementing proactive and preventative sustainable maintenance measures in DAU3 to eliminate this activity completely. Expenditure should be directed towards sustainable rectification of track capacity integrity.

Prudency of standard

The required ballast depth is in line with CETS requirements and hence has been assessed as prudent.

Prudency of cost

Queensland Rail have stated that based upon the data within their EAMS system some 2.152 kms of work have been completed for the submitted cost. Undercutting works are undertaken using an excavator mounted undercutter bar, with the track primarily removed and replaced. Overall although Arcadis acknowledges that track lowering may be necessary in the West Moreton system due to its challenges, it is considered an inefficient activity due its resource intensity and high costs, environmental impacts and potential need for ongoing maintenance.

Whilst Arcadis deems the cost for the work undertaken prudent, we recommend that future investment in track lowering is carefully weighted against alternative solutions that may provide more sustainable and cost-effective whole of life approaches to address track stability and poor vertical alignment.

6 CONCLUSION

Overall, Arcadis assessed the projects reviewed as prudent and efficient in scope, standard and cost in relation to the terms outlined in Schedule E clause 2 of the Queensland Rail 2020 Undertaking (AU2). From the information provided and the site visit undertaken, Arcadis assesses that the works undertaken that form the 2022-23 expenditure claim were reasonable and necessary to comply with safe operational requirements of the System and meet expected demand.

The table below summarises the output from the assessments of prudency and efficiency undertaken.

Table 6-1 Prudency assessment summary

Project Number	Project Name	2022-23 CAPEX Claim (ex. IDC)	Assessed as prudent Scope	Assessed as prudent Standard	Assessed as prudent Cost
B.04754	West Moreton Minor Signalling Renewals	3,317,304	✓	✓	✓
B.05460	WM Formation Strengthening 18/19 - 20/21	3,113,966	✓	✓	✓
B.05649	Bridge Renewal West Moreton 20/21-24/25	11,933,688	✓	✓	✓
B.05650	Reconditioning West Moreton 20/21-22/23	7,730,683	✓	✓	✓
B.05651	West Moreton Rerail Kingsthorpe to Oakey	5,908,393	✓	✓	✓
B.05653	Culvert Renewal West Moreton	2,026,553	✓	✓	✓
B.05655	Level Crossing Upgrades West Moreton	1,287,306	✓	✓	✓
B.06159	Sleepers with gauge issue & Range rerail	3,462,216	✓	✓	✓
B.04075	Level Crossing Upgrades - Regional	1,673,244	✓	✓	✓
B.04764	RMS2 LX System Wide	1,861,541	✓	✓	✓
Other	Ballast Undercutting*	1,065,884	✓	✓	✓
SUBTOTAL					**43,380,778**
MINUS DEDUCTIONS NOT PRUDENT					**0**
TOTAL					**43,380,778**

*Arcadis has observed that Queensland Rail is submitting an expenditure code for "ballast undercutting," which does not involve replacing fouled or deteriorated ballast. Instead, it pertains to the removal of surplus ballast below track that has undergone multiple resurfacing activities, resulting in the track rails being too high and not complying with the CETS maximum limit of ballast depth. This excessive ballast height poses a risk to the safe passage of trains, necessitating its

reduction. It is important to note that this activity has been previously approved as a CAPEX activity in previous submissions whilst fundamentally acknowledging that there are no new asset components involved with this maintenance activity.

Arcadis acknowledges QR's prudent management of the 2022/23 CAPEX claim, considering the scale and costs of the projects submitted and the challenges posed by a constrained labour and resources market. Additionally, we recognize the unique difficulties faced by QR due to its exclusive use of narrow gauge, which limits efficiencies compared to organizations utilizing standard gauge systems.

However, our assessment team has identified areas for improvement that could enhance operational efficiencies. We recommend that Queensland Rail consider the following actions:

- Implement strategies to enhance asset management efficiencies by utilising predictive maintenance approaches and data analytics to mitigate reactive maintenance requirements. This includes addressing defects such as the need for ballast undercutting and rerailing, by adopting a proactive approach based on predictive data and leading indicators rather than relying solely on visual inspections and reactive measures.

- Adjust structural integrity requirements to enable cost efficient sustainable solutions to be implemented, such as considering implementing drainage programs with reduced design integrity (for example from 50 years to 10 years), to enable more efficient resource utilisation and reduce reactive requirements while maintaining network reliability.

- Consolidate project works to minimize inefficiencies in mobilisation and demobilisation costs, particularly when dealing with multiple short sections of work that could be combined

- Transitioning towards proactive and preventative maintenance strategies to eliminate the need for excessive ballasting and subsequent ballast lowering. Sustainable maintenance practices should be prioritised in future projects to phase out this activity and invest in long-term track capacity integrity.

By implementing these recommendations, Queensland Rail can improve operational efficiencies, enhance network reliability, and ensure the long-term sustainability of its infrastructure.

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APPENDICES

A. SME FORMS

ARCADIS Design & Consultancy for natural and built assets

IMPROVING QUALITY OF LIFE.