CAPITAL EXPENDITURE FY 19

QUEENSLAND RAIL WEST MORETON SYSTEM

REVIEW OF SCOPE, COST AND STANDARD PRUDENCY

Flagstaff Consulting 25 YEARS

Document Version Control

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EXECUTIVE SUMMARY

Introduction

Queensland Rail provides below rail infrastructure for rail traffic in Southern Queensland. Queensland Rail's provision of this infrastructure is regulated by the Queensland Competition Authority (QCA) under the *Queensland Competition Authority Act 2007* and the *Queensland Competition Authority Regulation 2007*.

The provision of the infrastructure is in accordance with an agreement, generally revised every five years, called an access undertaking. The undertaking details the conditions that are required to be met for capital expenditure to be included in the Regulated Asset Base (RAB) on which tariffs to customers are based. The undertaking that the capital expenditure under this specific review was delivered is Access Undertaking 1 (AU1).

Commission

QCA has commissioned the Flagstaff Consulting Group (FCG) to complete a review of Queensland Rail's capital expenditure submission for FY 19. The review is to be based on the prudency and efficiency framework described in Schedule E of AU1.

Queensland Rail Capital Expenditure FY 19 Submission

Queensland Rail's submission consists of eight projects with a total value of ***$ 27.237 m*** (excluding Interest During Construction (IDC)[1]). The projects, in order of decreasing value, are:

- B.04636: Timber and steel bridge elimination - ***$ 12.012 m***
- B.05171: Relay/recondition track program - ***$ 6.878 m***
- B.04728: Signalling pole route upgrade - ***$ 2.539 m***
- B.04613: Formation strengthening - ***$ 2.514 m***
- Ballast undercutting (track lowering) - ***$ 2.016 m***
- B.04403: Culvert/drain renewal - ***$ 1.091 m***
- B.04291: Relaying program – Rosewood to Helidon - ***$ 0.127 m***
- B.05243: Davidson St Oakey Level Crossing CCTV - ***$ 0.061 m.***

FCG Assessment

FCG generally found the Queensland Rail capital expenditure to be prudent in scope, cost and standard. FCG supports the full capital expenditure claim of ***$ 27,236,895*** from Queensland Rail FY 19 (excluding Interest During Construction (IDC)).

B.046036: Timber and steel bridge elimination - *$ 12.012 m*
This project was the replacement of [redacted] single track timber bridges and one set of long multi-barrel culverts with [redacted] dual track and [redacted] single track concrete bridges. [redacted] of these locations were on the Main Line and [redacted] were on the Western Line. FCG found the project prudent in scope, cost and standard.

B.05171: Relay/recondition track program - *$ 6.878 m*
This project involved the full reconstruction of [redacted] of track. FCG found the project prudent in scope, cost and standard.

B.04728: Signalling pole route upgrade - *$ 2.539 m*
This project is the replacement of approximately [redacted] of aerial cable. FCG found the project prudent in scope, cost and standard.

B.04613: Formation strengthening - *$ 2.514 m*
This project involved the strengthening of [redacted] of formation. FCG found the project prudent in scope, cost and standard.

Ballast undercutting (track lower) - *$ 2.016 m*
This project involved the lowering of [redacted] of track. FCG found the project prudent in scope, cost and standard.

B.04403: Culvert/drain renewal - *$ 1.091 m*
This project involved the reconstruction of [redacted] culverts. Following provision of additional support information from Queensland Rail regarding procurement and change management, FCG found the project prudent in scope, cost and standard.

B.04291: Relaying program – Rosewood to Helidon - *$ 0.127 m*
This is the final minor elements of a rerailing program. FCG found the project prudent in scope, cost and standard.

B.05243: Davidson St Oakey Level Crossing CCTV - *$ 0.061 m*
This project is the installation of a CCTV system at Davidson St Oakey. FCG found the project prudent in scope, cost and standard.

[1] *FCG will not consider IDC in this report; all figures in the report will be excluding IDC.*

Summaries of FCG's project reviews of Queensland Rail's FY 19 capital submission are below and in Table 1. This table has traffic light coding to show FCG's assessment of the quality of Queensland Rail documentation.

Table 1: Individual assessment of projects and documentation quality[2]

Project ID	Project	Queensland Rail Value ($,000) (2019 AUD)	FCG Value ($,000) (2019 AUD)	Documentation Quality		
				Scope	Cost	Standard
	TOTAL	**27,236.9**	**27,236.9**			
B.04636	Timber bridge elimination	12,012.3	**12,012.3**			
B.05171	Relay/recondition track	6,877.8	**6,877.8**			
B.04728	Signalling pole route upgrade	2,538.6	**2,538.6**			
B.04613	Formation strengthening	2,514.1	**2,514.1**			
No ID	Ballast undercutting (track lowering)	2,015.5	**2,015.5**			
B.04403	Culvert/drain renewal	1,091.4	**1,091.4**			
B.04291	Rerailing program – Rosewood to Helidon	126.7	**126.7**			
B.05243	Davidson St Oakey Level Crossing CCTV	60.6	**60.6**			

Traffic Light Colour Coding

Code	Meaning
	Supporting documentation was high quality
	Supporting documentation was average quality
	Supporting documentation was poor quality
	FCG value differs to that claimed by Queensland Rail

[2] *Further detail on the basis for the assessment of documentation quality is in the individual project reviews.*

1. INTRODUCTION

Queensland Rail provides below rail infrastructure for rail traffic in Southern Queensland. Queensland Rail's provision of this infrastructure is regulated by the Queensland Competition Authority (QCA) under the *Queensland Competition Authority Act 2007* and the *Queensland Competition Authority Regulation 2007.*

The provision of the infrastructure is in accordance with an agreement, generally revised every five years, called an access undertaking. The undertaking details the conditions that are required to be met for capital expenditure to be included in the Regulated Asset Base (RAB) on which tariffs to customers are based. The undertaking that the capital expenditure under this specific review was delivered is Access Undertaking 1 (AU1). The relevant part of AU1 is Schedule E which provides the criteria to be met for capital expenditure to be included in the RAB.

2. OBJECTIVE

QCA has commissioned the Flagstaff Consulting Group (FCG) to complete a review of Queensland Rail's capital expenditure submission for FY 19. The review is to be based on the prudency and efficiency framework described in Schedule E of AU1.

3. QUEENSLAND RAIL CAPITAL EXPENDITURE SUBMISSION

Queensland Rail made a capital expenditure submission to the QCA on 19 December 2019, titled *West Moreton System Queensland Rail Capital Expenditure Report 2018-2019.*

This submission consisted of eight projects with a total value of ***$ 27.237 m*** (excluding Interest During Construction (IDC)[3]). These projects, in order of decreasing value, were:

- B.04636: Timber and steel bridge elimination - ***$ 12.012 m***
- B.05171: Relay/recondition track program - ***$ 6.878 m***
- B.04728: Signalling pole route upgrade - ***$ 2.539 m***
- B.04613: Formation strengthening - ***$ 2.514 m***
- Ballast undercutting (track lowering) - ***$ 2.016 m***
- B.04403: Culvert/drain renewal - ***$ 1.091 m***
- B.04291: Relaying program – Rosewood to Helidon - ***$ 0.127 m***
- B.05243: Davidson St Oakey Level Crossing CCTV - ***$ 0.061 m.***

4. METHODOLOGY

FCG employed a five-stage methodology for this review. The methodology, with key milestone meetings identified, is described in the Figure 4.1 below:

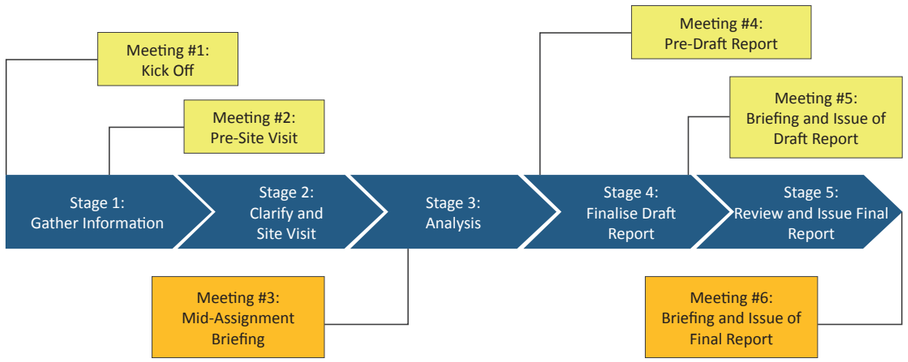

Figure 4.1: Review process

Although identified as sequential the stages will overlap; for example, preparation of the report structure will commence in Stage 1.

[3] *FCG will not consider IDC in this report; all figures in the report will be excluding IDC.*

4.1 Stage 1: Information Gathering

This stage involved the collection and sorting of project information and data. It included initial discussions with specific Queensland Rail staff. Unless authorised otherwise by QCA, FCG obtained all Queensland Rail information and data through QCA. All data was stored and transferred via a restricted access secure cloud-based system.
An RFI system was used to request missing information.

FCG had identified that a short site visit would be of value. This site visit was subsequently cancelled due to Covid 19 complications.

4.2 Stage 2: Analysis

General

The analysis of prudency was guided by a flow chart and review checklist templates. The review templates, with accompanying commentary, was completed for each project. The review templates align to the requirements of UT 5 and address prudency of scope, cost and standard.

A flow chart of the review process is shown in Figure 4.2 below. The review templates are included at Appendix A.

Prudency of scope

In general terms, our review of the scope compared the delivered scope against approved scope and challenged the 'need' for the new capital projects to accommodate the demands as they were understood at the time of approval. The review of scope also considered the extent of consultation with key stakeholders prior to the initiation of a project to validate that the project was initiated with a reasonable understanding by stakeholders of cost and impact.

An important consideration for scope prudency is the legal requirement for Queensland Rail to maintain a safe railway under Rail Safety National Legislation (RSNL).

Prudency of cost

The detailed cost reviews included a combination of checking against current industry pricing, benchmarking and reviewing procurement methodology. The intent of the cost review was to substantiate that value for money was achieved. FCG believe that the most effective way to achieve this is to validate that Queensland Rail utilised the most effective procurement methodology in the context of a project.

Prudency of standard

The prudency of the standard of works was assessed by determining whether the works were of a reasonable standard to meet the requirements of the scope and not over designed. Standards need to be consistent with adjacent infrastructure or existing requirements.

4.3 Stage 3: Finalise Draft Report

In this stage, the FCG team finalised a draft report for review by QCA. Prior to presenting the draft report to QCA, FCG intended to engage with Queensland Rail to address aspects that required additional discussion or clarification; however, this did not occur due to Covid 19 complications.

4.4 Stage 4: Review and Issue Final Report

The FCG team prepared the final report considering feedback provided by the QCA and Queensland Rail on the draft report.

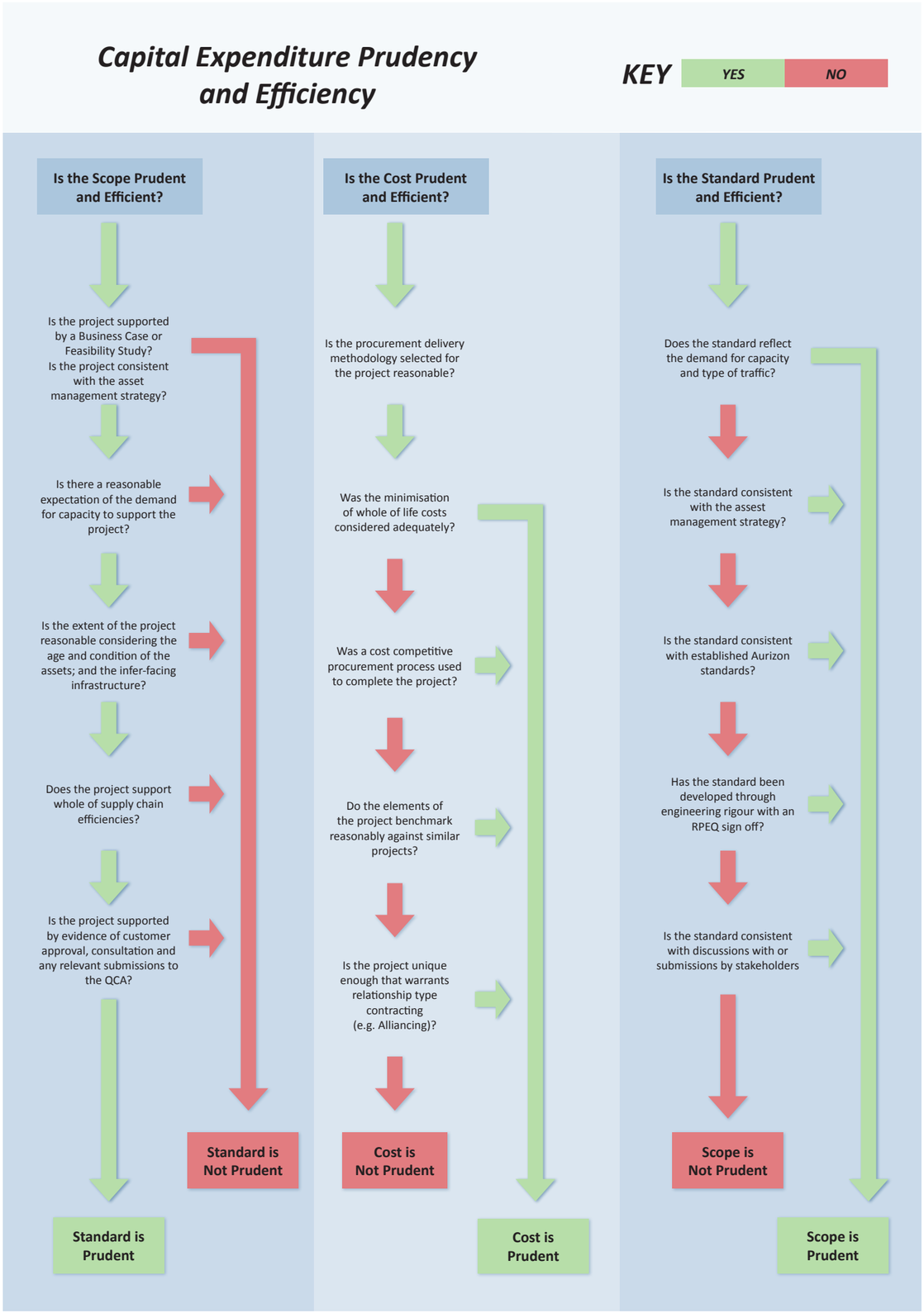

Figure 4.2: Review process

5. KEY FINDINGS

FCG assess the Queensland Rail capital expenditure submission to be generally prudent in terms of scope, cost and quality.

FCG supports the Queensland Rail FY 19 capital expenditure claim of ***$ 27,236,895*** (excluding Interest During Construction (IDC)).

B.046036: Timber and steel bridge elimination - *$ 12.012 m*
This project was the replacement of [redacted] timber bridges and one multi-barrel culvert with [redacted] dual and [redacted] single track concrete bridges. [redacted] of the locations were on the Main Line and [redacted] were on the Western Line. FCG found the project prudent in scope, cost and standard.

B.05171: Relay/recondition track program - *$ 6.878 m*
This project involved the full reconstruction of [redacted] of track. FCG found the project prudent in scope, cost and standard.

B.04728: Signalling pole route upgrade - *$ 2.539 m*
This project is the replacement of approximately [redacted] of aerial cable. FCG found the project prudent in scope, cost and standard.

B.04613: Formation strengthening - *$ 2.514 m*
This project involved the strengthening of [redacted] of formation. FCG found the project prudent in scope, cost and standard.

Ballast undercutting (track lower) - *$ 2.016 m*
This project involved the lowering of [redacted] of track. FCG found the project prudent in scope, cost and standard.

B.04403: Culvert/drain renewal - *$ 1.091 m*
This project involved the reconstruction of [redacted] culverts Following provision of additional support information from Queensland Rail regarding procurement and change management, FCG found the project prudent in scope, cost and standard.

B.04291: Relaying program – Rosewood to Helidon - *$ 0.127 m*
This is the final minor elements of a rerailing program. FCG found the project prudent in scope, cost and standard.

B.05243: Davidson St Oakey Level Crossing CCTV - *$ 0.061 m*
This project is the installation of a CCTV system at Davidson St Oakey. FCG found the project prudent in scope, cost and standard.

Summaries of FCG's project reviews of Queensland Rail's FY 19 capital submission are below and in Table 5.1.
This table has traffic light coding to show FCG's assessment of the quality of Queensland Rail documentation.

Table 5.1: Individual assessment of projects and documentation quality

Project ID	Project	Queensland Rail Value ($,000) (2019 AUD)	FCG Value ($,000) (2019 AUD)	Documentation Quality		
				Scope	Cost	Standard
	TOTAL	**27,236.9**	**27,236.9**			
B.04636	Timber bridge elimination	12,012.3	**12,012.3**			
B.05171	Relay/recondition track	6,877.8	**6,877.8**			
B.04728	Signalling pole route upgrade	2,538.6	**2,538.6**			
B.04613	Formation strengthening	2,514.1	**2,514.1**			
No ID	Ballast undercutting (track lowering)	2,015.5	**2,015.5**			
B.04403	Culvert/drain renewal	1,091.4	**1,091.4**			
B.04291	Rerailing program – Rosewood to Helidon	126.7	**126.7**			
B.05243	Davidson St Oakey Level Crossing CCTV	60.6	**60.6**			

Traffic Light Colour Coding

Code	Meaning
	Supporting documentation was high quality
	Supporting documentation was average quality
	Supporting documentation was poor quality
	FCG value differs to that claimed by Queensland Rail

6. WEST MORETON SYSTEM

6.1 General

The West Moreton System is part of the Queensland Rail network. It has a route length of approximately 314 km and extends between the townships of Rosewood to the East and Columboola in the West. At Rosewood in the East the system joins the South East Queensland (SEQ) urban rail network and at Columboola in the West the system joins Queensland Rail's Western System.

The West Moreton System is shown in Figure 6.1 below.

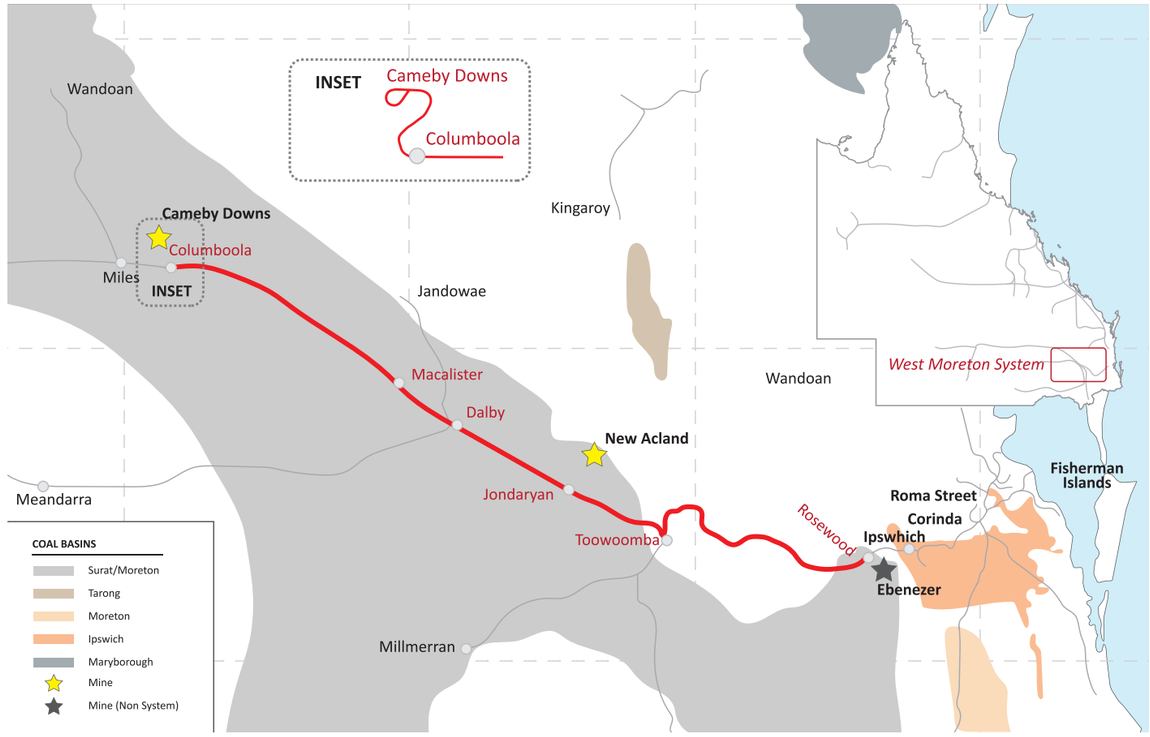

Figure 6.1. West Moreton Network (from Queensland Rail 2018-2019 Capital Expenditure Report)

Queensland Rail's West Moreton System Information Pack divides the track into three elements:

- Rosewood to Toowoomba - 104.705 route and 157.061 track kilometres
- Toowoomba to Dalby - 83.860 route and track kilometres
- Dalby to Miles - 126.494 route and track kilometres.

The Rosewood to Toowoomba length traverses the floodplains of the Lockyer Valley and crosses the Toowoomba Range with some tight curves and grades up to 2%. It is dual track for part of this distance, generally over the floodplain, and is single track with passing loops across the Little Liverpool and Toowoomba Ranges. It is a narrow gauge, 15.75 tonne axle load railway with a maximum train length of 673.8 m. The track has some concrete sleepers and new rail. Signalling on this part of the system is Remote Controlled Signalling (RCS).

Toowoomba to Dalby is single track with nine passing loops distributed across the 84 km. This track is mainly timber/steel at 1 in 2 or 1 in 4 ratios with a small length of 100% steel. The train control system changes from RCS to Direct Train Control (DTC) at Willowburn, west of Toowoomba.

Dalby to Miles is single track with nine passing loops distributed across the 84 km. This track is mainly timber/steel at 1 in 2 ratios with a small length of 100% steel. Train control remains as DTC to Columboolah/Cameby Downs.

Table 1. Summary of West Moreton System track characteristics

	Rosewood to Toowoomba	Toowoomba to Dalby	Dalby to Miles
Route length (km)	104.75	83.86	126.494
Track length (km)	157.061	83.86	126.494
Track Category	7	8	8
Maximum speed	80 km/hr	80 km/hr	80 km/hr
Maximum grade	1/50	1/88	1/50
OTCI Target	46	46	46

The most significant traffic on the line is coal. An alternative way to view the system considering the coal traffic is to view it as two corridors: Rosewood to Jondaryan (R2J) and Jondaryan to Columboola (J2C). This view is based on the increased coal traffic from the New Acland mine joining the system at Jondaryan. In 2019, west of Jondaryan the system transported 2.1 mtpa from the Cameby Downs mine and at Jondaryan an additional 4.15 mtpa from New Acland joined the system to increase the eastbound traffic through to Rosewood to 6.25 mtpa.

At the time of planning and initiating the capital works under review in this report, this annual tonnage of 6.25 mtpa was not anticipated to decrease. There was some possibility of the New Acland traffic increasing to 7 mtpa resulting in approximately 9.2 mtpa east of Jondaryan over the Toowoomba Range to Rosewood.

7. ASSET MANAGEMENT VISION AND STRATEGY

7.1 Vision

The Queensland Rail vison for the West Moreton System is:

" to provide a safe and reliable network that is trusted by customers, where performance is competitive with industry and represents sound value for money for Queensland Rail's stakeholders[4]."

7.2 Strategy

The asset strategies for the West Moreton System are based on the below Queenland rail standards[5]:

- Signalling, Control and Train Protection MD-15-181
- Track and Civil MD-15-182
- Above Rail Assets (stations, stabling yards and supporting infrastructure) MD-15-183
- Traction Power MD-15-185
- Telecommunications MD-15-184.

Queensland Rail's key strategies for the West Moreton System include[6]:

- Predictive not reactive maintenance – to be achieved through better collection, analysis and utilisation of asset condition data so that faults can be prevented instead of repaired
- Undertake asset renewals that introduce modern, reliable, low maintenance, less disparate and (where possible) future-proofed infrastructure assets
- More effective planning of works delivery with the aim of minimising the impacts of capital works and major maintenance on the network to deliver improved productivity and network availability arising from closures
- Focus on improved cost-effectiveness by reviewing internal works processes and cost contributors and more effective utilisation of industry through appropriate packaging and tendering of works and management of delivery.

[4] *Queensland Rail 'West Moreton System, Asset Management Plan 2018-19', 31 July 2018, page 7*
[5] *Queensland Rail 'West Moreton System, Asset Management Plan 2018-19', 31 July 2018, page 7*
[6] *Queensland Rail 'West Moreton System, Asset Management Plan 2018-19', 31 July 2018, page 7*

7.3 Asset Management Planning

In the Asset Management Plan (AMP) Queensland Rail describe the asset management decision making process, their Asset Planning Framework (APF). This includes understanding the level of intervention needed to keep an asset operating at its' required level of service and understanding the impact that an asset failure would have on Queensland Rail[7].

Queensland Rail's APF is shown in Figure 7.1 below.

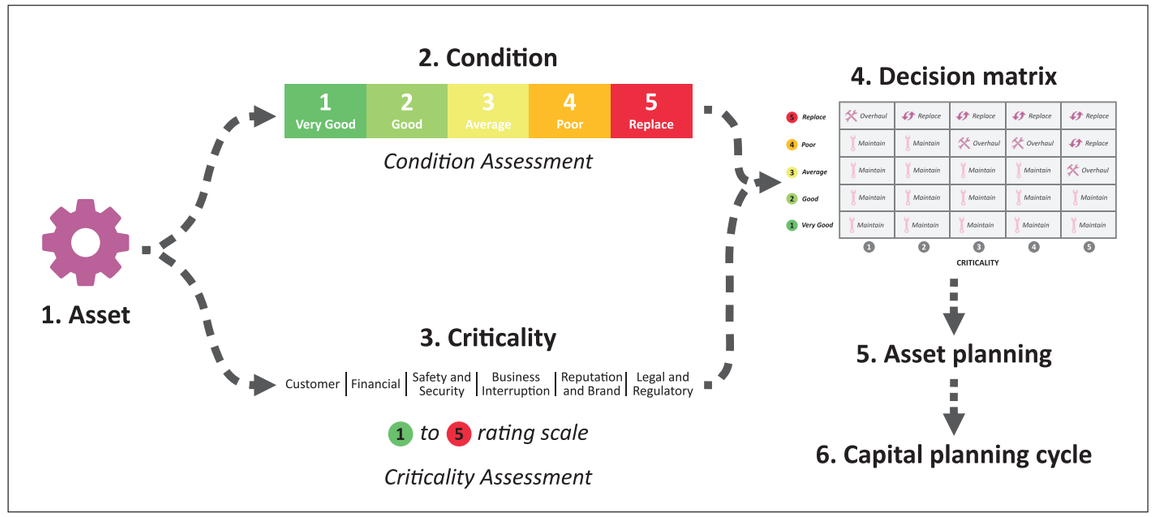

Figure 7.1: Asset Planning Framework.

Step 4 of the APF addresses the question of "fit for purpose" maintenance; essentially what an appropriate level of maintenance input for an asset is given the criticality of the asset.

This decision matrix is shown in Figure 7.2 below.

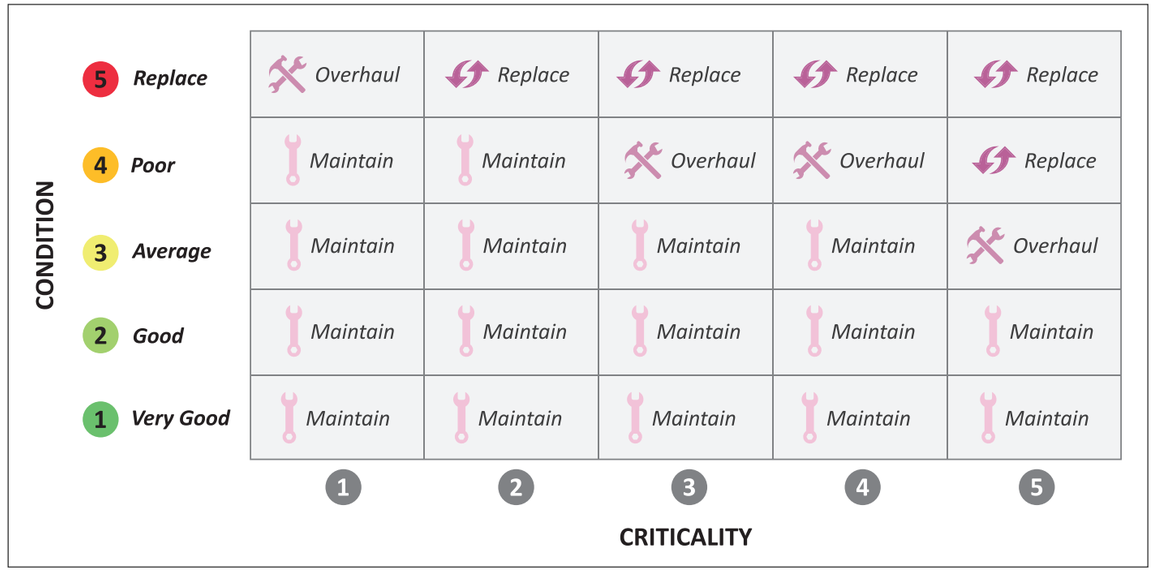

Figure 7.2: Decision Matrix.

[7] *Queensland Rail 'West Moreton System, Asset Management Plan 2018-19', 31 July 2018, page 9*

7.4 Stakeholder Consultation and Rorecast Traffic

Queensland Rail have four stakeholders to consult with regarding the West Moreton System:

- The operators of the Westlander
- Seasonal agricultural products
- Yancoal coal mine
- New Acland coal mine.

In terms of traffic the two coal mines provide the largest impact on traffic. At the time Queensland Rail was planning and initiating these capital works coal traffic on the system consisted of 2.1 mtpa from the Yancoal mine to Jondaryan and an additional 4.15 mtpa joining the system at this location from the Acland Mine resulting in 6.25 mtpa on the track east of Jondaryan. To meet this demand, Queensland Rail maintains the track west of Jondaryan as single track with passing loops and the track East of Jondaryan to Rosewood as a duplicated track.

At the time of planning the capital works, 2017 and 2018, there was also some discussion of tonnages from New Acland increasing to approximately 7 mtpa resulting in the traffic east of Jondaryan increasing to approximately 9 mtpa.

FCG assess that with the existing and anticipated tonnages known to Queensland Rail at the time of planning and implementing the capital works; it is reasonable to plan works to keep the system able to operate at full capacity, that is at approximately 9 mtpa.

7.5 Inland Rail

At the time of planning and initiating the capital works Queensland Rail had little certainty regarding the specific timeline of the commissioning of the elements of Inland Rail and was committed to maintaining the rail to achieve its task assuming Inland Rail had not yet been commissioned.

Considering planning time to deliver capital works, FCG assess that Queensland Rail was reasonable in assuming that the West Moreton System would have to achieve its task independent of Inland Rail.

8. ANALYSIS

8.1 General

FCG conducted reviews on all eight projects. The projects are described in general in Table 8.1 below.

Figure 8.1: Individual assessment of projects and documentation quality

Project ID	Project	Queensland Rail Value ($,000)	Description
	TOTAL	**27,236.9**	
B.04636	Timber bridge elimination	12,012.3	This project was the replacement of bridges at six sites totalling [redacted] individual timber bridges and one multi-barrel culvert with seven concrete bridges: [redacted] dual track and [redacted] single tracks. [redacted] of these bridge site locations were on the Main Line and [redacted] on the Western Line. The multi-barrel culvert replaced was on the Western Line.
B.05171	Relay/recondition track program	6,877.8	This project involved the full reconstruction of [redacted] of track.
B.04728	Signalling pole route upgrade	2,538.6	This project is the replacement of approximately [redacted] of aerial cable.
B.04613	Formation strengthening	2,514.1	This project involved the strengthening of [redacted] of formation.
No ID	Ballast undercutting (track lowering)	2,015.5	This project involved the track lowering [redacted] of track.
B.04403	Culvert/drain renewal	1,091.4	This project involved the reconstruction of [redacted] culverts.
B.04291	Rerailing program – Rosewood to Helidon	126.7	This is the final minor elements of a rerailing program.
B.05243	Davidson St Oakey Level Crossing CCTV	60.6	This project is the installation of a CCTV system at Davidson St Oakey.

8.2 B.04636 Timber Bridge Elimination

Project Overview

The West Moreton System has 141 timber bridges. These timber bridges are old and operating at the limit of their capability under the existing rail traffic[8]. It is also difficult to source suitable timber and skilled tradesmen to maintain these timber bridges.

Queensland Rail established the Below Rail Cost Optimisation – Regional South Corridor program of works to progressively replace timber bridges across the West Moreton System. Project B.04636 is a four-year program of works established to replace eighteen timber bridges across the West Moreton System in the period FY 16 to FY 20.

Review Summary

FCG found project B.04636 prudent in scope, cost and standard.

A summary of FCG's assessment is included in Table 8.2 below.

Table 8.12: B.05171 Relay/recondition program summary

Prudency	
Scope	✓ [9]
Cost	✓ [10]
Standard	✓ [11]

Cost	($)
Queensland Rail claim	12,012,334
FCG Adjustment	0
FCG Recommendation	12,012,334

Prudency of Scope

FCG found project B.04636 prudent in scope based on:

- ***Queensland Rail's application of its Asset Planning Framework (APF) using field assessment data and asset criticality***
- ***The impact on system operational performance of legacy timber bridges***
- ***The impact on system safety risk of legacy timber bridges***
- ***The increasing cost of maintaining timber bridges***
- ***The increasing difficulty of finding appropriate resources for maintaining legacy timber bridges.***

[8] *The Queensland Rail capital expenditure submission (p21) details that although currently rated at 15.75 tonne axle load the bridges were originally designed for 12 tonne axle loads.*

[9] *Quality of documentation for scope is rated as Average Quality. The scope is defined well within Queensland Rail's submission, however further scope prioritisation documentation and details on the overall progress of the wider program would provide have been useful.*

[10] *Quality of documentation for cost is rated as Poor Quality. Original budget estimates are provided however no planned costs provided per package or individual bridge and only a single asset value provided for each bridge claimed within FY 19. FCG suggest Queensland Rail should conduct some form of benchmarking in project completion reports for internal benefit.*

[11] *Quality of documentation for standard is rated as Average Quality. Queensland Rail describe the standards followed; however, no asset completion certificates, or design certifications provided to evidence compliance has been achieved*

Timber bridges across the West Moreton System impact operations through increased closure requirements and speed restrictions. There is also a greater rail safety risk of derailment when compared to concrete or steel replacement alternatives.

Maintaining timber bridges includes the difficulty of sourcing high quality timber in the lengths and sizes required and the complementary difficulty in finding the appropriate skills to maintain timber bridges in today's market. Both challenges are likely to increase over time. Timber bridge defects commonly include bridge/rail misalignment, termite damage, cracked or perishing girders, loose screws, split spans, rotten transoms and headstocks. Queensland Rail considered continuation of the existing maintenance program; however, replacement was assessed as the best option. FCG agree that this was appropriate with the anticipated tonnages at the time of the decision.

Eighteen bridge sites were selected for the program by Queensland Rail. Some of the sites had one timber bridge and others, Main Line sites, had two timber bridges, on both UP and DOWN lines. This assessment was based on Queensland Rail applying the Asset Planning Framework (APF) which balances priority and condition risk. Factors taken into consideration within priority ranking include:

- Bridge condition
- Tonnage over the Bridge
- History of temporary speed restrictions
- Location on the network and criticality to wider network operations.

Figure 8.1 below shows a typical timber bridge on the West Moreton System. This bridge, Sandy Ck at Km 88.460, is not part of the FY 19 scope but is due for replacement because of poor condition and can be considered typical.

Figure 8.1: Typical West Moreton System timber at Sandy Creek

Figure 8.2 is a close of Pier 4 of the Sandy Ck bridge. The dots in the centre of the open chevrons indicate that this bridge has defects in superstructure, piers and substructure.

Figure 8.2: Close up of Pier 4 at Sandy Ck bridge

The 18 timber bridges were broken into two work packages, with different delivery timeframes for each package. The original scope of works is summarised in Table 8.3 below.

Table 8.3: B.04636 Milestone dates

	Phrase	Dates
1	Pre-Concept and Concept - both packages	November 2015 to July 2016
2	Development - both packages	July 2016 to January 2017
3	Package A (eleven sites) - Implementation	February 2017 to June 2018
4	Package A – Finalisation	July 2018 to September 2018[12]
5	Package B (seven sites) - Implementation	July 2017 to June 2020
6	Package B - Finalisation	July 2020 to September 2020

[12] *Completion Date based upon 3 months for final close out of documentation and accounts, as provisioned for Package B works within Queensland Rail's P6 works schedule provided with the FY 19 Capital expenditure submission.*

The 18 sites were assigned to one of two deliverable packages, A and B. The sites are listed in Tables 8.4 and 8.5 below. Seven sites were claimed in this FY 19 submission; these have been highlighted in yellow[13].

Table 8.4: B.04636 Package A - Timber bridge replacement sites

	Line	Kilometre	Description
1	Main	66.440	DN and UP roads, near Western Creek
2	Main	89.570	DN and UP roads
3	Main	110.040	DN and UP roads
4	Main	115.230	
5	Main	115.400	Rocky Creek
6	Main	115.840	
7	Main	130.130	
8	Main	130.340	
9	Western	2.040	Willowburn
10	Western	10.640	East of Gowrie
11	Western	135.740	Jingi Jingi Creek, replaces long multi-barrel culvert

Table 8.5: B.04636 Package B - Timber bridge replacement sites

	Line	Kilometre	Description
1	Main	57.460	DN and UP roads
2	Main	61.300	DN and UP roads, Western Creek 2
3	Main	67.930	DN and UP roads, Western Creek 3
4	Main	69.090	DN and UP roads, Western Creek 4
5	Main	81.770	DN and UP roads
6	Main	83.070	DN and UP roads
7	Western	117.750	Replaces culvert

[13] The seven bridges claimed within this submission are not under one package; three sites are from Package A and four from Package B. No explanation has been provided for this by Queensland Rail within its FY 19 submission. The splitting of the bridges into two packages could be commercial de-risking to award the bridges to two contractors; it does not appear to relate to specific FY targets.

The locations of these seven bridge sites is shown on the extracts of the West Moreton schematics at Figure 8.3 below.

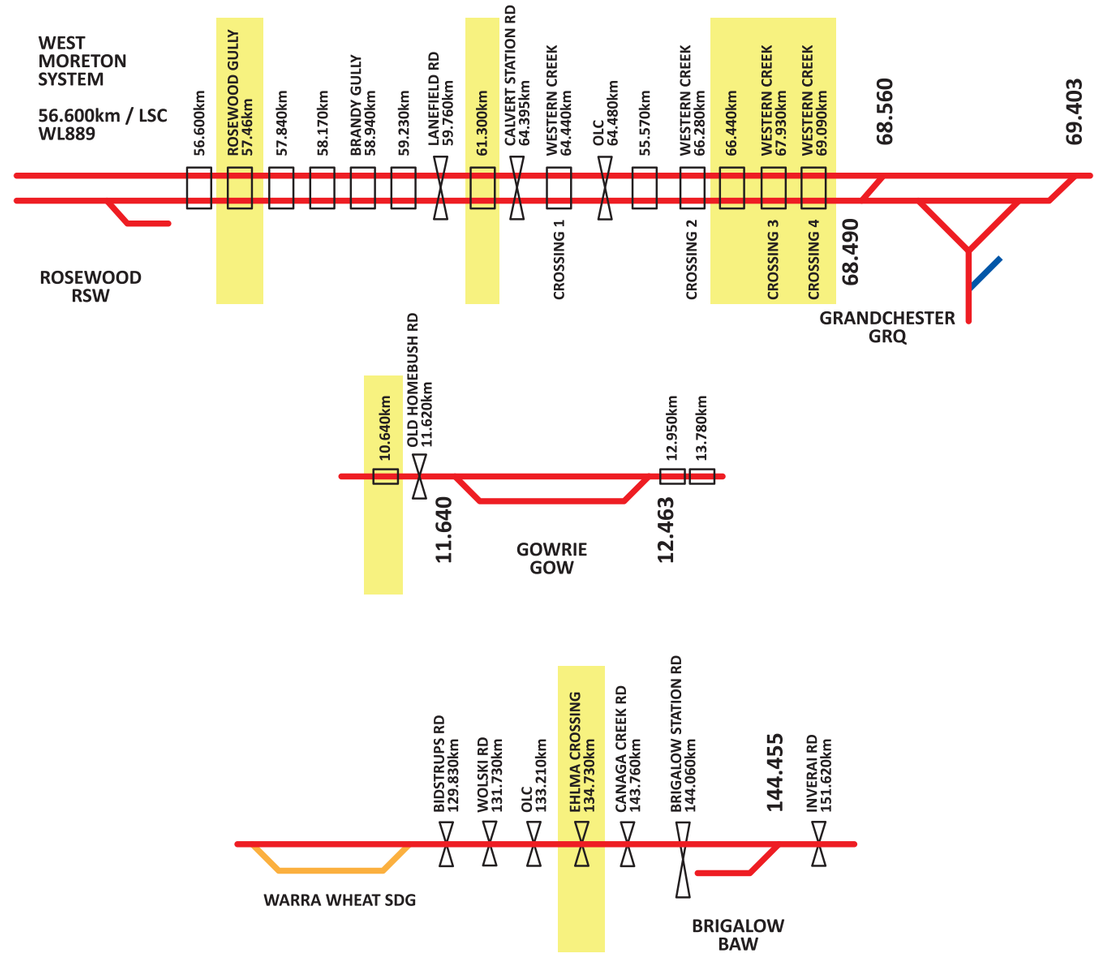

Figure 8.3: B.04636 Timber bridge replacement sites overlayed on West Moreton schematic

Other bridges identified under Package A do not appear to have been included in previous capital expenditure submissions[15], nor is there any advice on whether these other sites have, or will be, completed. This highlights the difficulty of assessing multi-year scope projects on an incremental annual basis.

Figure 8.3 shows that:

- Five of the bridge sites are clustered between Rosewood and Grandchester.
- One of the sites is located at Gowrie to the West of Toowoomba
- The final site does not match with an existing bridge location.

[14] Extracted from Queensland Rail's West Moreton information pack.
[15] This review is only addressing the bridges submitted for this review.

The five bridge sites clustered between Rosewod and Grandchester are adjacent a cluster of defective bridges reported by SYSTRA in the 2019 capital, maintenance and operations cost review, Figure 8.4 below is taken from that report. As these bridges were all built at the same time and are in the same topography, it is reasonable to consider these sites to be candidates for replacement.

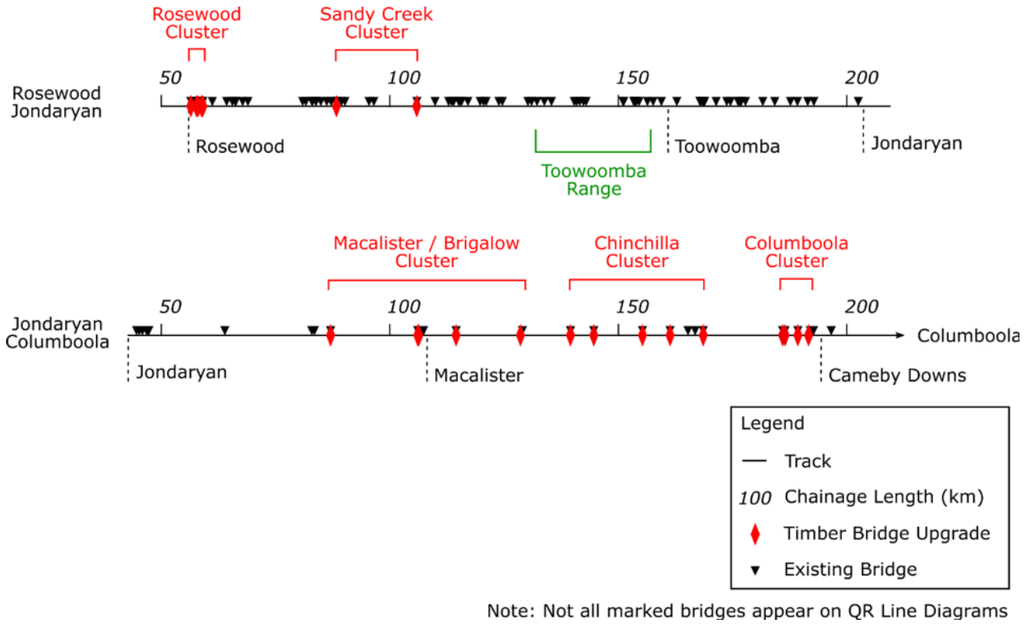

Figure 8.4: Clusters of poor condition bridges reported by SYSTRA in 2019

The bridge replacement at Gowrie is adjacent the Old Homebush Rd level Crossing. In terms of criticality this bridge is a single track location approximately 30 km from the point where the additional coal traffic joins the system at Jondaryan. Queensland Rail has no redundancy if the bridge was to fail. In terms of criticality replacing the bridge is prudent; however FCG did not receive and, was therefore unable to to review condition reports of the existing bridge to support replacement.

The Queensland Rail schematics do not show an existing bridge at Kilometre 135.740, immediately to the east of the Ehlma level crossing, on the Western Line section of the West Moreton System. However, a satellite image[16] shows a significant creek crossing in the area; therefore, it appears the previous structure may have been an extensive multi-barrel culvert which could have become ineffective through age or continual silting. Figure 8.5 on the next page.

[16] *Google Maps accessed 6 April 2020.*

Figure 8.5: Bridge site east of Ehlma at Kilometre 135.740 on the Western Line

This bridge is described by Queensland Rail as 116 m long with 21 spans. SYSTRA on 2019 reported that this area immediately west of Macalister required frequent resurfacing operations in 2016/2017, up to three resurfacings in 12 months.

FCG assess that it was prudent of Queensland Rail to scope this culvert replacement as a bridge replacement given:

- The demonstrated issues with maintaining track geometry in this specific location
- The difficulty in maintaining some long multi-barrel culverts in these types of locations
- The risk to rail safety of ineffective culverts in flood events
- The relative ease of constructing a bridge on an operational rail system as opposed to an extensive multi-barrel culvert[17].

[17] *Construction of a bridge allows much of the bridge substructure to be constructed without removing the track and consequently in short possession windows. Culvert construction does not allow this. Combining the ability to construct the substructure as early works with the use of precast headstocks, abutments and beams allows the superstructure to be erected quickly in a constrained track possession.*

The checklist template for the assessment of prudency of scope is in Table 8.6 below.

Table 8.6: Prudency of scope for project B.04636 Timber Bridge Replacement Program

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Plan	Aligning scope with system wide priority Reliability of achieving target transit time by system or track section	Demand changes resulting from the creation of Inland Rail Project have modified Queensland Rail's structural design parameters for replacement bridges. Given the timing of Inland Rail's inception and understanding of its impacts on demand, Queensland Rail sought to revise structural axle load parameters down where possible to provide commercial savings to this program of works. Replacement of timber bridges will reduce temporary speed restrictions and other operational constraints at respective bridge locations.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	Queensland Rail consulted with stakeholders where required under Clause 3.2(e)(vi), Schedule E of AU1.
3	Accommodation for current contracted demand and potential future demand	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR) Processes used to evaluate alternatives SFAIRP analysis	Queensland Rail was required to plan for tonnages between Rosewood and Jondaryan of up to 9.2 mtpa.
4	Age and condition of assets	Reasonable consideration of standard and configuration of adjacent infrastructure Track geometry data Ground penetrating radar data Geotechnical reports Equipment condition reports and fault record	Scope prioritisation was determined by field condition assessment and the location's network criticality, as prescribed under Queensland Rail's Asset Planning Framework (APF).
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Queensland Rail demonstrated whole of supply chain considerations by maximising bridge replacements in the critical area around Rosewood. One bridge constructed on the Western Line replaced a long multi-barrelled low lying culvert. FCG assess that this structure must have been causing reliability issues for Queensland Rail with a consequent impact on supply chain reliability.
6	Legislative and tenure requirements	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Outcomes of consultation with relevant stakeholders	Access seekers Access holders Customer specific expenditure has been approved by the customer concerned	No negotiations were required with access seekers. Access holders were engaged through regular maintenance shut planning processes. Queensland Rail engages with access holders through the forum of the South-West User Group (SWUG). There was no specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by QUEENSLAND RAIL or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Prudency of Cost

FCG found project B.04636 prudent in cost based on:

- ***Effective delivery strategy combining substructure construction with the line operating and superstructure installed with prefabricated components over 48-hour possessions***
- ***Cost competitive procurement strategy***
- ***Reasonable benchmarking of the bridges with expected costs.***

Queensland Rail's Implementation Phase Recommendation for this project dated January 2017 outlines the case for the removal and replacement of [redacted] timber bridges for [redacted] m in budget. This budget included a risk contingency of [redacted]; or [redacted] which is a reasonable contingency to allow at contract award.

The delivery of these works was broken into Package A of 11 bridges and Package B of 7 bridges.
The breakdown of the planned budget is as outlined in Table 8.7 below.

Figure 8.4: Clusters of poor condition bridges reported by SYSTRA in 2019

Item	Phase	[redacted]	[redacted]
1	Pre-concept and Concept	[redacted]	
2	Development	[redacted]	[redacted]
3	Implementation	[redacted]	[redacted]
4	Finalisation	[redacted]	
5	Risk contingency	Planned - $ 0.399 m	[redacted]
6	**TOTAL**	[redacted]	

The claimed value of [redacted] is supported by reported "Asset Values" for the seven bridge sites in Queensland Rail's West Moreton Capex cost spreadsheet provided.

A common method of order of magnitude benchmarking is to use direct cost per square metre of bridge deck for superstructure and substructure. In 2009 several large green field rail projects were being scoped in Queensland; typical rates for green field rail bridges at this time ranged from [redacted] per square metre of deck. This equates to a square metre rate of [redacted] to [redacted] in 2019[18]. Note that this benchmark is for green field work and does not include overheads, mobilisation, approaches or demolition.

Table 8.8 below shows the unit rates per square metre of deck based on the total cost of each bridge with no normalisation for the factors listed above.

[18] *Average CPI of approximately 2.2%.*

Table 8.8: Unit Rate analysis based on total bridge cost

Item	Location	Tracks[19]	[redacted]	Bridge Length and Spans	[redacted]
1	ML 57.460	Two	[redacted]	27 m/4 span	[redacted]
2	ML 61.300	Two	[redacted]	16 m/ 2 span	[redacted]
3	ML 66.440	Two	[redacted]	21 m/2 span	[redacted]
4	ML 67.930	Two	[redacted]	26 m/ 3 span	[redacted]
5	ML 69.090	Two	[redacted]	18 m/ 2 span	[redacted]
6	WL 10.640	One	[redacted]	14 m/4 span	[redacted]
7	WL 135.740	One	[redacted]	116 m/21 span	[redacted]

Shorter length bridges generally have a higher per metre cost as the standard fixed costs relating to works irrespective of length must be absorbed by a smaller deck area. Table 8.8 supports this with what appears to be an asymptote at approximately [redacted] per square metre. This is reasonable given our benchmark range from the 2009 projects is [redacted] per square metres of deck, indexed to 2019.

More realistic benchmarking can be achieved by repeating this analysis after some of the fixed costs associated with the bridges are deducted. FCG ranged this analysis deducted from each bridge cost the following fixed costs:

- Allowance for off-site and on-site overheads ranging from 20 to 25%
- Bridge approach works on either side[20] ranging from $ 200,000 to $ 300,000
- Mobilisation and demobilisation ranging from $ 25,000 to $ 50,000
- Mobilisation and demobilisation ranging from $ 25,000 to $ 50,000.

Table 8.9 shows these high and low normalised rates.

Table 8.9: Unit Rate analysis based on normalised bridge cost discounting fixed costs

Item	Location	Tracks[21]	Bridge Length and Spans	[redacted]	[redacted]
1	ML 57.460	Two	27 m/4 span	[redacted]	[redacted]
2	ML 61.300	Two	16 m/ 2 span	[redacted]	[redacted]
3	ML 66.440	Two	21 m/2 span	[redacted]	[redacted]
4	ML 67.930	Two	26 m/ 3 span	[redacted]	[redacted]
5	ML 69.090	Two	18 m/ 2 span	[redacted]	[redacted]
6	WL 10.640	One	14 m/4 span	[redacted]	[redacted]
7	WL 135.740	One	116 m/21 span	[redacted]	[redacted]

Table 8.9 shows that Queensland rail achieved an average cost for bridge deck ranging between [redacted] per square metre for superstructure and substructure.

[19] *FCG did not have access to the specific bridge designs and used a nominal 3.7m width for a single-track bridge deck and 7.0 m for a double-track bridge. This does not include walkways.*
[20] *This item includes rail stress management.*
[21] *FCG did not have access to the specific bridge designs and used a nominal 3.7m width for a single-track bridge deck and 7.0 m for a double-track bridge. This does not include walkways.*

These Queensland Rail achieved rates are slightly higher than the FCG benchmark rates of [redacted]; however the FCG rates are “green field” and it is reasonable to expect that the Queensland Rail rates will be marginally higher due to the challenges of replacing bridges on an operating system. The Queensland Rail achieved rates for bridges align with industry benchmarking.

Figure 8 .6 below shows these results graphically. This figure clearly illustrates the savings in unit rates for longer bridges.

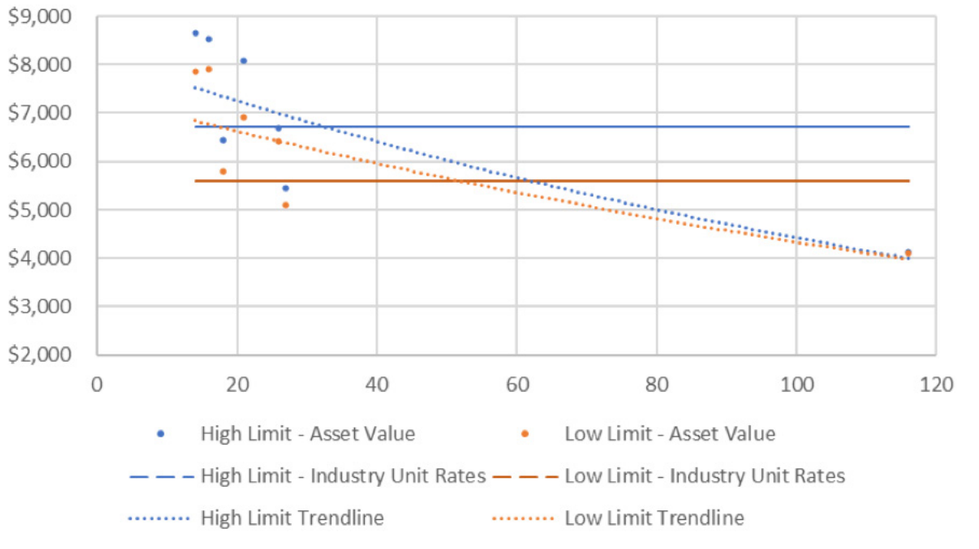

Figure 8.6: Unit rate analysis based on normalised bridge costs ($/square metre of the deck).

The prudency of cost assessment from the guideline template is included in Table 8.10 below.

Table 8.10: Prudency of cost for project B.04636 Timber Bridge Elimination

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Development Plan	Aligning scope with system wide priority Reliability of achieving target transit time by system or track section	Scope prioritisation includes consideration of the structure location and that location’s criticality within the overall West Moreton System. FY 19 bridge replacement works form part of the wider rolling program of timber bridge replacement planned out to FY 27.
2	Costs relative to the scale, nature and complexity of the project	Delivery methodology Difference between budgeted and actual cost Project or program of works Whole of supply chain impact	Timber bridge replacement costs: • Claimed amount: $ 12,012,334. • Actual costs incurred during FY 19 $ 14,238,607 • Total spend to date $ 23.475,360. FCG assumes Queensland Rail has only included assets commissioned in FY 19 in this capital expenditure submission . Asset values per bridge provided with total cost appearing to be allocated in thirds across transoms, piers and foundations.
3	Circumstances prevailing in the market for: • Engineering, equipment supply and construction • Labour • Materials.	Market conditions Procurement policy Possible application of benchmarking Project management	Works delivered predominately with external structural design consultants and contractor. Procurement was conducted in accordance with Queensland Rail’s procurement policies. It appears the contractor was selected through a competitive tender process; JF Hull advertises on its website that it has had significant work with Queensland Rail involving timber bridge replacement specifically mentioning the West Moreton System. Bridge replacement unit rates appear reasonable on a cost per metre square basis. Queensland Rail’s use of TMR’s OnQ project management framework provides rigour around delivery and cost management processes.
4	Asset Management Plan	Reasonable consideration of: • Standard and configuration of adjacent infrastructure • Minimising whole of life cost • Scope priority assessments • Track geometry data	Consideration was given to continuing the previous maintenance program for timber bridges, however the increasing annual costs and other operational constraints led to the decision to replace. Scope prioritisation based upon field condition inspections, deterioration / defect history and bridge location criticality within the West Moreton System.
5	Actions, or proposed actions, in relation to: • Safety during construction and operation • Environmental requirements • Compliance with Law and Authorities • Minimising disruption to Train Services • Accommodating reasonable request to amend scope or sequence of works • Minimising total project cost • Aligning other elements of the supply chain • Meeting contractual timeframes • Dealing with external factors.	Minimising disruption to Train Services Legislative requirements Regulatory safety requirements Requests from Access Holders Possible multiple beneficiaries and appropriate allocation of cost Contractual timeframe	All timber bridge superstructure replacement works were carried out under track closures for safety in construction and operation. However, Queensland Rail constructed much of the substructure of piles and concrete blade walls without lifting any track. No defined stakeholder process referenced by Queensland Rail for this project. Noted that all bridge works are replacement works within the rail corridor and have no direct public interface. The project management of all Queensland Rail Projects is based upon TMR’s OnQ Project Management Framework. This project was deemed a Type 3 project and managed in accordance with the OnQ framework.
6	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG is not aware of any submissions made to the QCA related to this project.

Prudency of Standard

FCG found project B.04636 prudent in standard based on:

- ***Application of Civil Engineering Track Standards (CETS)***
- ***Application of Civil Engineering Structural Standards (CESS)***
- ***Application of accepted design and construction practices for concrete rail bridges.***

External engineering consultants were engaged to carry out structural design for all bridges under this project. Queensland Rail have provided no practical completion certificates, or equivalent, from its contractors to evidence completion of works and compliance with necessary standards.

The existing timber bridges across the system are rated for 12 tal. At project inception the intent was to replace the timber bridges with concrete bridges of 30 tal capacity to meet forecast demand and tonnages. In May 2017, the Australian Government announced the creation of the Inland Rail project. Following Queensland Rail's assessment of its impact on the West Moreton System, it revised down the annual tonnage and demand on the West Moreton System and amended the bridge design to 20 tal.

The announcement of the Inland Rail project was made part way through the structural design period for Package B timber bridges. When it was determined that replacement bridges could be designed for 20 tal capacity, instead of the planned 30 tal, consideration of the design status and whether such a change could be affected to provide a commercial benefit to the project works was considered. Where commercial benefit could be realised by revising the design axle load parameter to 20 tal, then this was done.

Although not clearly demonstrated, as this program has been managed with TMR's OnQ project management framework and commissioning certification/signoff is a critical step to putting an asset into operation then FCG expect all applicable standards have been met.

The prudency of standard assessment from the guideline template is included in Table 8.11 below.

Table 8.11: Prudency of standard for project B.04636 Timber and Steel Bridge Elimination

Item	Factors	FCG Guidance Notes	FCG Findings
1	Requirements of Railway Operators and Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	These works are asset renewal and no agreements were impacted or stakeholder engagement was required for these works.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	With reference to West Moreton Asset Management Plan (2015), the short-term tonnages forecast was for up to 11 million tonnes per annum. FCG believes this figure is high, however assess that it was reasonable for Queensland Rail to plan for a range between 6.25 and 9.2 mtpa. Speed restrictions and other operational constrains are common for most of the timber bridges across the West Moreton System.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	Design and construction in accordance with: • CESS • CETS • All applicable Australian Standards • Any other standards identified applicable for each structure and/or its location.
4	Consistency with the Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Scope priority assessments Track geometry data	Scope prioritization carried out to select timber bridges for replacement with field inspections and structure location within the system contributing in the final risk assessment.
5	Design standards contained within the Safety Management System	CETS CESS	CESS and CETS. Compliance with applicable Australian Standards. No asset completion certificates provided to evidence either works by external contractor (ITP's) or by Queensland Rail. Only signed record provided is an extract of the asset information for the seven bridges claimed. Engineering consultants are required to certify their designs are compliant with all applicable standards. The OnQ Project Management System requires finalisation of works including all documentation prior to works being deemed commissioned and put back into operation. Evidence of this was not sighted by FCG.
6	Laws and the requirements of any Authority	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG is not aware of any submissions made to the QCA related to this project.

8.3 B.05171[24] Track Relay/Recondition Program

Project Overview

The B.05171 Track Relay/Recondition Program fully reconstructs track at given locations. These locations are where the track system is defective to the extent that individual location repairs cannot maintain a serviceable track combined with deeper formation failures that create drainage and track geometry issues.

The scope of work is to remove the existing track system and formation and replace with a formation and track system designed to current standards. On the West Moreton System this usually consists of a new track system of 50 kg/m rail on concrete sleepers on an engineered capping layer and formation strengthened by geogrids and geofabrics.

Queensland Rail are claiming [redacted] of track reconstruction in the FY 19 submission.

Review Summary

FCG found project B.05171 prudent in scope, cost and standard.

A summary of FCG's assessment is included in Table 8.12 below.

Table 8.12: B.05171 Relay/recondition program summary

Prudency	
Scope	✓[25]
Cost	✓[26]
Standard	✓[27]

Cost	($)
Queensland Rail claim	6,877,736
FCG Adjustment	0
FCG Recommendation	6,877,736

Prudency of Scope

FCG found project B.05171 prudent in scope based on:

- ***Queensland Rail's application of the APF***
- ***The impact on system operational performance of poor track geometry***
- ***The impact on system safety risk of poor track geometry and rail defects***
- ***The order of magnitude of track reconstruction with historical resurfacing requirements***
- ***The location of track reconstruction sites aligning with historical resurfacing requirements***
- ***The increasing cost of maintaining track geometry through evidence of multiple resurfacing operations.***

Track reconditioning is required when at least two factors are present: defective, or life expired, track system and ineffective capping and formation. It is usually identified through a combination of inputs including:

- Driver reports
- Visual inspections
- Track geometry measurements
- Ground penetrating radar
- Ultrasonic inspections
- Evidence of drainage issues.

[24] *The Internal Business Case identifies this project as B.07498; the Capital Expenditure Submission identifies it as B.05171.*
[25] *Quality of documentation for scope is rated as High Quality. Track reconstruction sites prudently and effectively selected.*
[26] *Quality of documentation for cost is rated as Average Quality. Costs are reasonable on an order of magnitude basis, however granular data that allows investigation of options for improved performance was not witnessed by FCG.*
[27] *Quality of documentation for standard is rated as High Quality. Standard for new construction is well defied; a site visited during a previous project evidenced a high quality of construction with good use of geogrids and geofabric.*

Track reconditioning is the most expensive solution to track geometry and formation issues and has significant operational impacts as it requires track closure. However, it is one part of an interconnected strategy of escalating maintenance options that need to be considered holistically. These escalating options in order of escalation are:

- Operational restrictions such as Temporary Speed Restrictions (TSR) or reduced axle load
- Resurfacing
- Frequent resurfacing
- Ballast cleaning, undercutting or lowering
- Formation reconstruction
- Track reconstruction.

The first option a rail system operator has is to place an operational restriction such as speed or load over a specific length of track. These types of restrictions can often be used as semi-permanent restrictions to prudently manage the cost of maintenance of the wider asset. Generally, though the aim is to remove them as soon as possible as the safety risk is complicated and potentially increased by the addition of an interface with the above rail operator.

The next option is to reset the geometry by adding ballast and resurfacing. This solution can be effective in some cases, however if the issue causing the geometry failure is in the capping or formation the track geometry issues will reappear.

There is evidence of multiple return visits to sites on the West Moreton System of resurfacing teams; these visits will eventually become unsustainable and the issues in the capping layer or formation will have to be addressed.

A side effect of multiple resurfacing is that the height of the ballast will increase and eventually make the track system unstable and unsafe. Queensland rail CETS have a height limit of 600 mm to address this risk. FCG suggest that the issues of poor capping and formation should have been addressed before this point but acknowledges that this is a real issue for Queensland Rail on the West Moreton System and that there is a requirement to undertake this for safe rail operations.

Eventually the poor capping and formation issues must be addressed by closing traffic and rebuilding the formation and capping, generally with a geogrid and geofabric layer in the new profile. This is a formation strengthening project. In some cases where the track system is old, defective or wearing out, the track system must be replaced as well. This a track relaying or reconstruction and is more expensive than formation strengthening.

Two of the indicators that can be used to determine the prudency of the scope of the combined ballast undercutting, formation rebuild, and track reconstruction quantities are:

- Frequency of resurfacing
- Track geometry data.

Evidence of the requirement of multiple resurfacing should support the total quantity of the three activities ballast undercutting, formation rebuild, and track reconstruction. SYSTRA in 2019 reported on the amount of resurfacing on the West Moreton System[28]. SYSTRA's figures for resurfacing visits in the year FY 18 were:

- Rosewood to Jondaryan (approximately 199.8 km):
- 6 visits - 0.22% - 0.4 km
- 5 visits - 1.00% - 2.0 km
- 4 Visits - 0.98% - 2.0 km
- 3 Visits - 8.09% - 16.2 km
- 2 Visits - 27.31% - 54.5 km
- 1 Visit - 32.21% - 64.4 km.

Jondaryan to Columboola (approximately 167.6 km):

- 5 visits - 0.98% - 1.6 km
- 4 Visits - 1.06% - 1.8 km
- 3 Visits - 2.54% - 4.3 km
- 2 Visits - 14.54% - 24.4 km
- 1 Visit - 45.26% - 75.9 km.

[28] *SYSTRA West Moreton System Review of Proposed Maintenance and Capital Expenditure 2019, Figures 6.11 and 6.15.*

Approximately 28.4 km of track required three or more resurfacing visits. It is reasonable to expect that the total length of track covered by the three activities of ballast undercutting, formation rebuild, and track reconstruction, is approximately this number; that is Queensland Rail is addressing priority sites with frequent track geometry issues. In Queensland Rail's FY 19 claim a total of [redacted] was addressed with these three activities, comprising the following:

- Track reconstruction - [redacted]
- Formation rebuild - [redacted]
- Ballast undercutting - [redacted]

It should be noted that ballast undercutting/track lowering does not address the underlying formation issues and is essentially delaying a necessary formation rebuild or track reconstruction by a year or two. Consequently, Queensland Rail is addressing [redacted] of the [redacted] that requires action. In terms of track reconstruction and formation rebuilding Queensland Rail may be short of the best option under a consistent 6.25 mtpa, or greater, scenario.

For sites requiring two resurfacings a year, this is approximately 78.8 km, Queensland Rail has little alternative to maintain track geometry other than speed restrictions or to keep on resurfacing which is not the best option in the longer term. This extent of annual resurfacing indicates the poor condition of the West Moreton System formation and the challenge of maintaining track geometry that Queensland Rail faces[29].

The specific locations can be tested for prudency by crosschecking against the frequency of the resurfacing at those locations and reviewing track geometry prior to the capital project[30]. The specific locations of track reconditioning are shown in Table 8.13 below.

Table 8.13: Prudency of standard for project B.04636 Timber and Steel Bridge Elimination

Site	Start km	End km	Length (km)	Locations and Comments
1	[redacted]	[redacted]	[redacted]	Oakey – Jondaryan single line
2	[redacted]	[redacted]	[redacted]	Rosewood Ballast Deck Bridge at 120.650 km
3	[redacted]	[redacted]	[redacted]	Jondaryan Yard Main Line
4	[redacted]	[redacted]	[redacted]	Yarongmulu - Laidley Up Road
5	[redacted]	[redacted]	[redacted]	Oakey yard Down Road
6	[redacted]	[redacted]	[redacted]	Oakey yard Up Road
7	[redacted]	[redacted]	[redacted]	Gowrie Yard Down Road
8	[redacted]	[redacted]	[redacted]	Gowrie Yard UP Road
9	[redacted]	[redacted]	[redacted]	Kingsthorpe Down Road
TOTAL			[redacted]	

[29] *A review of Track Condition Index reports for FY 18 by SYSTRA indicated that Queensland Rail is meeting this challenge and maintaining the track geometry to CETS requirements.*

[30] *At the time of writing this report FCG has not received the relevant track geometry data from Queensland Rail.*

Overlaying these locations on the graphs prepared by SYSTRA showing resurfacing frequency[31] by kilometre location validates whether these locations are sites that require continual maintenance to maintain track geometry through the frequency of resurfacing operations. This is shown below in Figure 8.7.

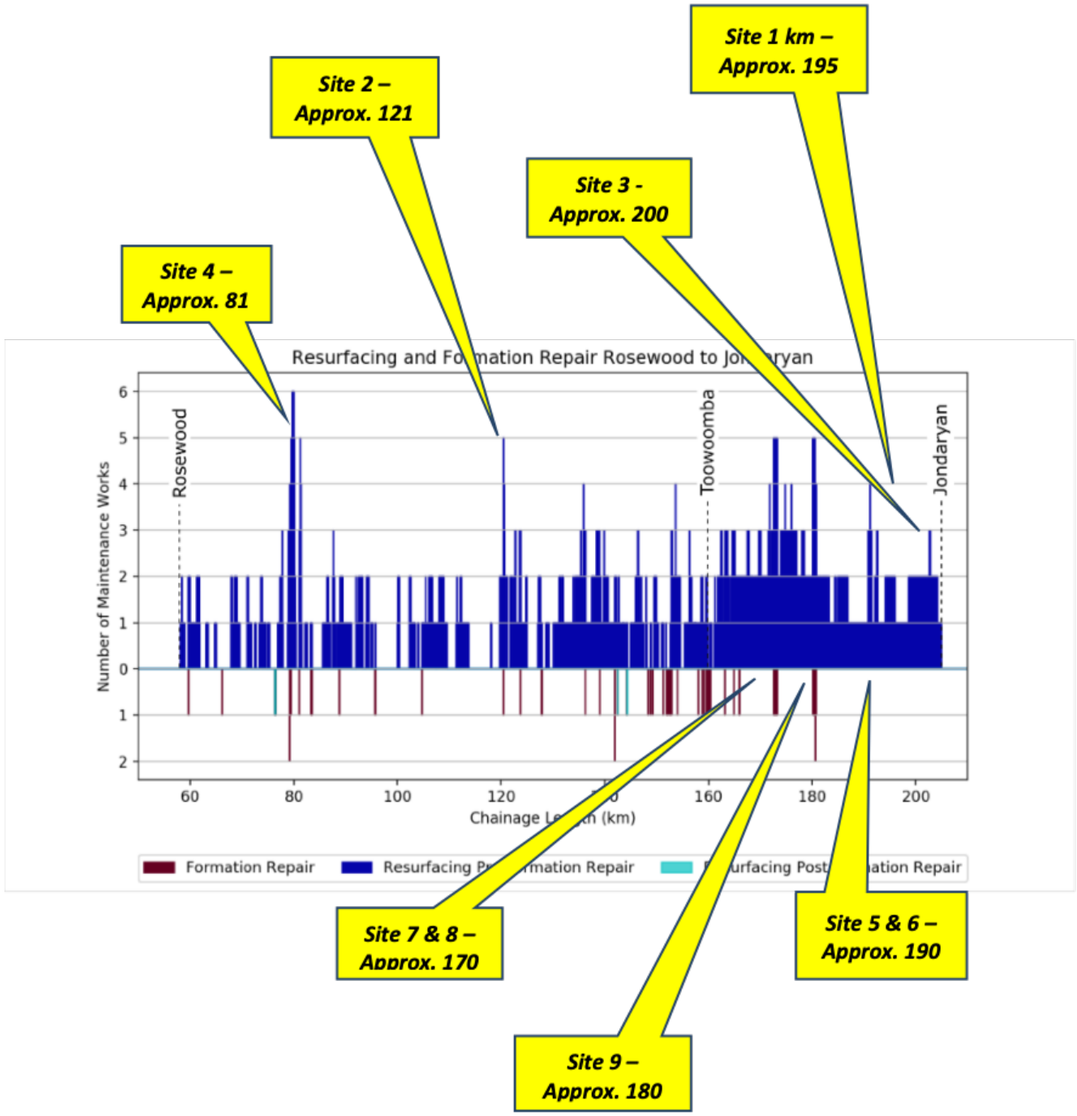

Figure 8.7: Rosewood to Jondaryan resurfacing sites overlayed on resurfacing frequency FY 18

Figure 8.7 clearly shows that the sites selected by Queensland Rail for track reconstruction align very well with sites requiring excessive resurfacing operations on the Rosewood to Jondaryan corridor in FY 18. It should be noted that Queensland Rail have done no track reconstruction on the Jondaryan to Columboola corridor; this could be a conscious decision to maintain this corridor, with only 2.1 mtpa traffic, with minimum capital as fit for purpose. The lack of track reconstruction on Jondaryan to Columboola indicates very prudent commitment of capital and accounts for the shortfall identified early in this report.

Queensland Rail is in the right order of magnitude in terms of track reconstruction and sites selected align with any site with more than three resurfacings per annum between Rosewood and Jondaryan; consequently, scope is prudent.

[31] *SYSTRA West Moreton System Review of Proposed Maintenance and Capital Expenditure 2019, Figures 6.12.*

The checklist template for the assessment of prudency of scope is in Table 8.14 below.

Table 8.14 Prudency of scope for project B.05171 Relay/Recondition Program

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Plan	Aligning scope with system wide priority Reliability of achieving target transit time by system or track section	FCG has validated that Queensland Rail has targeted the highest priority sites for track reconditioning.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	This is an asset renewal project and has no impact on current access agreements.
3	Accommodation for current contracted demand and potential future demand	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR) Processes used to evaluate alternatives SFAIRP analysis	Queensland Rail was required to plan for tonnages between Rosewood and Jondaryan of up to 9.2 mtpa. Consequently, Queensland Rail appropriately prioritised work in this corridor. It appears Queensland Rail is proactively using TSRs on the Jondaryan to Columboola corridor to minimise any track reconstruction requirements on this stretch.
4	Age and condition of assets	Age and condition of assets Reasonable consideration of standard and configuration of adjacent infrastructure Track geometry data Ground penetrating radar data Geotechnical reports Equipment condition reports and fault record	Scope prioritization was determined by field condition assessment and the location's network criticality, as prescribed under Queensland Rail's Asset Planning Framework (APF).
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Queensland Rail has demonstrated a whole of supply chain approach by targeting Rosewood to Jondaryan sites while managing the lower priority and lower trafficked Jondaryan to Columboola corridor sites with TSRs.
6	Legislative and tenure requirements	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Outcomes of consultation with relevant stakeholders	Access seekers Access holders Customer specific expenditure has been approved by the customer concerned	No negotiations were required with access seekers. Access holders were engaged through regular maintenance shut planning processes, specifically the SWUG forums. There was no specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Prudency of Cost

FCG found project B.05171 prudent in cost based on achieving a reasonable unit rate.

Queensland Rail are claiming $ 6,877,736 for track reconstruction of [redacted] representing an average unit rate of [redacted] kilometre. This is a reasonable rate in terms for construction of the upper levels of a rail formation, capping and track system including geogrid and geofabric layers. This rate is achieved through combining internal resources, accessing a panel of local civil contractors, cost competitive Queensland Rail supply contracts and possibly some reuse of materials.

The prudency of cost assessment from the guideline template is included in Table 8.15 below.

Table 8.15: Prudency of cost for project B.05171 Relay/Recondition Program

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Development Plan	Aligning scope with system wide priority Reliability of achieving target transit time by system or track section	Scope prioritization includes consideration of the structure location and that location's criticality within the overall West Moreton System.
2	Costs relative to the scale, nature and complexity of the project	Delivery methodology Difference between budgeted and actual cost Project or program of works Whole of supply chain impact	This project was delivered under TMR's OnQ project management framework.
3	Circumstances prevailing in the market for: • Engineering, equipment supply and construction • Labour • Materials.	Market conditions Procurement policy Possible application of benchmarking Project management	Procurement conducted in accordance with Queensland Rail's procurement policies. Queensland Rail achieved a reasonable average unit rate of $ 904,014 per kilometre of track reconstructed.
4	Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Minimising whole of life cost Scope priority assessments Track geometry data Ground penetrating radar data	Scope prioritisation is based on: • Minimising whole of life cost by considering capital and maintenance costs • Field inspections • Records of resurfacing frequency • Deterioration / defect history • Track geometry data. FCG did not observe evidence of using Ground Penetrating Radar. However, Queensland Rail effectively identified priority sites through the means above.
5	Actions, or proposed actions, in relation to: • Safety during construction and operation • Environmental requirements • Compliance with Law and Authorities • Minimising disruption to Train Services • Accommodating reasonable request to amend scope or sequence of works • Minimising total project cost • Aligning other elements of the supply chain • Meeting contractual timeframes • Dealing with external factors.	Delivery methodology Difference between budgeted and actual cost Project or program of works Whole of supply chain impact	This project was delivered under TMR's OnQ project management framework.
6	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users.	Review of relevant submissions	FCG are not aware of any submissions to QCA related to this project.

Prudency of Standard

FCG found project B.05171 prudent in standard based on:

- ***The application of CETS***
- ***The use of geogrid and geofabric***
- ***Discussions with the engineer on site during a previous commission.***

Queensland Rail are claiming $ 6,877,736 for track reconstruction of [redacted] representing an average unit rate of [redacted]. This is a reasonable rate in terms for construction of the upper levels of a rail formation, capping and track system including geogrid and geofabric layers. This rate is achieved through combining internal resources, accessing a panel of local civil contractors, cost competitive Queensland Rail supply contracts and possibly some reuse of materials.

Figure 8.5: Bridge site east of Ehlma at Kilometre 135.740 on the Western Line.

This bridge is described by Queensland Rail as 116 m long with 21 spans. SYSTRA on 2019 reported that this area immediately west of Macalister required frequent resurfacing operations in 2016/2017, up to three resurfacings in 12 months.

FCG assess that it was prudent of Queensland Rail to scope this culvert replacement as a bridge replacement given:

- The demonstrated issues with maintaining track geometry in this specific location
- The difficulty in maintaining some long multi-barrel culverts in these types of locations
- The risk to rail safety of ineffective culverts in flood events
- The relative ease of constructing a bridge on an operational rail system as opposed to an extensive multi-barrel culvert .

The checklist template for prudency of standard is in Table 8.16 on the next page.

Table 8.15: Prudency of cost for project B.05171 Relay/Recondition Program

Item	Factors	FCG Guidance Notes	FCG Findings
1	Requirements of Railway Operators and Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	This is an asset renewal project and has no impact on current access agreements.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	Queensland Rail was required to plan for tonnages between Rosewood and Jondaryan of up to 9.2 mtpa. Consequently, Queensland Rail appropriately prioritised work in this corridor.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	Design and construction in accordance with Civil Engineering Track Standards (CETS) were applied. No asset completion certificates provided to evidence either works by external contractor (ITP's) or by Queensland Rail.
4	Consistency with the Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Scope priority assessments Track geometry data Ground penetrating radar data	The panning of these works prudently addressed high priority sites with histories of track geometry issues and the requirement for frequent resurfacing. The frequent resurfacing was triggered by a rapid decrease in track geometry quality.
5	Design standards contained within the Safety Management System	CETS	Construction was consistent with CETS.
6	Laws and the requirements of any Authority	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG are not aware of any submissions to QCA related to this project.

8.4 B.04728 Grandchester to Laidley Signal Cable

Project Overview

This project was the replacement of approximately 8 km of aerial signal cabling with a new cable buried in conduits. The existing aerial signal cable was approximately fifty years old and was assessed by Queensland Rail as life expired with cracked insulation and faulty cable cores. Queensland Rail reported the poles were in poor condition with major damage from white ants.

During the Covid 19 pandemic restrictions on access to Queensland Rail personnel to provide further detail of the scope and costs of the project forced FCG to make its own assessments of these features of the project, and to base the preliminary prudency appraisal on those assessments. Access to the rail corridor for inspection of the project works was not available.

With the relaxation of the pandemic restrictions within Queensland Rail, FCG has been able to seek explanation and further information from Queensland Rail personnel which has allowed a properly-informed prudency appraisal.

Review Summary

FCG found project B.04728 prudent in scope, cost and standard.

A summary of FCG's assessment is included in Table 8.17 below.

Table 8.17: B.04728 Grandchester to Laidley Signal Cable summary

Prudency	
Scope	✓ [32]
Cost	✓ [33]
Standard	✓ [34]

Cost	($)
Queensland Rail claim	2,538,607
FCG Adjustment	0
FCG Recommendation	2,538,607

Prudency of Scope

FCG found project B.04728 prudent in scope based on:

- ***The critical importance of the single track between Grandchester and Laidley in terms of system capacity***
- ***Queensland Rail's reports of the fault history of the existing system***
- ***The impact on system operational performance of failed signalling***
- ***The impact on system safety risk of failed signalling***
- ***The age of the existing asset.***

The length of track between Grandchester and Yarongmulu is the only length of single track, approximately 7 km, on the approximately 60 km of duplicated track between Helidon and Rosewood. Essentially this 7 km length of track creates the capacity constraint between Helidon and Rosewood. There is a safety aspect to this length of track as a signal fault or failure without redundant communication could lead to an incident.

[32] *Quality of documentation for scope is rated as Average Quality. Scope was generally defined but not in detail.*
[33] *Quality of documentation for cost is rated as Average Quality. An un-annotated SAP export was provided.*
[34] *Quality of documentation for standard is rated as Poor Quality. No design or commissioning record information was provided.*

The key influence of this length of track on the West Moreton System is illustrated in the extract of the track schematic shown in Figure 8.9 below.

Figure 8.9: Track schematic showing single track between Grandchester and Yarongmulu

Queensland Rail reported increasing service interruptions and commissioned an investigation and study into the aerial cable which concluded that its replacement was warranted. FCG did not sight objective evidence of degraded performance however FCG accepts the proposition that an approximately 50-year-old timber pole mounted aerial cable installation had reached the end of its working life.

FCG acknowledges the obligation on Queensland Rail as a Registered Transport Operator to maintain a safe rail operation which includes a reliable signalling system with a backup communications alternative.

[35] *Inkatlas accessed 19 April 2020*

The system is single track through this location because of the challenging topography through the Little Liverpool Range. The track has two tunnels along this alignment. The challenging topography can be seen in the topographical map shown in Figure 8.10 and in the aerial view Figure 8.11.

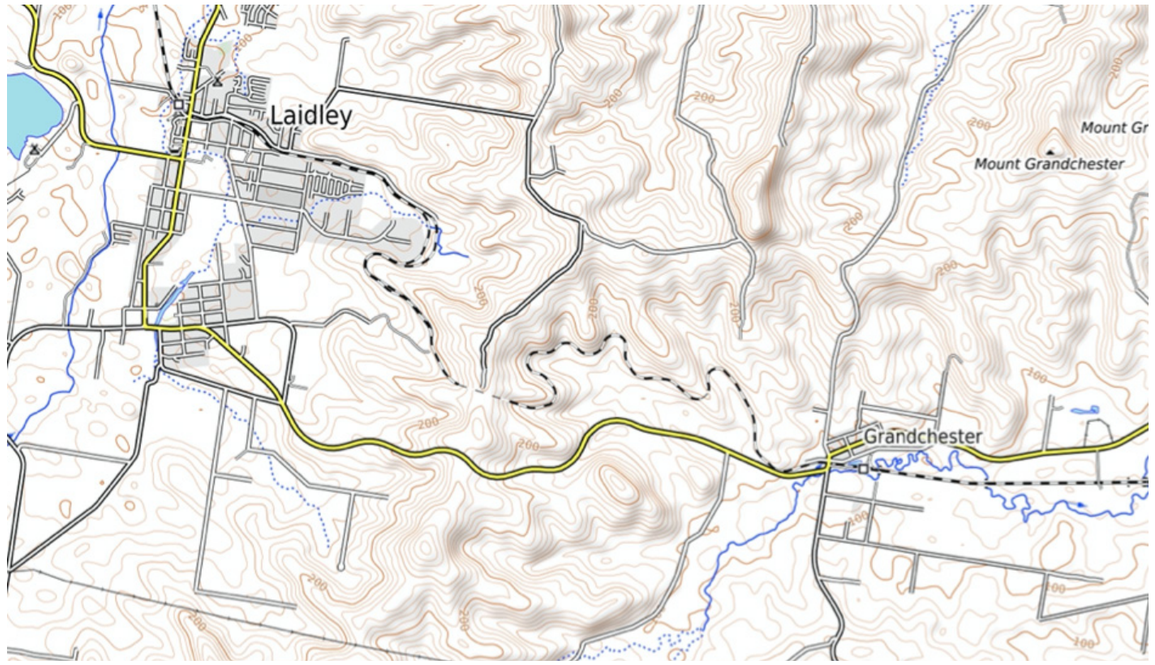

Figure 8.10: Rail corridor between Grandchester and Laidley[35]

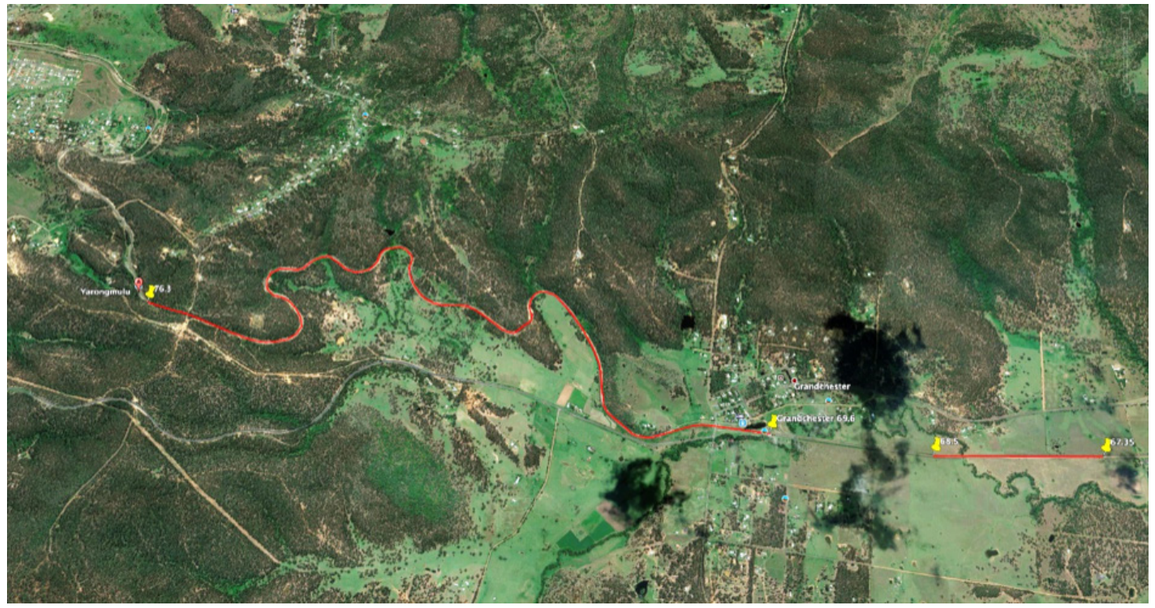

Figure 8.11: Rail corridor Aerial View[36].

[35] *Inkatlas accessed 19 April 2020*
[36] *Google Earth accessed 16 April 2020*

While information on the ground conditions through which the replacement buried signal cable was to be laid was not available, FCG's assessment of the geology was:

- In the section through the Little Liverpool Range - hard rock;
- In the flood plain section to the East of Grandchester - alluvial soils.

The requirement to cut the cable trench through the hard rock of the Little Liverpool Range section of the cable route would have represented a significant cost.

Post-pandemic, Queensland Rail informed FCG that after project approval a new cable replacement strategy was conceived to avoid the rock excavation. This strategy was quite innovative. Sometime before the signal cable project, an optical fibre communications cable had been laid along this section of the West Moreton system. The cable was buried, so a trench had been excavated through rock for its installation. Queensland Rail decided that instead of cutting a new, parallel trench, they would:

- Temporary duplicate the existing communications cable in the signal cable replacement zone with a second optical fibre cable installed within the web of one of the rails;
- Re-excavate the communications cable trench thereby avoiding rock excavation. In the process the now duplicated communications cable would, by design, be destroyed;
- Install the new signal cable and a replacement communications cable in the re-opened trench and backfill.

There was a significant saving in the final installed cost of the signal cable against Queensland Rail's ultimate budget. FCG concludes this saving arose predominantly due to the avoidance of the need for rock excavation.

The Project Cost Handover Report states in Clause 6 the project scope was delivered for $ 2,571,968 compared to the original budget of $ 4,009,000. The report explains that savings were delivered by replacing the communications optical fibre over this route; specifically stating "By replacing the communications cable we were able to use the existing cable route to significantly lower the cost and reduce the duration of excavation."

FCG also found during post-pandemic discussions with Queensland Rail that the scope of the signal cable project included replacement of all location cases along the project alignment. FCG counts 20 number of such location cases. All location cases on the signal cable alignment were life-expired. The project was also an opportunity to replace these life-expired assets with current technology. In addition, Queensland Rail assessed the risks to rail operations of unplanned system time loss due to technical difficulties which may have arisen during de-termination of the old signal cable, and re-termination of the new in the existing locs was unacceptable.

New location cases were designed by Queensland Rail's signalling group and manufactured in Queensland Rail's workshops.

In summary, FCG acknowledges that the 50-year-old aerial cable and timber pole supports over such a critical section of track did need replacement, and the scope performed by Queensland Rail to complete the replacement was appropriate.

The checklist template for the assessment of prudency of scope is in Table 8.18 on the next page.

Table 8.18: Prudency of scope for project B.04728 Grandchester to Laidley Signal Cable

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Plan	Aligning scope with s ystem wide priority Reliability of achieving target transit time by system or track section	FCG accepts that a reliable communications system is a critical component of the provision of a safe rail system. The subject capital works will improve network reliability.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	This program of capital works is asset renewal and will not create an increase in capacity. FCG's conclusion is that requirements of existing Access Agreements are unaffected by this work.
3	Accommodation for current contracted demand and potential future demand	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR) Processes used to evaluate alternatives SFAIRP analysis	Other than during the cable replacement activity itself, for which Queensland Rail advise there are mature and well developed processes to minimise service interruptions, and for which Queensland Rail implemented appropriate risk mitigation measures, the improved reliability of the signalling network will assist in meeting demand.
4	Age and condition of assets	Reasonable consideration of standard and configuration of adjacent infrastructure Geotechnical reports Equipment condition reports and fault record	Queensland Rail advise, and FCG has been able to confirm by our own research, that the signal cable replaced under this project was past its service life.
5	Promotion of an economically efficient operation	Whole of supply chain consideration	The improved reliability of the replacement cable will enhance system economical operation through reduced service interruptions. Queensland Rail report that an improvement to net EBIT of $ 137k over 5 years will flow from this project.
6	Legislative and tenure requirements	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	The project was delivered meeting the requirements of the RSNL and ONRSR. As Queensland Rail states a reliable signalling system is a critical component of the provision of safe track services.
7	Outcomes of consultation with relevant stakeholders	Access seekers Access holders Customer specific expenditure has been approved by the customer concerned	No negotiations were required with access seekers. Access holders were engaged through regular maintenance shut planning processes. There was no specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Prudency of Cost

The initial budget estimate for the project in Queensland Rail's May 2015 capital submission for AU1 was $ 903k. In 2017 the project estimate increased to $ 4,009k.

There is a note made in Queensland Rail's 20 January 2017 Approved Grandchester to Laidley Signal Cable – Implementation Plan that there is a "Need to work with QCA re $ 3m variance to original submission". While FCG is unaware of any interaction between QCA and Queensland Rail in respect of the significant increase in cost of the cable replacement, review of the scope of the project, including at that time the requirement for extensive rock excavation, and high level benchmarking against industry norms leads FCG to conclude:

- The original capital submission was insufficient. This early submission would have been prepared with limited comprehension of the full scope of the project.
- The estimate as approved, including a notional 9% contingency, was appropriate for the project.

The final project expenditure, and amount of the present capital claim for this project, is $ 2,538k. This includes the aforementioned saving made through the innovation of re-using the existing cable route.

FCG confirms that the costs detailed in Queensland Rail's submission are prudent considering the entire scope of the project – cable replacement and ancillaries.

In terms of cost the documentation in Table 8.19 below has been reviewed.

Table 8.19: Cost detail for project B.04728 Grandchester to Laidley Signal Cable

Item	Document	Date	Cost Information
1	West Moreton System Capital Submission	May 2015	Project Budget - $ 903k ($ 416 k FY 16 and $ 487k FY 17)
2	West Moreton System Asset Management Plan	5 May 2015	[redacted]
3	QCA Final Decision on Draft Access Undertaking		[redacted]
4	B04728 Approved Implementation Plan	20 January 2017	[redacted]
5	Project Handover Report	18 December 2019	[redacted]
6	Capital Expenditure Submission FY 19	18 December 2019	Project value $ 2,538k

The SAP figure is a total cost of $ 2,571,279 comprising:

- Direct Costs of [redacted]
- Indirect Costs of [redacted]

Flagstaff calculated that the indirect costs or overheads as recorded in SAP amounted to [redacted] of the total cost of this project or [redacted] of direct costs. This is at the lower end of typical industry experience for such costs, which would generally range between [redacted] of direct cost. FCG accepts that the indirect costs are reasonable.

The prudency of cost assessment from the guideline template is included in Table 8.20 below.

Table 8.20: Prudency of cost for project B.04728 Grandchester to Laidley Signal Cable

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Development Plan	Aligning scope with system wide priority Reliability of achieving target transit time by system or track section	The cable replacement enhances system reliability. Although hard evidence of network interruptions arising from the deterioration of the previous aged assets was not provided, it is clear these would have been occurring and there is no doubt that new cable and ancillary's replacement would significantly reduce their incidence.
2	Costs relative to the scale, nature and complexity of the project	Delivery methodology Difference between budgeted and actual cost Project or program of works Whole of supply chain impact	The delivery methodology adopted was direct labour self-performance construction by Queensland Rail. The original budget established in 2015 of $ 903k was overrun by an additional $ 1,810k. The program compared to the original expectation was over one year late. The improved reliability of the project will deliver schedule benefits to all users of the asset.
3	Circumstances prevailing in the market for: • Engineering, equipment supply and construction • Labour • Materials.	Market conditions Procurement policy Possible application of benchmarking Project management	There is no evidence that the costs of delivery of these capital works were negatively impacted by resource constraints or other market forces. Material and services procurement was performed directly by Queensland Rail. There is no evidence of waste nor re-work.
4	Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Minimising whole of life cost Scope priority assessments	Reasonable provision was made for future branches of the signal network. The cable route was constructed as "re-enterable" meaning future installation is facilitated. FCG conclude that the costs of program delivery in respect of Queensland Rail's asset management planning was prudent.
5	Actions, or proposed actions, in relation to: • Safety during construction and operation • Environmental requirements • Compliance with Law and Authorities • Minimising disruption to Train Services • Accommodating reasonable request to amend scope or sequence of works • Minimising total project cost • Aligning other elements of the supply chain • Meeting contractual timeframes • Dealing with external factors.	Delivery methodology Difference between budgeted and actual cost Project or program of works Whole of supply chain impact	The delivery methodology adopted was direct labour self-performance construction by Queensland Rail. The original budget established in 2015 of $ 903k was overrun by an additional $ 1,810k. The program compared to the original expectation was over one year late. The improved reliability of the project will deliver schedule benefits to all users of the asset.
6	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG is not aware of any other matters raised in submissions to the QCA in respect of the claimed Control System capital works program.

Prudency of Standard

FCG found project B.04728 prudent in standard based on:

- ***The commissioned cable is operating***
- ***The provision of Project Completion and Handover Reports.***

FCG did not receive information on the design or standards adopted. For the purposes of this review, FCG has made assumptions of what the design and standard of the replacement signal cable and ancillaries commensurate with the project cost would have been in accordance with Queensland Rails routine practices. These assumed standards are prudent in FCG's view.

The Project Completion report and Project Handover reports provided support the FY 19 capital expenditure claim. Signal cable and associated capital works were successfully commissioned and are operating as designed. Detailed commissioning records of the activities conducted for the entry into service of the replacement asset would have provided added confidence for QCA of the effectiveness of the capital initiative.

The checklist template for prudency of standard is in Table 8.21 below.

Table 8.21: Prudency of standard for project B.04728 Grandchester to Laidley Signal Cable

Item	Factors	FCG Guidance Notes	FCG Findings
1	Requirements of Railway Operators and Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	Given this program of capital works is not responding to any changes in network capacity, FCG's conclusion is that there are no grounds for concluding a lack of prudency or inefficiency of standard in respect of this factor.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	The signal cable replacement was necessary to improve the reliability and safety of the network. It does not deliver capacity benefits for current and future usage other than reduction to system interruptions.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	Queensland Rail did not provide any information with respect to the design and standards of the signal cable replacement.
4	Consistency with the Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Scope priority assessments	Queensland Rail's "West Moreton Asset Management Plan 201516 2nd Edition FINAL 050515.pdf" states at clause 4 that strategic objectives of the plan are: "Predictive not reactive maintenance – to be achieved through better collection, analysis and utilisation of asset condition data so that faults can be prevented instead of repaired. Undertake asset renewals that introduce modern, reliable, low maintenance, less disparate and (where possible) future-proof infrastructure assets." The signal cable replacement project is entirely consistent with these strategies.
5	Design standards contained within the Safety Management System	Appropriate Australian design standards	Queensland Rail has not provided any design information with respect to the signal cable replacement.
6	Laws and the requirements of any Authority	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	This project was delivered meeting the requirements of the RSNL and ONRSR.
7	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG is not aware of any other matters raised in submissions to the QCA in respect of the claimed Control System capital works program.

8.5 B.04613 Formation Strengthening

Project Overview

This project involves the reconstruction of approximately [redacted] of formation. There are several mechanisms of formation strengthening used including:

- Remove and replace existing formation materials
- Remove and replace capping[37]
- Lime stabilisation.

This claim is part of a rolling program of approximately [redacted] of formation strengthening per year. The works are normally accompanied by clearing and improving Right of Way (ROW) drainage.

Review Summary

FCG found project B.04613 Formation Strengthening prudent in scope, cost and standard.

A summary of FCG's assessment is included in Table 8.22 below.

Table 8.22: B.04613 Formation strengthening summary

Prudency	
Scope	✓[38]
Cost	✓[39]
Standard	✓[40]

Cost	($)
Queensland Rail claim	2,514,075
FCG Adjustment	0
FCG Recommendation	2,514,075

Prudency of Scope

FCG found project B.04613 prudent in scope based on:

- ***The order of magnitude similarity in quantity of combined track reconstruction, formation rebuild and ballast undercutting (approximately 30.5 km) compared to the quantity of track requiring three or more resurfacing operations in a year (approximately 28.4 km)***
- ***The impact on system operational performance of poor track geometry***
- ***The impact on system safety risk of poor track geometry***
- ***The increasing cost of maintaining track geometry through evidence of multiple resurfacing operations.***

The issues with the poor formation on the West Moreton System were discussed in some detailed earlier in Section 8.2. B.04798 Relay Reconditioning.

[37] *Sometimes referred to as sub-ballast capping (or SBC).*
[38] *Quality of documentation for scope is rated as Average Quality. The scope is defined soundly within Queensland Rail's submission.*
[39] *Quality of documentation for cost is rated as Average Quality. Individual sites are costed; however, it is not clear which projects have been claimed in which FY.*
[40] *Quality of documentation for standard is rated as Average Quality. Only generic information on the finished construction is provided. However, FCG assumes it meets CETS standards.*

SYSTRA noted in 2019 the positive point that Queensland rail was consistently maintaining the track geometry within the CETS limits; however, SYSTRA also noted on the negative side that that Queensland rail placed heavy reliance on track resurfacing to maintain this geometry and identified approximately 28.4 km of track that required three or more resurfacing visits in FY 18.

As described in Section 8.2 Queensland Rail's strategy for approaching this poor performing approximately 28.4 km is to use an escalating number of more effective and consequently more expensive methods:

- The cheapest and least effective is ballast undercutting (track lowering) normally employed where frequent resurfacing operations have lifted the height of the ballast to above 600 mm which is the CETS limit for ballast height for safe operation. Ballast lowering does not solve underlying formation issues. It is easy to mobilise. Queensland Rail completed [redacted] of ballast undercutting in FY 19.
- The next more expensive methodology is where the formation is rebuilt but the existing track structure is reused. Queensland Rail completed [redacted] of formation rebuild in FY 19.
- The next more expensive methodology is in situations where the track system is worn or defective as well as a poor formation. In some circumstances the defects can be created or exacerbated, by the poor foundation provided by a poor formation. Queensland Rail completed [redacted] of ballast undercutting in FY 19.

The FY 19 works were a subset of a program of works. The clusters of projects were in eight 8 general areas totalling 11.616 km. These are listed in Table 8.23 below.

Table 8.23: Formation rebuild clusters[41]

Item	Cluster	Total km	Comments
1	Rosewood-Helidon	[redacted]	Two sites
2	Macalister Coal Siding - Chinchilla	[redacted]	Thirteen sites
3	Toowoomba - Wyreema	[redacted]	One site
4	Toowoomba – Oakey	[redacted]	Six sites
5	Jondaryan Coal Siding	[redacted]	Two sites
6	Tycanba – Macalister Coal Siding	[redacted]	Eight sites
7	Chinchilla-Columboola	[redacted]	Six sites
8	Helidon Toowoomba	[redacted]	Two sites
	TOTAL	[redacted][42]	

[41] *Data from B.04613 Project Completion Report dated 18 March 2020.*
[42] *Queensland Rail claim 12.8 km rebuilt as opposed to the [redacted] total arrived at by FCG in Table 8.24. This difference could relate to inaccuracies in chainages of start and end points of sites and FCG do not consider it material to a prudency check; however, Queensland Rail should investigate this.*

Cross checking these formation strengthening sites with Multiple resurfacing sites identified by SYSTRA is shown in Figure 8.12 below.

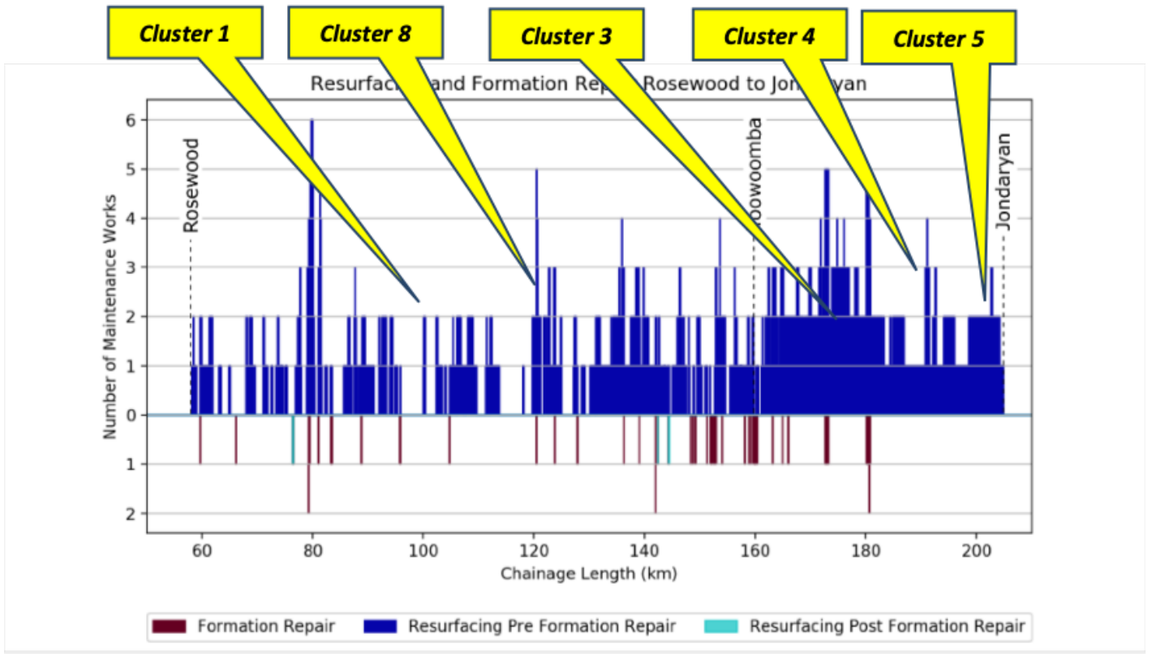

Figure 8.12: Cross check of formation strengthening sites with multiple resurfacing operations at specific locations on J2C (FY 2017/2018)

Figure 8.12 indicates that the formation strengthening sites are supported as valid candidates for formation strengthening through evidence of a general alignment with the requirement for multiple resurfacing operations to maintain track geometry.

The checklist template for the assessment of prudency of scope is in Table 8.24 below.

Table 8.24: Prudency of scope for project B.04613 Formation Strengthening

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Plan	Aligning scope with system wide priority Reliability of achieving target transit time by system or track section	FCG has validated that Queensland Rail has targeted the second highest priority sites for formation strengthening with the highest priority sites targeted for track reconditioning.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	FG assume Queensland Rail consulted with stakeholders where required.
3	Accommodation for current contracted demand and potential future demand	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR) Processes used to evaluate alternatives SFAIRP analysis	Queensland Rail was required to plan for tonnages between Rosewood and Jondaryan of up to 9.2 mtpa. Consequently, Queensland Rail appropriately prioritised work in this corridor. It appears Queensland Rail is proactively using TSRs on the Jondaryan to Columboola corridor to minimise any track reconstruction requirements on this stretch.
4	Age and condition of assets	Reasonable consideration of standard and configuration of adjacent infrastructure Track geometry data Ground penetrating radar data Geotechnical reports Equipment condition reports and fault record	Scope prioritization was determined by field condition assessment and the location's network criticality. Sites selected were supported by evidence of the requirement for multiple track resurfacing operations in a 12 month period.

The checklist template for the assessment of prudency of scope is in Table 8.24 continued below.

Item	Factors	FCG Guidance Notes	FCG Findings
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Queensland Rail has demonstrated a whole of supply chain approach by targeting Rosewood to Jondaryan sites while managing the lower priority and lower trafficked Jondaryan to Columboola corridor sites with TSRs and formation strengthening as opposed to more expensive track reconstruction.
6	Legislative and tenure requirements	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Outcomes of consultation with relevant stakeholders	Access seekers Access holders Customer specific expenditure has been approved by the customer concerned	No negotiations were required with access seekers. There was no specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Prudency of Cost

FCG found project B.04613 prudent in cost based on:

- ***Achieved unit rates are reasonable***
- ***Although not specifically clear what sites were included in the FY 19 claim the figure is consistent with approximately 5.5 km of formation strengthening***
- ***Project Completion Report dated 18 January 2020 states program budget not exceeded.***

The Project Completion Report provides total project cost per each site completed. FCG has grouped these as clusters to test rate achieved per kilometre of formation strengthening. These results are shown in Table 8.25.

Table 8.25: Benchmarking of rates achieved

Item	Cluster	[redacted]	[redacted]	[redacted]
1	Rosewood-Helidon	[redacted]	[redacted]	[redacted]
2	Macalister Coal Siding - Chinchilla	[redacted]	[redacted]	[redacted]
3	Toowoomba - Wyreema	[redacted]	[redacted]	[redacted]
4	Toowoomba – Oakey	[redacted]	[redacted]	[redacted]
5	Jondaryan Coal Siding	[redacted]	[redacted]	[redacted]
6	Tycanba – Macalister Coal Siding	[redacted]	[redacted]	[redacted]
7	Chinchilla-Columboola	[redacted]	[redacted]	[redacted]
8	Helidon Toowoomba	[redacted]	[redacted]	[redacted]
	TOTAL	[redacted]	[redacted][43]	[redacted]

Table 8.25 illustrates that Queensland Rail is achieving reasonable rates for formation strengthening with an average rate achieved of [redacted]. A general impact of geographical location, that is projects further out are more expensive, and project size, larger projects have cheaper unit rates, can be seen.

Although it is not clear to FCG from the information provided which formation strengthening sites were addressed in FY 19; a claim of [redacted] with the average rate indicates that [redacted] was achieved for the 12 months which is below the target. Although this could appear to be a cost saving it may have unintended impacts such as additional excessive resurfacing and operational impacts such as speed restrictions.

[43] *Queensland Rail claim final project cost was $ 7,995,242 as opposed to the figure of $ 7,870,008 arrived at by FCG in Table 8.26. This difference could relate to inaccuracies in chainages of start and end points of sites and FCG do not consider it material to a prudency check; however, Queensland Rail should investigate this.*

The prudency of cost assessment from the guideline template is included in Table 8.26 below.

Table 8.26: Prudency of cost for project B.04613 Formation strengthening

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Development Plan	Aligning scope with system wide priority Reliability of achieving target transit time by system or track section	Scope prioritization includes consideration of the structure location and that location's criticality within the overall West Moreton System.
2	Costs relative to the scale, nature and complexity of the project	Delivery methodology Difference between budgeted and actual cost Project or program of works Whole of supply chain impact	Project is under budget in cost however it appears that not all sites requiring formation strengthening were addressed. Queensland Rail have an effective program of works with a rolling target of [redacted] of formation strengthening planned for each 12 months. FCG assess that under the tonnages in the FY 19 context the West Moreton requires at least this level of formation strengthening effort annually.
3	Circumstances prevailing in the market for: • Engineering, equipment supply and construction • Labour • Materials.	Market conditions Procurement policy Possible application of benchmarking Project management	Procurement conducted in accordance with Queensland Rail's procurement policies. Production rates achieved, average cost of [redacted], are reasonable.
4	Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Minimising whole of life cost Scope priority assessments Track geometry data Ground penetrating radar data	Scope prioritization based upon field condition inspections, deterioration / defect history criticality within the West Moreton System.
5	Actions, or proposed actions, in relation to: • Safety during construction and operation • Environmental requirements • Compliance with Law and Authorities • Minimising disruption to Train Services • Accommodating reasonable request to amend scope or sequence of works • Minimising total project cost • Aligning other elements of the supply chain • Meeting contractual timeframes • Dealing with external factors.	Minimising disruption to Train Services Legislative requirements Regulatory safety requirements Requests from Access Holders Possible multiple beneficiaries and appropriate allocation of cost Contractual timeframe	No defined stakeholder process referenced by Queensland Rail for this project.
6	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG are not aware of any submissions made to QCA regarding this project.

Prudency of Standard

FCG found project B.04613 prudent in standard based on:

- ***The sites being operational***
- ***Discussions with the Queensland Rail on site on a previous occasion***
- ***The requirement to meet the standards specified in CETS***
- ***Queensland Rail obligations as a RIM under the Rail Safety National Law.***

The checklist template for prudency of standard is in Table 8.27 below.

Table 8.27: Prudency of standard for project B.04613 Formation strengthening

Item	Factors	FCG Guidance Notes	FCG Findings
1	Requirements of Railway Operators and Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	This project is an asset renewal project and all access agreements are unaffected. No requirement for stakeholder acceptance of these works, Queensland Rail is the Rail Infrastructure Manager (RIM).
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	With reference to West Moreton Asset Management Plan (2015), the short-term tonnages forecast was for up to 11million tonnes per annum. Speed restrictions and other operational constrains are applied to some poor formation sites.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	Design and construction in accordance with: • Civil Engineering Structures Standard (CESS) • Civil Engineering Track Standards (CETS) • All applicable Australian Standards • Any other standards identified applicable for each structure and/or its location.
4	Consistency with the Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Scope priority assessments Track geometry data Ground penetrating radar data	Prioritisation based on inspections and track geometry reports. Frequency of resurfacing operations required to maintain track geometry supports the sites selected.
5	Design standards contained within the Safety Management System	CETS	Civil Engineering Track Standards (CETS). Compliance with applicable Australian Standards. No asset completion certificates provided by Queensland Rail.
6	Laws and the requirements of any Authority	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG are not aware of any submissions made to QCA regarding this project.

8.6 Ballast undercutting

Project Overview

This project involves the track lowering by ballast undercutting of approximately [redacted] of formation. The project is primarily driven by the requirement in CETS for ballast height to be capped at 600mm.

This claim is part of a rolling program of approximately [redacted] of formation strengthening per year. The works are normally accompanied by clearing and improving Right of Way (ROW) drainage.

Review Summary

FCG found the ballast undercutting project prudent in scope, cost and standard.

A summary of FCG's assessment is included in Table 8.28 below.

Table 8.28: Ballast undercutting program summary

Prudency	
Scope	✓ [44]
Cost	✓ [45]
Standard	✓ [46]

Cost	($)
Queensland Rail claim	2,514,075
FCG Adjustment	0
FCG Recommendation	2,514,075

Prudency of Scope

FCG found project B.05171 prudent in scope based on:

- ***The order of magnitude similarity in quantity of combined track reconstruction, formation rebuild and ballast undercutting (approximately [redacted]) compared to the quantity of track requiring three or more resurfacing operations in a year (approximately [redacted])***
- ***Queensland Rail CETS requirements for maximum ballast depth of 600 mm***
- ***The impact on system operational performance of poor track geometry***
- ***The impact on system safety risk of poor track geometry.***

[44] *Quality of documentation for scope is rated as Poor Quality. The scope is only generally defined and specific sites are not identified.*
[45] *Quality of documentation for cost is rated as Poor Quality. Only high-level benchmarking information is available.*
[46] *Quality of documentation for standard is rated as Average Quality. Completed project requirements are clearly detailed in CETS.*

The issues with the poor formation on the West Moreton System were discussed in some detailed earlier in Section 8.2. B.04798 Relay Reconditioning and B.04613 formation.

Queensland Rail uses an escalating number of increasing more effective and consequently more expensive methods ballast undercutting (track lowering) is the cheapest and least effective of these methods and is normally employed where frequent resurfacing operations have lifted the height of the ballast to above 600 mm which is the CETS limit for ballast height for safe operation.

The checklist template for the assessment of prudency of scope is in Table 8.29 below.

Table 8.29 Prudency of scope for ballast undercutting

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Plan	Aligning scope with system wide priority Reliability of achieving target transit time by system or track section	FCG assesses that the ballast undercutting operations are part of the Queensland Rail strategy to meet the requirements of CETS; specifically track geometry limits and the cap on maximum ballast height of 600 mm.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	FCG assume Queensland Rail consulted with stakeholders where required.
3	Accommodation for current contracted demand and potential future demand	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR) Processes used to evaluate alternatives SFAIRP analysis	Queensland Rail was required to plan for tonnages between Rosewood and Jondaryan of up to 9.2 mtpa. Consequently, Queensland Rail appropriately prioritised work in this corridor. It appears Queensland Rail is proactively using TSRs on the Jondaryan to Columboola corridor to minimise any track reconstruction requirements on this stretch.
4	Age and condition of assets	Reasonable consideration of standard and configuration of adjacent infrastructure Track geometry data Ground penetrating radar data Geotechnical reports Equipment condition reports and fault record	Scope prioritization was determined by field condition assessment and the location's network criticality. The primary driver would be sites approaching the 600 mm ballast height limit in CETS.
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Queensland Rail has demonstrated a whole of supply chain approach by targeting Rosewood to Jondaryan sites while managing the lower priority and lower trafficked Jondaryan to Columboola corridor sites with TSRs and formation strengthening as opposed to more expensive track reconstruction. However specific detail of ballast undercutting (track lowering) sites has not been provided.
6	Legislative and tenure requirements	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Outcomes of consultation with relevant stakeholders	Access seekers Access holders Customer specific expenditure has been approved by the customer concerned	No negotiations were required with access seekers. There was no specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Prudency of Cost

FCG found project B.05171 prudent in scope based on:

- ***Achieving a reasonable unit rate***
- ***Limited options available to Queensland Rail.***

The prudency of cost assessment from the guideline template is included in Table 8.30 below.

Table 8.30: Prudency of cost for ballast undercutting

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Development Plan	Aligning scope with system wide priority Reliability of achieving target transit time by system or track section	This project is an asset renewal project and all access agreements are unaffected. No requirement for stakeholder acceptance of these works, Queensland Rail is the Rail Infrastructure Manager (RIM).
2	Costs relative to the scale, nature and complexity of the project	Delivery methodology Difference between budgeted and actual cost Project or program of works Whole of supply chain impact	The cost of the ballast undercutting is reasonable. It reflects a small team with task specific equipment.
3	Circumstances prevailing in the market for: • Engineering, equipment supply and construction • Labour • Materials.	Market conditions Procurement policy Possible application of benchmarking Project management	Production rates achieved, average cost of [redacted], are reasonable.
4	Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Minimising whole of life cost Scope priority assessments Track geometry data	Scope prioritization based upon sites approaching the 600 mm ballast height limit.
5	Actions, or proposed actions, in relation to: • Safety during construction and operation • Environmental requirements • Compliance with Law and Authorities • Minimising disruption to Train Services • Accommodating reasonable request to amend scope or sequence of works • Minimising total project cost • Aligning other elements of the supply chain • Meeting contractual timeframes • Dealing with external factors.	Minimising disruption to Train Services Legislative requirements Regulatory safety requirements Requests from Access Holders Possible multiple beneficiaries and appropriate allocation of cost Contractual timeframe	No defined stakeholder process referenced by Queensland Rail for this project.
6	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG are not aware of any submissions made to QCA regarding this project.

Prudency of Standard

FCG found project B.04613 prudent in standard based on:

- ***The sites being operational***
- ***Discussions with the Queensland Rail on site on a previous occasion***
- ***The requirement to meet the standards specified in CETS***
- ***Queensland Rail obligations as a RIM under the Rail Safety National Law.***

The checklist template for prudency of standard is in Table 8.31 below.

Table 8.31: Prudency of standard for project ballast undercutting

Item	Factors	FCG Guidance Notes	FCG Findings
1	Requirements of Railway Operators and Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	This project is an asset renewal project and all access agreements are unaffected. No requirement for stakeholder acceptance of these works, Queensland Rail is the Rail Infrastructure Manager (RIM).
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	With reference to West Moreton Asset Management Plan (2015), the short-term tonnages forecast was for up to 11million tonnes per annum. Speed restrictions and other operational constrains are applied to some poor formation sites.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	Design and construction in accordance with Civil Engineering Track Standards (CETS).
4	Consistency with the Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Scope priority assessments Track geometry data Ground penetrating radar data	Prioritisation based on inspections and track geometry reports.
5	Design standards contained within the Safety Management System	CETS	Civil Engineering Track Standards (CETS). Compliance with applicable Australian Standards. No asset completion certificates provided by Queensland Rail.
6	Laws and the requirements of any Authority	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG are not aware of any submissions made to QCA regarding this project.

8.7 B.04403 Culvert Renewals

Project Overview

This project was originally created to replace [redacted] culverts between Gatton and Miles deemed most at risk of failure or requiring significant maintenance costs. Funding of $ 5.245 million for this work was approved internally by Queensland Rail in May 2017.

The scope was subsequently increased by a further [redacted] culverts, with [redacted] original removed and [redacted] new culvert locations added, to [redacted] in total. [redacted] culverts were completed for the FY 18 capital expenditure submission and this FY 19 submission addresses [redacted] culverts. There are another [redacted] culverts to be completed and claimed in the FY 20 capital expenditure claim.

Review Summary

FCG found project B.04403 prudent in scope, cost and standard.

A summary of FCG's assessment is included in Table 8.32 below.

Table 8.32: B.04403 Culvert renewals

Prudency	
Scope	✓ [47]
Cost	✓ [48]
Standard	✓ [49]

Cost	($)
Queensland Rail claim	1,091,393
FCG Adjustment	0
FCG Recommendation	1,091,393

Prudency of Scope

FCG found project B.04403 prudent in scope based on:

- ***Queensland Rail's application of its Asset Planning Framework (APF)***
- ***The impact on system operational performance of potential culvert failures***
- ***The impact on system safety risk of potential culvert failures.***

[47] *Quality of documentation for scope is rated as Average Quality. The scope is defined well within Queensland Rail's submission, however further scope prioritization documentation and/or details on the overall progress of the wider program was provided.*

[48] *Quality of documentation for cost is rated as Average Quality. Only single asset value per culvert claimed was provided within FY 19 cost spreadsheet with no further breakdown or explanation of costs.*

[49] *Quality of documentation for standard is rated as Average Quality. Queensland Rail describe the standards followed; however, no asset completion certificates, or design certifications provided to evidence compliance has been achieved.*

The complete list of culverts approved under project B.04403 is detailed within Table 8.33 below.

Table 8.33: B.04403 Culverts

[redacted]	Status	[redacted]	[redacted]
[redacted]	Previously claimed and assessed as prudent (Total 19)	[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]	In Queensland Rail FY 19 Submission (this review)	[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]		[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

The culverts were selected following Queensland Rail's condition and risk assessment, in accordance with its Asset Planning Framework, of all culverts across the system. Factors taken into consideration within this risk ranking include:

- Condition inspection reports
- Tonnage and demand across the culverts
- Temporary speed restrictions
- Location on the network and criticality to wider network operations.

This process identified 42 critical sites in priority order . Of these 42 sites, [redacted] of these were selected to be within the original approved scope of project B.04403. From the FY 18 Capital Expenditure Consultant Report, an additional [redacted] culverts were added, and one removed. No information has been provided within FY 19 capital expenditure submission related to this scope increase.

Queensland Rail's FY 19 Capital Expenditure submission lists [redacted] culverts bringing the total number of culverts claimed to date to [redacted] culverts. Of these six culverts claimed under Queensland Rail's FY 19 submission, only one of these is a culvert location within the original approved scope of [redacted] culverts. However, the other five culverts were individually listed within the list of 42 priority sites.

The checklist template for the assessment of prudency of scope is in Table 8.34 below.

Table 8.34: Prudency of scope for project B.04403 Culverts

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Plan	Aligning scope with system wide priority Reliability of achieving target transit time by system or track section	These culverts were identified through the AFP process and were impacting BRTT through speed restrictions. A culvert failure under a flood condition will cause a formation failure and major rail safety incident.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	This project is an asset renewal project and all access agreements are unaffected. No requirement for stakeholder acceptance of these works, Queensland Rail is the Rail Infrastructure Manager (RIM).
3	Accommodation for current contracted demand and potential future demand	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR) Processes used to evaluate alternatives SFAIRP analysis	Queensland Rail was required to plan for tonnages between Rosewood and Jondaryan of up to 9.2 mtpa. Consequently, Queensland Rail appropriately prioritised work in this corridor.
4	Age and condition of assets	Reasonable consideration of standard and configuration of adjacent infrastructure Track geometry data Ground penetrating radar data Geotechnical reports Equipment condition reports and fault record	Scope prioritisation is determined by field condition assessment and the culvert's location criticality within the system, as prescribed under Queensland Rail's APF. Replacement of culverts nearing the end of their service life will lessen risk of failures affecting rolling stock operations. There is also the risk with culverts of a formation failure under flood conditions such as the Mt Isa incident on 27 December 2015 . No complete list of currently approved culverts within this project provided. Five of the six culverts within this claim are not within the originally approved [redacted] culverts (May 2017). However, they are on the list of 42 critical sites identified. [redacted] Culverts claimed and assessed prudent within FY 18; [redacted] claimed in the current submission, with [redacted] remaining to be completed and claimed in FY 20 capital expenditure submission.
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Queensland Rail has demonstrated a whole of supply chain approach by a maintaining the system to be able to achieve the expected capacity at the planned speeds. Queensland Rail also coordinated track closures with stakeholders through the SWUG forum.
6	Legislative and tenure requirements	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Outcomes of consultation with relevant stakeholders	Access seekers and holders Customer specific expenditure has been approved by the customer concerned	No negotiations were required with access seekers. There was no specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Prudency of Cost

FCG found project B.04403 prudent in cost based on:

- ***The procurement of works with external contractors was carried out in a competitive tender situation***
- ***Tenderers were selected from a pre-qualified panel of providers***
- ***The actual cost for the [redacted] culverts completed in FY 19 was in line with awarded contract price for the works***

Queensland Rail's Implementation Recommendation for this project (May 2017) outlines the case for the removal and replacement of [redacted] culverts between Gatton and Miles. The original proposed delivery of these works was divided up as follows:

- [redacted] culverts to be completed and commissioned within FY 18
- [redacted] culverts to be completed and commissioned within FY 19
- [redacted] culverts to be completed and commissioned within FY 20.

The total budget for the project is $ 5,245,000 consisting of:

- [redacted]
- [redacted]
- [redacted]

In the FY 18 Capital Expenditure submission Queensland Rail claimed [redacted] culverts.
The consultant review report noted that prudency of cost had been demonstrated for the claimed [redacted] culverts.

Queensland Rail have claimed under this submission $ 1,091,393 for the completion and commissioning of [redacted] culverts. Queensland Rail has provided a single asset value only for each of the culverts claimed under this submission. No detailed breakdown of planned or actual costs for design, construction and other direct/indirect costs has been provided.

These [redacted] culverts were constructed by external contractors sourced from a pre-qualified panel of providers via a competitive procurement process. Initial review of the information provided identified the cost provided for [redacted] of the culverts (WL 71.750 and WL 121.630) were larger than expected (for their size). Further information provided confirmed that these [redacted] culverts were delivered for their award price (Ch 71.750) and for [redacted] over the award price (WL 121.630) due to three variations (two additional cost, one a cost saving).

Based on this, it is clear that:

- Prudency of the awarded value of works has been evidenced by the competitive market pricing of these works
- Prudency of the contract management and final costs realised has been achieved

Queensland Rail has therefore demonstrated prudency of cost for the six culverts completed within FY 19

The prudency of cost assessment from the guideline template is included in Table 8.35 below.

Table 8.35: Prudency of cost for project B.04403 Culvert Renewals

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Development Plan	Aligning scope with system wide priority Reliability of achieving target transit time by system or track section	Scope prioritisation includes consideration of the culvert condition and the culvert location's criticality within the overall West Moreton System.
2	Costs relative to the scale, nature and complexity of the project	Delivery methodology Difference between budgeted and actual cost Project or program of works Whole of supply chain impact	This project was delivered under TMR's OnQ project management framework as a Level 3 project. All works were procured via a competitive tender by pre-qualified panel service providers [redacted] Standard designs were used to minimise costs. External subcontractors were engaged to support where internal resources were not available. As a multi-year project, eight culverts remain to be completed.
3	Circumstances prevailing in the market for: • Engineering, equipment supply and construction • Labour • Materials.	Market conditions Procurement policy Possible application of benchmarking Project management	Procurement conducted in accordance with Queensland Rail's procurement policies, via a competitive tender with prequalified panel service providers. Queensland Rail's use of TMR's OnQ project management framework provides rigour around delivery and cost management processes. Despite this, no information has been provided to demonstrate cost control.
4	Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Minimising whole of life cost Scope priority assessments	Increasing annual costs and other operational constraints led Queensland Rail to decide the preferred way forward was to proceed with replacement of culverts deemed to be the highest priority. A failed culvert can also create a potential wash out site in heavy rainfall conditions. Scope prioritisation based upon field condition inspections, deterioration / defect history and culvert location criticality within the West Moreton System.

The prudency of cost assessment from the guideline template is included in Table 8.35 continued below.

Item	Factors	FCG Guidance Notes	FCG Findings
5	Actions, or proposed actions, in relation to: • Safety during construction and operation • Environmental requirements • Compliance with Law and Authorities • Minimising disruption to Train Services • Accommodating reasonable request to amend scope or sequence of works • Minimising total project cost • Aligning other elements of the supply chain • Meeting contractual timeframes • Dealing with external factors.	Minimising disruption to Train Services Legislative requirements Regulatory safety requirements Requests from Access Holders Possible multiple beneficiaries and appropriate allocation of cost Contractual timeframe	All culvert replacement works were carried out under track closures for safety in construction and operation. No defined stakeholder process referenced by Queensland Rail for this project. All culvert replacement works are replacement works within the rail corridor and have no direct public interface. The project management of all Queensland Rail Projects is based upon TMR's OnQ Project Management Framework. This project was deemed a Type 3 project and managed in accordance with the OnQ framework.
6	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG is unaware of any submissions to QCA regarding this project.

Prudency of Standard

FCG found project B.04403 prudent in standard based on:

- ***The Australian standards identified by Queensland Rail***
- ***The evidence of the Asset Handover Forms.***

All culverts under this project were required to be designed and installed in accordance with applicable Australian Standards including:

- AS1597.1:2010 Precast reinforced concrete box culverts (not exceeding 1200 mm span and 1200 mm height)
- AS4058:2007 Precast concrete pipes (pressure and non-pressure)
- AS3725:2007 Design for installation of buried concrete pipes
- Applicable manufacturing standards were also identified as key compliance standards
- Other identified Australian design standards deemed applicable.

Although no asset completion or design certification documents have been provided, Queensland Rail has provided a signed copy of its Asset Handover Form evidencing all requirements have been met for asset transfer to its Asset Register. It is reasonable to expect that any design and construction certification requirements have been reviewed and verified by Queensland Rail prior to these assets being put into service.

The checklist template for prudency of standard is in Table 8.36 on the next page.

Table 8.36: Prudency of standard for project B.04403 Culvert Renewals

Item	Factors	FCG Guidance Notes	FCG Findings
1	Requirements of Railway Operators and Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	Though Queensland Rail refers generally to the use of the SWUG process to discuss closure and other major maintenance and timetabling issues with rolling stock operators, there is no reference to whether any access agreements or stakeholder engagement was required for these works.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	Speed restrictions and other operational constrains are common for some culvert locations on the West Moreton System.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	Design and construction in accordance with: • CESS and CETS • Applicable Australian Standards • Any other standards identified applicable for each structure.
4	Consistency with the Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Scope priority assessments	Scope prioritisation for culvert replacement determined with consideration of field condition reports and structure location criticality within the system.
5	Design standards contained within the Safety Management System	CETS CESS	CESS and CETS Design compliance with applicable Australian Standards. Manufacturing compliance with applicable Australian Standards, including AS4508:2007 No asset completion certificates provided to evidence either works by external contractor (ITP's) or by Queensland Rail. Engineering consultants are required to certify their designs are compliant with all applicable standards.
6	Laws and the requirements of any Authority	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG are not aware of any submissions made to QCA regarding this project.

8.8 B.04291 Re-Railing

8.8.1 General

Project Overview

The purpose of this project was to upgrade [redacted] of deteriorated and life expired 41 kg rail between Rosewood and Helidon with new 50 kg rail. Works were mostly competed and claimed for within FY 18, however a final residual amount of [redacted] has been claimed for within Queensland Rail's FY 19 capital expenditure submission. This project was scheduled to be completed in FY 20, however due to opportunities realised has been completed a year early in FY 19.

This claim is the final claim of costs for this project, with previously claimed works in prior years assessed as prudent. The value of this claim represents less than 2.5% of the overall project actual costs and closes this project with an actual spend over 30% under the approved budget.

Review Summary

FCG found project B.04291 prudent in scope, cost and standard.

A summary of FCG's assessment is included in Table 8.37 below.

A summary of FCG's assessment is included in Table 8.37 below.

Prudency	
Scope	✓ [52]
Cost	✓ [53]
Standard	✓ [54]

Cost	AUD 2019
Queensland Rail claim	126,648
FCG Adjustment	-
FCG Recommendation	126,648

Prudency of Scope

FCG found project B.4291 prudent in scope based on:

- ***Queensland Rail's application of its Asset Planning Framework(APF)***
- ***This project is essentially complete, and the claim is for minor post commissioning work.***

This project was originally derived to address evident stress induced defects on a [redacted] section of rail between Rosewood and Oakey, believed to be a result of increased carriage and tonnage across the system. Though no site visit was possible due to government restrictions in place at the time of review, photographs of previously existing rail within the FY 18 Capital Expenditure consultant's review support the poor condition of rail and need for rerailing works.

Further, the Project Completion Report provided by Queensland Rail in support of its claim confirms that all works were completed in April 2018, within FY 18. This claim therefore represents final close out costs due to invoicing and payment after completion taking final payment of costs into the FY 19 period.

[52] *Quality of documentation for scope is rated as High Quality. All scope completed and panned timeframes bettered.*
[53] *Quality of documentation for cost is rated as Average Quality. Though the valued claimed is small and overall budget bettered by over 30%, no details on what this $ 126,648 was for or reasons for this not being picked up under the FY 17/18 capex submission have been provided.*
[54] *Quality of documentation for standard is rated as High Quality. No Certificates of Completion provided; however, the Practical Completion and Handover Reports have been provided as evidence. Rail standard is specified in detail in the CETS.*

The checklist template for the assessment of prudency of scope is in Table 8.38 below.

Table 8.38: Prudency of scope for B.04291 Re-railing

Item	Factors	FCG Guidance Notes	FCG Findings
1	Requirements of Railway Operators and Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	This project is an asset renewal project and all access agreements are unaffected.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR	Queensland Rail was required to plan for tonnages between Rosewood and Jondaryan of up to 9.2 mtpa. Consequently, Queensland Rail appropriately prioritised work in this corridor.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	CETS
4	Consistency with the Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Scope priority assessments	Scope prioritisation was determined by field condition assessment and the structure's network criticality, as prescribed under Queensland Rail's APF.
5	Design standards contained within the Safety Management System	CETS	CETS
6	Laws and the requirements of any Authority	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG is unaware of any submissions regarding this project.

Prudency of Cost

FCG found project B.4291 prudent in scope based on:

- ***The assessment of prudent in FY 18 for 97.5% of the project cost***
- ***The project being 37% under budget.***

Expenditure throughout the program, according to the Project Completion Report and FY 18 capital expenditure review, was:

- Prior actuals on the project - $ 5,044,037
- Total program to date - $ 5,170,685
- Claimed Value FY 18/19 - $ 126,648
- Forecast final total on the program - $ 5,170,685
- Original Budget Approved - $ 8,199,000.

This multi-year program has all works completed, with the remaining value claimed under FY 19 representing less than 2.5% of the final program value. Further, the overall actual spend was nearly 37% less than budgeted due to opportunities realised with daily track closures and a scheduled 10-day track closure in April 2018.

The prudency of cost assessment from the guideline template is included in Table 8.39 below.

Table 8.39: Prudency of cost for project B.04291 Rerailing Elimination

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Development Plan	Aligning scope with system wide priority Reliability of achieving target transit time by system or track section	Scope prioritisation includes consideration of the culvert condition and the culvert location's criticality within the overall West Moreton System.
2	Costs relative to the scale, nature and complexity of the project	Delivery methodology Difference between budgeted and actual cost Project or program of works Whole of supply chain impact	This project was delivered under TMR's OnQ project management framework as a Level 3 project.
3	Circumstances prevailing in the market for: • Engineering, equipment supply and construction • Labour • Materials.	Market conditions Procurement policy Possible application of benchmarking Project management	Procurement conducted in accordance with Queensland Rail's procurement policies.
4	Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Minimising whole of life cost Scope priority assessments	Scope prioritisation based upon inspections and rail wear data.
5	Actions, or proposed actions, in relation to: • Safety during construction and operation • Environmental requirements • Compliance with Law and Authorities • Minimising disruption to Train Services • Accommodating reasonable request to amend scope or sequence of works • Minimising total project cost • Aligning other elements of the supply chain • Meeting contractual timeframes • Dealing with external factors.	Minimising disruption to Train Services Legislative requirements Regulatory safety requirements Requests from Access Holders Possible multiple beneficiaries and appropriate allocation of cost Contractual timeframe	No defined stakeholder process referenced by Queensland Rail for this project. These projects were delivered meeting the requirements of the RSNL and ONRSR.
6	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG is unaware of any submissions regarding this project.

Prudency of Standard

FCG found project B.4291 prudent in standard based on:

- ***Final inspections of the works by supply chain south asset management team and project delivery engineers and supervisors to confirm completed works were suitable for operational use***
- ***All relevant completion sheets, weld returns, and restressing forms were complete and compliant.***

The checklist template for prudency of standard is in Table 8.40 below.

Table 8.40: Prudency of standard for project B.04291 Rerailing

Item	Factors	FCG Guidance Notes	FCG Findings
1	Requirements of Railway Operators and Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	This project is an asset renewal project and all access agreements are unaffected.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	Queensland Rail was required to plan for tonnages between Rosewood and Jondaryan of up to 9.2 mtpa. Consequently, Queensland Rail appropriately prioritised work in this corridor.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	CETS
4	Consistency with the Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Scope priority assessments Track geometry data Ground penetrating radar data	Scope prioritisation for rerailing works determined with consideration of field condition reports and location criticality within the system.
5	Design standards contained within the Safety Management System	CETS	CETS applied
6	Laws and the requirements of any Authority	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG are not aware of any submissions made to QCA regarding this project.

8.9 B.05243 Davidson St Level Crossing CCTV

Project Overview

The scope of the project was to install Closed Circuit Television (CCTV) systems at two level crossings:

- John St in Rosewood
- Davidson St in Oakey.

The project business case was approved in October 2017. The approved budget was $ 210,000, and the work was to be performed in FY 18 and FY 19. This claim in the FY 19 capital expenditure submission is for the Davidson St level crossing only. The Davidson St level crossing is located on the Western Line in the Oakey central business district. QUEENSLAND RAIL reported this crossing experiences a high level of commuter traffic in the morning and afternoon peak periods, plus significant heavy vehicle traffic. The level crossing has an active flashing light system.

Review Summary

FCG found project B.05243 Davidson St Level Crossing CCTV to be prudent in scope, cost and standard.

A summary of FCG's assessment is included in Table 8.41 below.

Table 8.41: B.05243 Davidson St Level Crossing CCTV summary

Prudency	
Scope	✓ [55]
Cost	✓ [56]
Standard	✓ [57]

Cost	($)
Queensland Rail claim	60,573
FCG Adjustment	0
FCG Recommendation	60,573

Prudency of Scope

FCG found project B.05243 prudent in scope based on:

- ***The high-risk potential of level crossings on a rail system as an interface with other parties***
- ***Specifically, for the Davidson St Crossing the high level of near misses.***

In the Queensland Rail business case for the installation of CCTV at the two level crossings evidence was provided that the Davidson St Level Crossing in FY 16 had the highest frequency of near miss incidents for any level crossing on the West Moreton System[58], with a total of 11 in that year.

This was three times the average number of incidents observed on the other 18 level crossings in the system and accounted for 14% of incidents occurring for that period. Despite Queensland Rail and Queensland Police Service efforts a high level of risk-taking behaviour continued at this crossing. These statistics make a compelling case for the CCTVs and their deterrence to risk-taking behaviour. Queensland Rail reported that experience elsewhere has been that the installation of CCTV's was an effective deterrent to such risk-taking behaviour.

In FY 18 Queensland Rail submitted for capital expenditure approval into the RAB $ 0.94m as the cost of a study into Regional Level Crossing Compliance. This study included the West Moreton system. This was found by QCA to be prudent and therefore a valid RAB inclusion. The study has not been made available to FCG; however, it is reasonable to assume this study included the incident observation statistics provided in the business case

[55] *Quality of documentation for scope is rated as Average Quality. Enough scope information was available for analysis. Details of the installation were not available.*
[56] *Quality of documentation for cost is rated as Average Quality. Enough scope information was available for analysis.*
[57] *Quality of documentation for standard is rated as Poor Quality. Details of the installation were not available.*
[58] *B05243 - Approved Davidson St John St LX CCTV Business Case Annexure 3*

The checklist template for the assessment of prudency of scope is in Table 8.42 below.

Table 8.42: Prudency of scope for project B.05243 Davidson St Level Crossing CCTV

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Plan	Aligning scope with system wide priority	This project was assessed as the highest priority evel crossing on the system due to the number of near misses.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	Queensland Rail consulted with relevant stakeholders specifically the Queensland Police Service.
3	Accommodation for current contracted demand and potential future demand	Historical tonnages Processes used to evaluate alternatives SFAIRP analysis	At the time of these capital works Queensland Rail was expecting tonnages o the West Moreton System to be at least 6.25 mtpa and possibly increasing to 9.2 mtpa. Queensland Rail reports that traffic is heavy at peak periods and over time this will increase.
4	Age and condition of assets	Reasonable consideration of standard and configuration of adjacent infrastructure Equipment condition reports and fault record	"Near Miss" incident data showed that the Davidson St level crossing had the highest number of near misses than any of the 18 level crossings on the West Moreton System.
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Not relevant to this project. This project was addressing rail system safety.
6	Legislative and tenure requirements	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	ALCAM assessment. Compliance with applicable Australian Standards. The projects was delivered meeting the requirements of the RSNL and ONRSR. The RSNL is quite detailed in its requirements at sites that interface with parties other than the Rail Infrastructure Manager.
7	Outcomes of consultation with relevant stakeholders	Access seekers Access holders Customer specific expenditure has been approved by the customer concerned	No negotiations were required with access seekers. Access holders were engaged through regular maintenance shut planning processes. QUEENSLAND RAIL applies their SWUG process to engage with access holders. There was no specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by QUEENSLAND RAIL or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Prudency of Cost

FCG found project B.05243 prudent in cost based on:

- ***Approved business case***
- ***Reported final costs under the business case budget***
- ***Reasonable value for a project this size.***

The project completion report B05243 - Project Completion Report included with the information pack for this capital claim states that the entire project – Rosewood as well as Oakey – was completed on 9 November 2018. It also states that the total project expenditure was $ 20k under the approved $ 210k budget.

The claimed amount for the Davidson Street Oakey installation: $ 60,573 was $ 50k less than its portion of the approved business case budget. Although installations like this are bespoke and heavily dependent on existing infrastructure FCG assess that $ 60,573 for the design, supply and installation of the Davison St CCTV is not excessive.

In terms of cost the documentation in Table 8.43 below has been reviewed.

Table 8.43: Cost detail for project B.05243 Davidson St Level Crossing CCTV

Item	Document	Date	Detail	Cost Information
1	Approved Business Case	October 2017	Financial Planning Table	Project Budget - $ 210k ($ 172 FY 18 and $ 38k FY 19) • WL30.910 Davidson St - $ 111k • ML56.080 John St - $ 99k.
2	Project Completion Report	November 2018	Clause 3 Project Cost Performance	Total $ 190k
3	Asset Register	December 2018		Davidson St $ 61k
4	SAP Report	18 December 2018	20191218 2018-19 WM Capex QCA.xlsx	Transaction sheet $ 180k FY 18 and $ 9k FY 19 SUMMARY Sheet $ 61k
5	FY 19 Capital Expenditure Submission	18 December 2019	Table 1: Commissioned Assets 2018-19 (excluding IDC)	Davidson St $ 61k

In Table 8.46 above there is some consistency supporting the outcome of $ 60,573 as a capital expenditure figure for this project. It does not align with the business case budget of $ 111k or the total project cost of $ 180k. The latter indicates that although the Davidson St CCTV came in significantly under budget, $ 61k cost for a budget of $ 111k, it appears the John St CCTV must have come in over budget, $ 119k cost for a budget of $ 99k. The John St CCTV is not in FCG scope; however, FCG suggest Queensland Rail investigate this.

There is no mention in the business case of the disposition of the CCTV feeds. This would require a program of monitoring the video feeds, identification of transgressions by the travelling public, and dealing with them through preparation and issue of infringement notices. Although it is likely this monitoring will be conducted by existing Queensland Rail and Police Service facilities these costs should be included or addressed by the business case.

The prudency of cost assessment from the guideline template is included in Table 8.44 on the next page.

Table 8.44: Prudency of cost for project B.05243 David Street Level Crossing CCTV

Item	Factors	FCG Guidance Notes	FCG Findings
1	Relevant Network Development Plan	Aligning scope with system wide priority	Scope prioritization includes consideration of the structure location and that location's criticality within the overall West Moreton System.
2	Costs relative to the scale, nature and complexity of the project	Delivery methodology Difference between budgeted and actual cost Project or program of works	This is a reasonable cost for a small project such as this.
3	Circumstances prevailing in the market for: • Engineering, equipment supply and construction • Labour • Materials.	Market conditions Procurement policy Possible application of benchmarking Project management	Procurement conducted in accordance with Queensland Rail's procurement policies. Queensland Rail's use of TMR's OnQ project management framework provides rigour around delivery and cost management processes.
4	Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Minimising whole of life cost Scope priority assessments	Scope prioritisation based upon near miss data.
5	Actions, or proposed actions, in relation to: • Safety during construction and operation • Environmental requirements • Compliance with Law and Authorities • Minimising disruption to Train Services • Accommodating reasonable request to amend scope or sequence of works • Minimising total project cost • Aligning other elements of the supply chain • Meeting contractual timeframes • Dealing with external factors.	Minimising disruption to Train Services Legislative requirements Regulatory safety requirements Requests from Access Holders Possible multiple beneficiaries and appropriate allocation of cost Contractual timeframe	The project management of all Queensland Rail Projects is based upon TMR's OnQ Project Management Framework.
6	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG is not aware of any submissions made to QCA regarding this project.

Prudency of Standard

FCG found project B.4291 prudent in standard based on the CCTV being commissioned and operational.

There was no information provided to allow Flagstaff to evaluate the prudency of the standards QUEENSLAND RAIL applied in the conduct of the works. However, as the CCTV is commissioned and operating and would require electrical certification; FCG assume that the standard of installation was adequate.

The checklist template for prudency of standard is in Table 8.45 below.

Table 8.45: Prudency of standard for project B.05243 David Street Level Crossing CCTV

Item	Factors	FCG Guidance Notes	FCG Findings
1	Requirements of Railway Operators and Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	Though Queensland Rail refers generally to the use of the SWUG process to discuss closure and other major maintenance and timetabling issues with rolling stock operators, there is no reference to whether any access agreements or stakeholder engagement was required for these works.
2	Current and likely future usage	Historical tonnages	The Davidson St level crossing has the highest level of near misses on the West Moreton System.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	Road design standards are applicable. FCG assumes local government inspection and approval was required and obtained prior commissioning.
4	Consistency with the Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Scope priority assessments	The Davidson St level crossing has the highest level of near misses on the West Moreton System.
5	Design standards contained within the Safety Management System		Compliance with applicable Australian Standards.
6	Laws and the requirements of any Authority	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	These projects were delivered meeting the requirements of the RSNL and ONRSR.
7	Any other matters in the submissions to the QCA by Queensland Rail or Funding Users	Review of relevant submissions	FCG are not aware of any submissions made to QCA regarding this project.

9. CONCLUSIONS

FCG generally found the Queensland Rail capital expenditure prudent in scope, cost and standard with two exceptions: prudency of cost for B.04728 Signalling pole route upgrade and B.04403 Culvert and drain renewal.

FCG supports the Queensland Rail FY 19 capital expenditure claim of ***$ 27,236,895*** (excluding Interest During Construction (IDC)).

B.04636: Timber and steel bridge elimination - *$ 12.012 m*
This project was the replacement of [redacted] timber bridges and [redacted] set of long multi-barrel culverts with [redacted] dual and three single concrete bridges. [redacted] of these locations were on the Main Line and [redacted] were on the Western Line. FCG found the project prudent in scope, cost and standard.

B.05171: Relay/recondition track program - *$ 6.878 m*
This project involved the full reconstruction of [redacted] of track. FCG found the project prudent in scope, cost and standard.

B.04728: Signalling pole route upgrade - *$ 2.539 m*
This project is the replacement of approximately [redacted] of aerial cable. FCG found the project prudent in scope, cost and standard.

B.04613: Formation strengthening - *$ 2.514 m*
This project involved the strengthening of [redacted] of formation. FCG found the project prudent in scope, cost and standard.

Ballast undercutting (track lower) - *$ 2.016 m*
This project involved the track lowering [redacted] of track. FCG found the project prudent in scope, cost and standard.

B.04403: Culvert/drain renewal - *$ 1.091 m*
This project involved the reconstruction of [redacted] culverts. Following provision of additional support information from Queensland Rail regarding procurement and change management, FCG found the project prudent in scope, cost and standard.

B.04291: Relaying program – Rosewood to Helidon - *$ 0.127 m*
This is the final minor elements of a rerailing program. FCG found the project prudent in scope, cost and standard.

B.05243: Davidson St Oakey Level Crossing CCTV - *$ 0.061 m*
This project is the installation of a CCTV system at Davidson St Oakey. FCG found the project prudent in scope, cost and standard.

Summaries of FCG's project reviews of Queensland Rail's FY 19 capital submission are below and in Table 9.1.
This table has traffic light coding to show FCG's assessment of the quality of Queensland Rail documentation.

Table 9.1: Individual assessment of projects and documentation quality

Project ID	Project	Queensland Rail Value ($,000) (2019 AUD)	FCG Value ($,000) (2019 AUD)	Documentation Quality		
				Scope	Cost	Standard
	TOTAL	**27,236.9**	**27,236.9**			
B.04636	Timber bridge elimination	12,012.3	**12,012.3**			
B.05171	Relay/recondition track	6,877.8	**6,877.8**			
B.04728	Signalling pole route upgrade	2,538.6	**2,538.6**			
B.04613	Formation strengthening	2,514.1	**2,514.1**			
No ID	Ballast undercutting (track lowering)	2,015.5	**2,015.5**			
B.04403	Culvert/drain renewal	1,091.4	**1,091.4**			
B.04291	Rerailing program – Rosewood to Helidon	126.7	**126.7**			
B.05243	Davidson St Oakey Level Crossing CCTV	60.6	**60.6**			

Traffic Light Colour Coding

Code	Meaning
	Supporting documentation was high quality
	Supporting documentation was average quality
	Supporting documentation was poor quality
	FCG value differs to that claimed by Queensland Rail

10. REFERENCES

All requested Queensland Rail management, cost and quality assurance documentation for renewal projects (commercial in confidence) provided up to date of issue of this report under the agreed Request for Information (RFI) process between QCA and Queensland Rail

- West Moreton System Capital Expenditure Report 2018/19, dated 18 December 2018
- West Moreton Asset Management Plan 2015/16 2nd Edition, not dated
- MD-10-575 Civil Engineering Track Standards (CETS) Version 4.0, dated 21 May 2018
- MD-10-586 Civil Engineering Structural Standards (CESS) Version 5.1, dated 5 July 2019
- AU1 West Moreton Reference Tariff Reset Capital Submission, not dated (Queensland Rail)
- AU1 West Moreton Reference Tariff Submission Review, dated 5 September 2013 (WorleyParsons)
- U1 West Moreton System Capital Works Information Request, not dated
- West Moreton Reference Tariff 2015 DAU Capital Submission, dated May 2015
- QCA West Moreton Network Information Request (2015 DAU Maintenance and Capital), dated August 2015.

Appendix A

Capital Expenditure Review Templates

Prudency of Scope

Item	Factors	Guidance notes for FCG review
1	Relevant Network Development Plan	• Aligning scope with system wide priority • Reliability of achieving target transit time by system or track section
2	Requirement to comply with Access Agreements	• Review of Access Agreements
3	Accommodation for current contracted demand and potential future demand	• Below Rail Transit Times (BRTT) • Temporary Speed Restrictions (TSR) • Processes used to evaluate alternatives • SFAIRP analysis
4	Age and condition of assets	• Track geometry data • Ground penetrating radar data • Geotechnical reports • Equipment condition reports and fault records
5	Promotion of an economically efficient operation	• Whole of supply chain consideration
6	Legislative and tenure requirements	• Includes rail safety, workplace health and safety, safety and environmental requirements.
7	Outcomes of consultation with relevant stakeholders	• Access seekers • Access holders • Customer specific expenditure has been approved by the customer concerned
8	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users.	• Review of relevant submissions

Prudency of Standard

Item	Factors	FCG comments
1	Requirements of Railway Operators and Access Agreements	• Review of Access Agreements • Stakeholder acceptance of standard of works
2	Current and likely future usage	• Historical tonnages • Below Rail Transit Times (BRTT) • Temporary Speed Restrictions (TSR)
3	Relevant Australian design and construction standards	• Reasonable standard to meet the scope and not overdesigned
4	Consistency with the Asset Management Plan	• Reasonable consideration of standard and configuration of adjacent infrastructure • Scope priority assessments • Track geometry data • Ground penetrating radar data
5	Design standards contained within the Safety Management System	• CETS • CESS
6	Laws and the requirements of any Authority	• Rail Safety National Law (RSNL) and Regulation • Office of the National Rail Safety Regulator (ONRSR).
7	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users.	• Review of relevant submissions

Prudency of Cost

Item	Factors	FCG comments
1	Relevant Network Development Plan	• Aligning scope with system wide priority • Reliability of achieving target transit time by system or track section
2	Costs relative to the scale, nature and complexity of the project	• Delivery methodology • Difference between budgeted and actual cost • Project or program of works • Whole of supply chain impact
3	Circumstances prevailing in the market for: • Engineering, equipment supply and construction • Labour • Materials.	• Market conditions • Procurement policy • Possible application of benchmarking • Project management
4	Asset Management Plan	• Reasonable consideration of standard and configuration of adjacent infrastructure • Minimising whole of life cost, opex and maintenance • Scope priority assessments • Track geometry data Ground penetrating radar data
5	Actions, or proposed actions, in relation to: • Safety during construction and operation • Environmental requirements • Compliance with Law and Authorities • Minimising disruption to Train Services • Accommodating reasonable request to amend scope or sequence of works • Minimising total project cost • Aligning other elements of the supply chain • Meeting contractual timeframes • Dealing with external factors.	• Minimising disruption to Train Services • Legislative requirements • Regulatory safety requirements • Requests from Access Holders • Possible multiple beneficiaries and appropriate allocation of cost • Contractual time frame.
6	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users.	• Review of relevant submissions

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