QUEENSLAND COMPETITION AUTHORITY:

AURIZON CENTRAL QUEENSLAND COAL NETWORK

CAPITAL EXPENDITURE REVIEW FY 19

Flagstaff Consulting 25 YEARS

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Document Version Control

Rev	Date	Details	Authorised	Peer Review	Issued to
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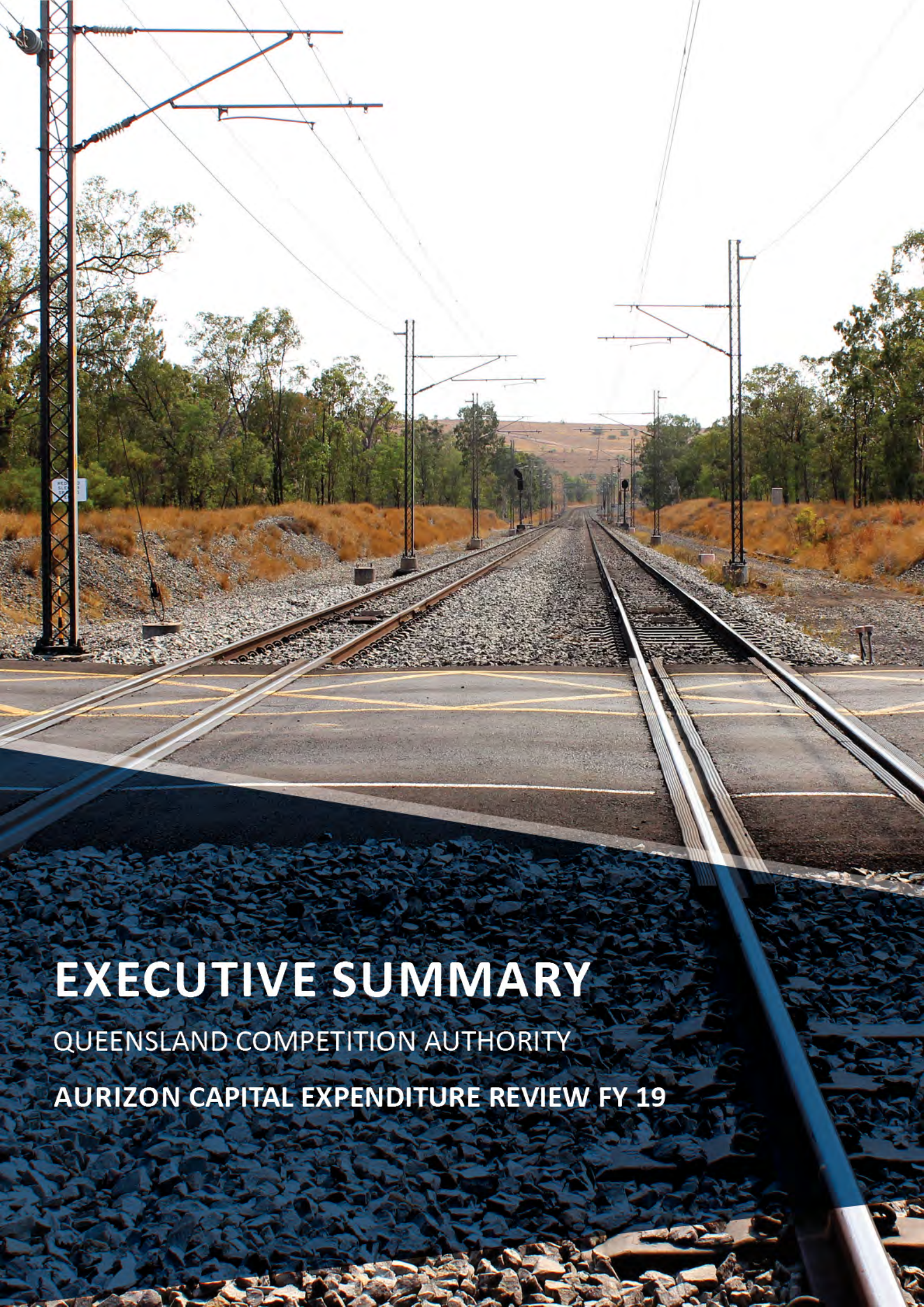


EXECUTIVE SUMMARY

QUEENSLAND COMPETITION AUTHORITY

AURIZON CAPITAL EXPENDITURE REVIEW FY 19

Introduction

Aurizon provides below rail infrastructure, the Central Queensland Coal Network (CQCN), to coal mines in central Queensland. Aurizon's provision of the CQCN infrastructure to the coal mines is regulated by the Queensland Competition Authority (QCA) under the Queensland Competition Authority Act 2007 and the Queensland Competition Authority Regulation 2007.

The current undertaking agreement is the fifth version of this undertaking, Aurizon Network 2017 Access Undertaking (UT5) approved by the QCA on 18 July 2019.

Objective

QCA has commissioned the Flagstaff Consulting Group (FCG) to complete the review of Aurizon's capital expenditure submission for FY 19 in terms of the prudency and efficiency framework described in Schedule E of UT5.

Total Capital Expenditure submission

Aurizon submitted an initial capital expenditure submission titled Aurizon Network FY 19 Capital Expenditure Report dated 31 October 2019. This initial submission consisted of a total value of ***$130,106,248 (excluding Interest During Construction (IDC)[1]).***

Projects totalling ***$3,744,583*** were withdrawn by Aurizon post Aurizon's initial submission.
The projects removed were:

• IV.00323 Track Upgrade FY 18	- Sustaining	- ($1,114,038)
• IV.00577 East End Fisherman's Landing	- Transformation	- $4,858,621.

The resulting grouping totals after these adjustments is:

• Sustaining	- $123,411,682
• Growth	- $238,068
• Transformation	- $2,711,916
• ***TOTAL***	***- $126,361,666.***

FCG completed its review on these figures and groupings representing an adjusted capital expenditure submission by Aurizon of ***$126,361,666.***

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

Assessment summary

FCG assess the Aurizon capital expenditure submission to be generally prudent and efficient in terms of scope, cost and quality. FCG supports FY 19 capital expenditure of ***$122,745,101*** in comparison with Aurizon's submission of ***$126,361,666.***

Aurizon has implemented several robust and effective asset management processes and some initiatives, such as the rail head wear tracking system and Network Asset Management System are commendable. However, in two areas FCG assess that Aurizon may be under scoping asset renewals and this may not be sustainable in the longer term; these areas are control systems and turnout renewals.

FCG are recommending amendments to five projects. One of these recommendations relates to a lack of supporting information to support prudency, three relate to programs of work where FCG assess that insufficient progress has been made to support a capital expenditure claim and one relates to a transformational project that should be submitted as a capital expenditure claim reflecting this transformational nature. A summary of the Aurizon submitted and FCG's recommended capital expenditure is in Table 1 below.

Table 1: Summary of Aurizon submitted capital expenditure (October 2019)

Capital Expenditure Type	Submitted Value	Value assessed as prudent	Comments
TOTAL	**126,361,666**	**122,745,101**	**See notes below for amendment details.**
Sustaining	123,411,682	120,118,516	IV.00449, IV.00470, IV.00476 and IV.00503 amended
Growth	238,068	238,068	
Transformation	2,711,916	2,388,517	IV.00360 amended

FCG's assessment differs from Aurizon by $3,616,565. This difference is due to five items:

- IV.00449 - Bridge Ballast Renewal - $58,050
- IV.00470 - Corridor Security - $1,381,137
- IV.00476 - Track Renewal Package 1 - $1,018,672
- IV.00503 - Electrical Renewals - $835,307
- IV.00360 - Network Asset Management System Tranche 2 - $323,399.

IV.00449 Bridge Ballast Renewal:
FCG found that two bridges, Byellee and Dalrymple Bay bridges, have been removed from the scope and had actual costs incurred. FCG recommend that the costs associated with theses bridges be claimed with the final claims for the Byellee and Dalrymple Bay bridges.

IV.00470 Corridor Security:
FCG assess that it is too early, in terms of work completed, in this program of works to include in a capital expenditure claim. This program has incurred $1,381,137 cost to date of a total program value of $30.7 m. FCG recommend this program of works be reported comprehensively as a series of projects over a number of years describing scope achieved and cost incurred for every year of the project.

IV.00476 Track Renewal Package 1:
FCG was provided conflicting cost information on this project. FCG assessment is based on the 30 September 2019 Project Completion Report for this project.

IV.00503 Electrical Renewals:
FCG assess that it is too early, in terms of work completed, in this program of works to include in a capital expenditure claim. This program has incurred $835,307 cost to date of a total program value of $12.7 m. FCG recommend this program of works be reported comprehensively as a series of projects over a number of years describing scope achieved and cost incurred for every year of the project.

IV.00360 Network Asset Management System Tranche 2:
FCG understand the merit of this project. However, this is a significant transformational project and should be claimed in a future capital expenditure review when it is more progressed.

Detailed project review summary

Details of FCG's project reviews of Aurizon's FY 19 capital assessment is shown in Table 2 below. This table has traffic light coding to show:

- Projects where FCG's assessment differs from Aurizon
- FCG's assessment of the quality of Aurizon documentation.

Table 2 Legend

Code	Meaning
✓	FCG assesses as prudent for this claim
✗	FCG assesses as not prudent for this claim
	FCG adjusted Aurizon's claim for this project
	FCG that supporting documentation was high quality
	FCG that supporting documentation was average quality
	FCG that supporting documentation was poor quality
	FCG conducted a high-level review and cannot comment on documentation quality
	FCG did not review this project after consultation with QCA

Table 2: Detailed assessment of projects

Capital Expenditure Type	Project	Submitted Value (2019 AUD)	FCG Assessment Value (2019 AUD)	Documentation Quality		
				Scope	Cost	Standard
TOTAL	**TOTAL CAPITAL SUBMISSION**	**126,361,666**	**122,745,101**			
Sustaining	**Total Sustaining**	123,411,682	120,118,516			
IV.00425	Rail Renewal Program Package 1	26,572,373	26,572,373	✓	✓	✓
IV.00446	Structures Renewal Package 1	15,465,451	15,465,451	✓	✓	✓
IV.00476	Track Renewal Package 1	15,193,594	14,174,922[2]	✓	✓	✓
IV.00461	Turnout Renewal Package 1[3]	14,053,345	14,053,345	✓	✓	✓
IV.00452	Formation Renewal Package 1	9,851,560	9,851,560			
IV.0449	Bridge Ballast Removal Package 1	8,567,512	8,509,462[4]	✓	✗	✓
IV.00455	Control Systems Renewal Package 1[5]	6,875,112	6,875,112	✓	✓	✓
IV.00473	Sleeper Renewal Package 1	6,317,874	6,317,874	✓	✓	✓
IV.00458	Level Crossing Renewal Package 1	4,048,374	4,048,374	✓	✓	✓
IV.00049	Radio System Replacement	3,609,098	3,609,098			

[2] Project IV.00425: Conflicting cost at completion information provided by Aurizon. FCG assessment is based on the Aurizon Project Completion Report dated 30 September 2019.
[3] FCG note less turnouts were renewed than initially planned for and this may have impacts in the mid or long term in the form of Unallocated Works.
[4] Project IV.00449: $58,050 costs from bridges removed from scope not substantiated.
[5] FCG suggest the faults trend indicates additional control system renewal may be required.

Capital Expenditure Type	Project	Submitted Value (2019 AUD)	FCG Assessment Value (2019 AUD)	Documentation Quality		
				Scope	Cost	Standard
IV.00555	Minerva Infra Upgrade	1,379,635	1,379,635			
IV.00470	Corridor Security Package	1,381,137	0 [6]	✓	✗	✓
IV.00399	Cyclone Debbie Rectification	1,156,299	1,156,299	✓	✓	✓
IV.00329	Structures Renewal FY 18	926,232	926,232			
IV.00004	Traction Fault Locator Renewal	881,498	881,498	✓	✓	✓
IV.00376	FY 18 Access Points	843,497	843,497			
IV.00503	Power Systems Renewal Package 1	835,307	0 [7]	✓	✗	✓
IV.00346	Package 1 FY 18 Control Systems Renewal	815,826	815,826			
IV.00283	Traction SCADA System	811,715	811,715			
IV.00364	Turnout Renewal FY 18	696,543	696,543			
A.04313	Gauge Face Lubrication	564,946	564,946			
IV.00334	Bridge Ballast Renewal Program FY 18	493,610	493,610			
IV00467	Access Roads Package 1	478,621	478,621			

[6] Project IV.00470: Capital expenditure claim too early in program; $1.4 m costs to date with full program costs of $30.7 m.
[7] Project IV.00503: Capital expenditure claim too early in program; $0.8 m costs to date with full program costs of $12.7 m.

Capital Expenditure Type	Project	Submitted Value (2019 AUD)	FCG Assessment Value (2019 AUD)	Documentation Quality		
				Scope	Cost	Standard
IV.00374	CQ Access Roads FY 18	337,699	337,699			
IV.0321	Sleeper Renewal Program	336,966	336,966			
IV.00344	Formation Renewal FY 18	330,989	330,989[8]	✓	✓	✓
IV.00343	Level Crossings Renewal Program FY 18	311,435	311,435			
IV.00322	Rail Renewal FY 18	210,734	210,734			
IV.00145	Autotransformer Renewal Project	185,545	185,545	✓	✓	✓
IV.00145	Track Upgrade FY17	154,769	154,769	✓	✓	✓
IV.00040	Train Detection Renewal Program	14,961	14,961			
IV.00261	Telecom Infrastructure Renewal	7,105	7,105			
IV.00266	Transmission Renewal FY17	6,281	6,281			
IV.00177	Structures Renewals FY17	(16,709)	(16,709)			
IV.00316	Access Points Renewal Program	(56,746)	(56,746)			
IV.00384	Electrical Equipment Renewal FY 18	(113,497)	(113,497)			
IV.00144	Rail Renewals FY17	(117,009)	(117,009)			

[8] *Project IV.00344: Capital expenditure claim supporting information provided during Aurizon final review discussions.*

Capital Expenditure Type	Project	Submitted Value (2019 AUD)	FCG Assessment Value (2019 AUD)	Documentation Quality		
				Scope	Cost	Standard
Growth	**Total Growth**	238,068	238,068			
A.01731	WIRP1: Dingo to Bluff Duplication	108,391	108,391	✓	✓	✓
A.04599	Havilah Culverts Upgrade	73,476	73,476			
A.02976	WIRP1: North Coast Line	47,818	47,818			
A.03686	WIRP1: Moura System Upgrade	7,189	7,189			
A.03735	WIRP1: Bauhinia North Upgrade	1,194	1,194			
Transformation	Total Transformation	2,711,916	2,388,517			
IV.00437	Callide Infrastructure Upgrade	2,298,631	2,298,631	✓	✓	✓
IV.00360	Network Asset Mgt System Tranche 2	323,399	0[9]	✓	✗	✓
IV.00184	Network Growth Other	30,469	30,469			
IV.00495	Coppabella Walk-ways Relocation	59,417	59,417			

[9] *Project IV.00360: Capital expenditure claim too early in a significant transformation program; $0.3 m costs to date with full program costs of $6.9 m.*

1. INTRODUCTION

Aurizon Network (Aurizon) provides below rail infrastructure to coal mines in central Queensland. The below rail infrastructure consists of the track system, structures, formation, signalling, train control and traction power systems; collectively this infrastructure is known as the Central Queensland Coal Network (CQCN).

Aurizon's provision of the CQCN is regulated by the Queensland Competition Authority (QCA) under the *Queensland Competition Authority Act 2007* and the *Queensland Competition Authority Regulation 2007.* The pricing principles and processes for setting tariffs to determine the access charges Aurizon may recover are described in an undertaking agreement that is periodically reviewed. The current undertaking agreement is the fifth version of this undertaking, *Aurizon Network 2017 Access Undertaking (UT5)* approved by the QCA on 18 July 2019. UT5 requires maintenance of a Regulated Asset Base (RAB) reflecting the value of the CQCN infrastructure.

Aurizon has the opportunity under UT5 to increase the RAB annually through a process which assesses the acceptability of capital works expenditure to be included in the RAB. The acceptability of these capital works is dependent on meeting criteria in Schedule E of UT5; specifically, this requires a test of prudency and efficiency of scope, cost and standard. An extract of UT5 describing specifics of the prudency and efficiency test is included in Appendix A.

QCA has commissioned Flagstaff Consulting Group (FCG) to complete the review of Aurizon's capital expenditure submission for FY 19 in terms of the prudency and efficiency framework described in Schedule E of UT5.

2. OBJECTIVE

The objective of the commission is to complete a review of Aurizon's capital expenditure submission for FY 19 in terms of the prudency and efficiency framework described in Schedule E of UT5.

The review is to be conducted interactively with Aurizon. The review will include a brief site visit to key identified infrastructure assets to validate a sample of the capital works in the field.

3. FCG METHODOLOGY

3.1 General

The review consisted of a five stage methodology. The methodology, with key milestone meetings identified, is described in the Figure 3.1 below. Although identified as sequential the stages will overlap; for example, preparation of the report structure will commenced in Stage 1.

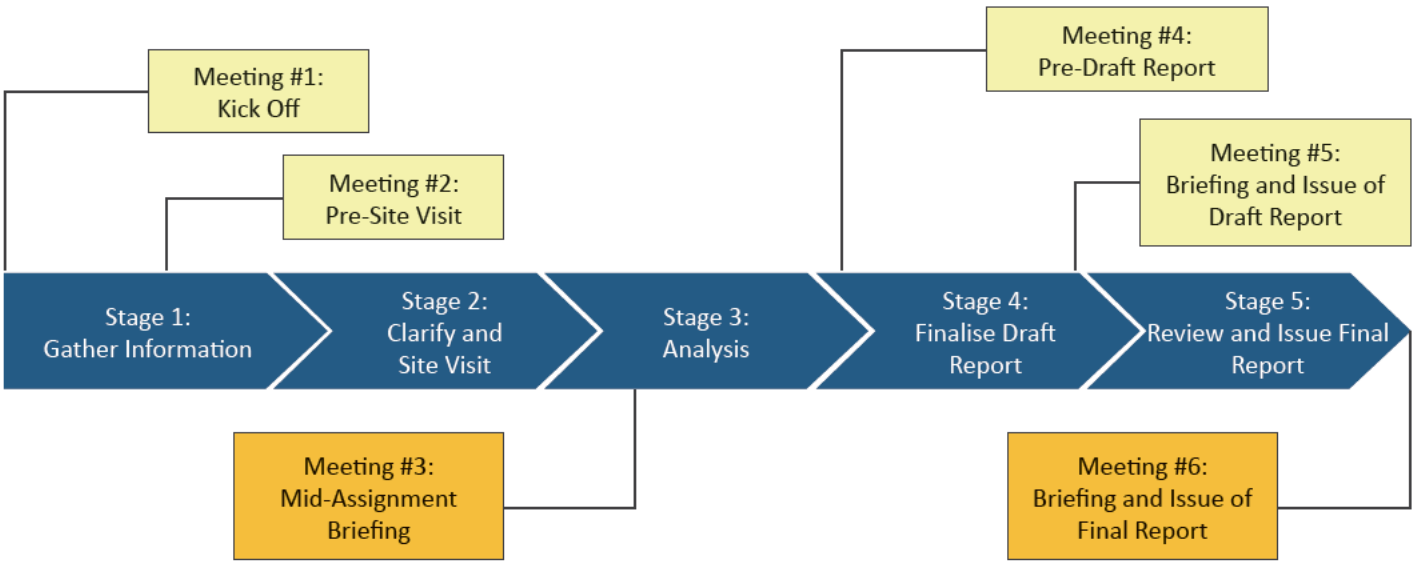


Figure 3.1: Review process

3.2 Stage 1: Information Gathering

The initial work comprised the collection and sorting of project information and data. This included initial discussions with specific Aurizon staff. All data was stored and transferred via a restricted access secure cloud-based system. An RFI system was established to request missing information.

3.3 Stage 2: Site visit

The site visit inspected completed projects and interviewed Aurizon staff. The site visit inspected completed projects on the Goonyella System.

3.4 Stage 3: Analysis

The analysis of prudency of scope was guided by several flow charts and a review template.

The review template, with accompanying commentary, was be completed for each project. The review template aligns with requirements of UT5 and will address prudency of scope, cost and standard.

The flow charts are included in Appendix B and the review template is included at Appendix C.

3.4.1 Prudency of scope

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

3.4.2 Prudency of cost

The detailed cost reviews included a combination of checking with current industry pricing, benchmarking and procurement methodology reviews. 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 was to validate that Aurizon utilised the most effective procurement methodology in the context of a project.

3.4.3 Prudency of standard

The prudency of the standard of works was assessed by determining whether the works are of a reasonable standard to meet the requirements of the scope and not over designed.

Standards needed to be consistent with adjacent infrastructure or existing requirements.

3.5 Stage 4: Finalise Draft Report

The FCG team finalised a draft report in preparation for review by QCA. The FCG team presented the draft report and explain key aspects of the report.

3.6 Stage 5: Review and Issue Final Report

QCA and Aurizon had an opportunity to review the report and provide feedback.

4. THE CENTRAL QUEENSLAND COAL NETWORK

4.1 General

The CQCN is a narrow-gauge railway, able to carry a maximum 26.5 tonne axle load (TAL). The CQCN is one of largest resource rail transport systems in the world. The CQCN has a long history with some parts of the system originally constructed in the early 1900's.

The tonnage transported on the CQCN has increased steadily and has more than doubled since the late 1990s, as shown in Figure 4.1 below.

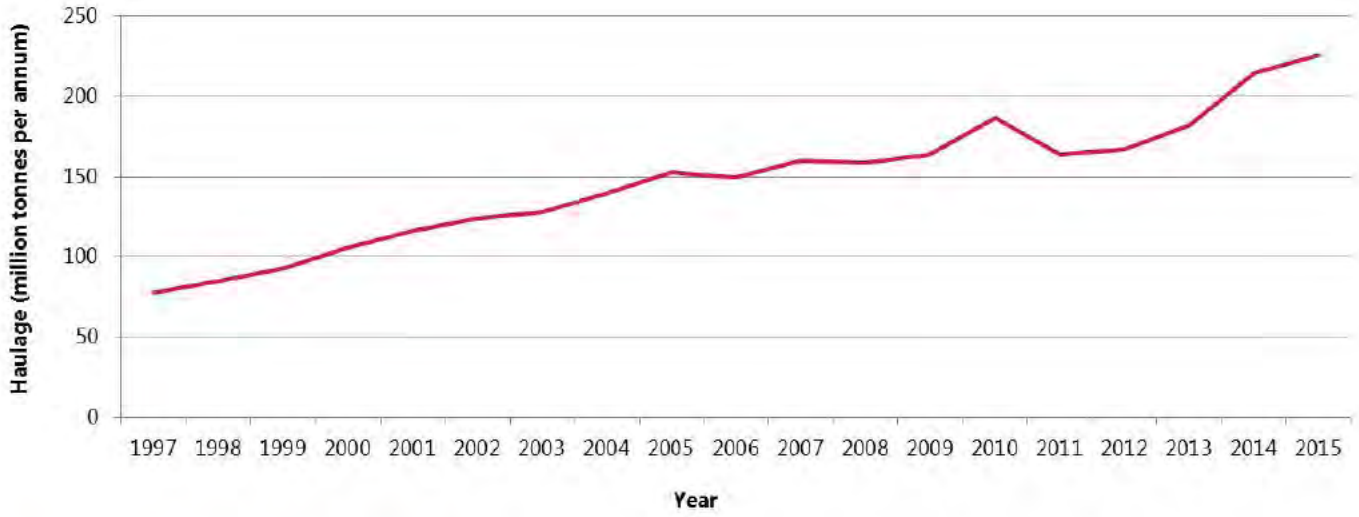


Figure 4.1 Tonnage transported by CQCN[10]

4.2 CQCN systems

4.2.1 General

The current configuration of the CQCN consists of five systems:

- Newlands
- Goonyella to Abbot Point Expansion (GAPE)
- Goonyella
- Blackwater
- Moura.

Figures 4.2 and 4.3 on the next page shows the location of these systems.

[10] *CQCN Condition Based Assessment 2017 (QCA).*

Figure 4.2 Northern CQCN showing Newlands, GAPE and Goonyella Systems[11]

4.2.2 Newlands System

The Newlands system is located at the northern end of the Bowen Basin. The system is non-electrified and generally comprises single line track with passing loops[12]. It services loading loops at the Newlands, Sonoma and McNaughton mines. The system connects to unloading loops at the Abbot Point Coal Terminal (APCT).

4.2.3 Goonyella to Abbot Point Expansion (GAPE) System

The GAPE system connects the Goonyella system to the Newlands system. Some sections of the original track, Euri Creek and Briaba, were maintained at 20 tal to minimise cost and constrained operationally to unloaded traffic while a new 26.5 tal track was a built beside the original.

4.2.4 Goonyella System

The Goonyella system services the central Bowen Basin. Coal is transported to terminals at Hay Point and Dalrymple Bay. The system is mainly comprised of bi-directional duplicated track. A single line connection links the Goonyella system with the Blackwater system via Oaky Creek to Gregory. The system services balloon loops at Goonyella, Riverside, North Goonyella, Moorvale, Millennium, Carborough Downs, Isaac Plains, Blair Athol, South Walker and Hail Creek. In addition, the line services dual unloading loops at Hay Point and triple unloading loops at Dalrymple Bay.

[11] *Figure from Aurizon Goonyella Information Pack.*

[12] *There is some duplicated track at Briaba.*

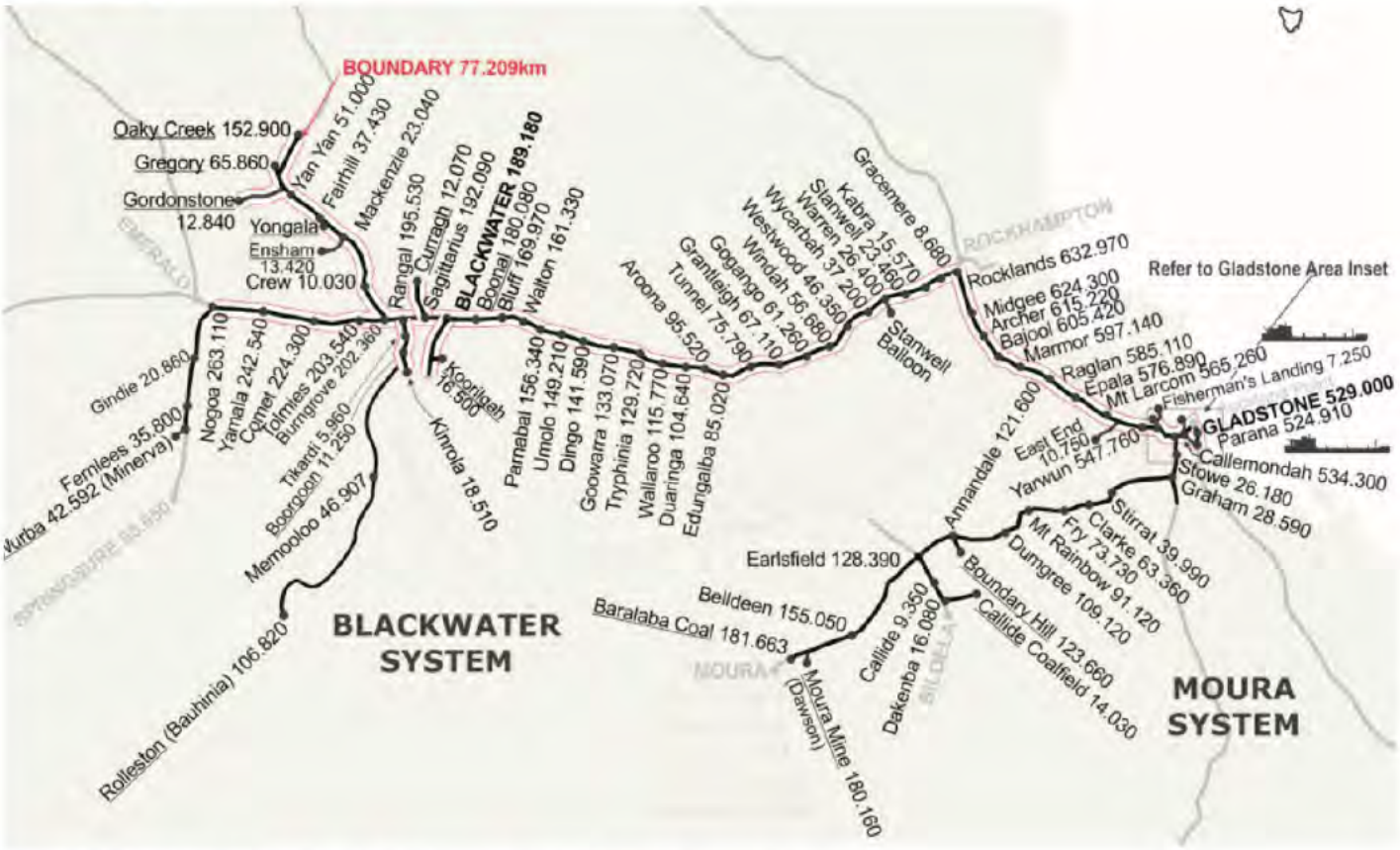


Figure 4.3 Southern part of the CQCN showing Blackwater and Moura Systems[13]

4.2.5 Blackwater System

The Blackwater system services East End, Boonal, Koorilgah, Blackwater, Curragh, Boorgoon, Kinrola, Ensham, Gordonstone, Rolleston, Minerva, Gregory and Fairhill. It transports coal to the Stanwell Power Station, Gladstone Power Station and the Port of Gladstone export facilities at the R. G. Tanna Coal Terminal (RGTCT) and Barney Point Coal Terminal (BPCT). The system comprises bi-directional duplicated and electrified track.

4.2.6 Moura System

The Moura system services the Moura, Boundary Hill and Callide mines. The system connects these mines to the export facilities at RGTCT and BPCT and to intrastate destinations via the NCL. The system is comprised of single line with passing loops and operates diesel locomotives.

[13] *Extract from Aurizon Blackwater Information Pack.*

4.3 Asset configuration

All systems are designed for 26.5 tal with a maximum speed of 80 km/hr. Other key characteristics of CQCN systems are shown below in Table 4.1 below.

Table 4.1: Key characteristics of the CQCN systems

Characteristic	Newlands	GAPE	Goonyella	Blackwater	Moura
Length (km)	193	80	987	1,082	234
Electrified[14]	No	No	Yes	Yes	No
Consist	3 Locomotives 82 Wagons 1.402 km	3 Locomotives 82 Wagons 1.402 km	4 Locomotives 124 Wagons 2.082 km	4 Locomotives 102 Wagons 1.716 km	4 Locomotives 102 Wagons 1.716 km
Consist payload (tonnes)	6,871	6,871	10,055	8,211	6,296

4.3.1 Track Systems

Aurizon intends to standardise, where possible and warranted, on 60 kg/m rail with 28.5 tal concrete sleepers and Pandrol E Clip fasteners.

The legacy nature of the system means there is still 53, 47 and 41 kg/m rail on timber, steel or the older FIST concrete sleepers on the network. These older track systems are incrementally being replaced as assets wear out or display defects based on assessment of site priority and future traffic at a location. In some locations these older track systems are still performing well.

[14] *25,000 volts, 50 Hz, alternating supply.*

4.3.2 Train control, signalling and communications

Due to the legacy nature of the CQCN and the incremental nature of its development the CQCN uses a range of signalling and train control systems for:

- Train control
- Interlockings
- Train detection
- Communications.

The main method of train control is Remote Control Signalling (RCS). RCS allows a train's route to be pre-set and all infrastructure (points and signals) will automatically change for this train. On routes with lower traffic intensity, such as the Moura system, or the far west of the Blackwater system, the train control is via Direct Train Control (DTC) where a train driver receives permission to proceed from an operator via radio.

Regarding interlockings:

- Newlands
  - Westrace (II, VLM6, HS VLM6 and HVLM)
  - Microlok (Plus and CCS)
  - Genisys
- GAPE
  - Westrace (II, VLM6, HS VLM6 and HVLM)
  - Microlok (Plus and CCS)
  - Genisys
- Goonyella
  - Westrace (II, VLM6, HS VLM6 and HVLM)
  - Microlok (Plus and CCS)
- Blackwater
  - Westrace (II, VLM6, HS VLM6 and HVLM)
  - Relays
- Moura
  - VPI
  - Microlok Plus.

Redundant communications systems are provided throughout the systems of the CQCN:

- Newlands
  - Underground optic fibre
  - Microwave radio
- GAPE
  - Underground optic fibre
  - Microwave radio
- Goonyella
  - Underground optic fibre
  - Microwave radio
  - OPGW fibre optic[16]
- Blackwater
  - Underground optic fibre
  - Microwave radio
  - OPGW fibre optic
- Moura
  - Underground optic fibre
  - UHF radio.

Regarding train detection the CQCN has a mix of:

- Axle counters
  - Siemens
  - Thales
  - Mixed
- Jointed track circuits
  - AC
  - DC.
- Jointless track circuits
  - CSEE[15]
  - TI 21.

Communications between driver and controller is via a TETRA[17] radio system.

[15] *CSEE is a proprietary name for a jointless track circuit provided by Ansaldo STS.*
[16] *A fibre optic cable utilising the overhead traction distribution infrastructure.*
[17] *Terrestrial Trunked Radio (TETRA) is a digital radio system.*

4.4 Performance and reliability

4.4.1 General

Aurizon regularly tracks and reports to stakeholders two measures that provide assurance that the CQCN is being maintained at an appropriate level to perform to supply chain, and the QCA's expectations. These two measures are reported separately for each system. They are:

- Transit time reliability through Below Rail Transit Time (BRTT).
- Track geometry quality through Overall Track Condition Index (OTCI).

The BRTT is calculated by adding an allowance to the theoretical non-stop through transit time to account for train starts, train stops and interfacing with other systems. This allowance differs for each system and the current agreed BRTT for the systems is shown in Table 4.2 below.

Table 4.2: Aurizon system transit time allowances[18]

System	Target Transit Time (%)
Newlands/GAPE	160
Goonyella	123
Blackwater	127
Moura	130

The OTCI is widely used in the rail industry as a general measure of track quality. The inputs for the OTCI come from precise data measuring (in mm) the deviations from design of a range of parameters. These parameters include:

- Top
- Twist over 3 m
- Twist over 10 m
- Gauge
- Versine.

These measurements are taken every metre and the OTCI at a location is the summing the absolute values of all the deviations. The average OTCI is the average for all OTCI measurements for the length of track under consideration.

[18] *Aurizon System Operating Parameters – Public Release 2016.*

4.4.2 FY 19 Transit time reliability – Below Rail Transit Time (BRTT)

The graphs of average BRTT by month for FY 19 are shown in Figure 4.4 below. These graphs indicate that the average BRTT achieved by Aurizon is better than the target for all systems.

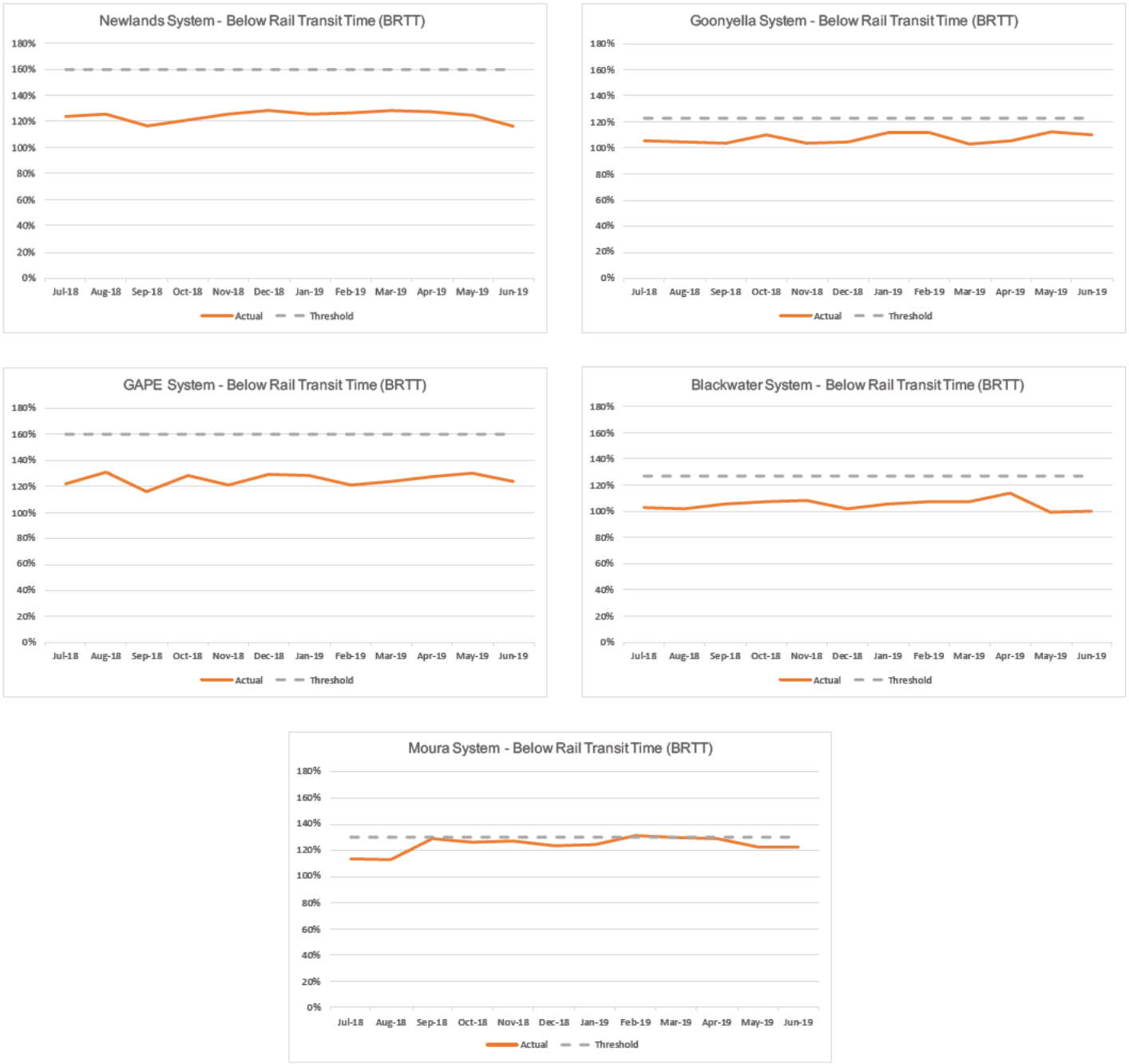


Figure 4.4: BRTT results for CQCN for FY 19

The two best performing systems were the GAPE and Newlands systems. This is understandable given the recent construction of GAPE and the upgrade works completed to Newlands in concert with GAPE.

The worst performing system was Moura, although still achieving an average under the target. This is also understandable given the low tonnages and age of the Moura system. It indicates that Aurizon are not over maintaining this system provided the achieved reliability is acceptable to the customers.

Reliability on the Moura System could be improved with greater investment in maintenance and asset renewal. In the scenario where an acceptable reliability is being achieved at a certain investment level then further investment may not be prudent, or welcomed by customers, regardless of an improvement in reliability.

4.4.3 FY 19 Track geometry - OTCI

Figure 4.5 below shows the average OTCI for the CQCN as at June 2019. These graphs indicate that the average OTCI achieved by Aurizon is better than the target for all systems; target of 35 for all systems except Moura which is 40.

Figure 4.5: OTCI results for CQCN for FY 19

Figure 4.5 shows that Newlands and GAPE are performing well with an average OTCI below 26.

Moura shows an increase in OTCI, representing a decrease in track geometry quality, after January 2019 from 28 to slightly above 32. This increase is possibly related to the wet season and as with the BRTT could be addressed through an increased investment in maintenance in the Moura System.

As with reliability, track geometry quality on the Moura System could be improved with greater investment in maintenance and asset renewal. In the scenario where acceptable geometry is being achieved at a certain investment level then further investment may not be prudent, or welcomed by customers, regardless of an improvement in track geometry.

5. AURIZON RAIL ASSET STRATEGY AND MANAGEMENT

5.1 Asset management system

Aurizon maintains a comprehensive asset management system comprising the following:

- Asset management policy
- Asset condition inspection guidelines
- Network Asset Management System (NAMS)
- Engineering standards such as CETS and CESS.

The Asset Policy document provides overarching guidance on acceptable maintenance targets and intervention triggers. The asset condition inspection guidelines were developed in 2017 by Aurizon. These guidelines provide a uniform approach to asset condition assessment in the field and a consistent method of classifying an asset as:

- GOOD
- FAIR
- POOR
- VERY POOR
- UNSAFE[19]

The guidelines include:

- Module 00 – Overview[20]
- Module 01 – Rail
- Module 02 – Insulated Rail Joint (IRJ)
- Module 03 – Sleeper Condition
- Module 04 – Turnout Condition
- Module 05 – Ballast Condition
- Module 06 – Track Geometry Condition
- Module 07 – Track Formation Condition
- Module 08 – Culvert Condition
- Module 09 – Bridge Condition
- Module 10 – Track Drainage Condition
- Module 11 – Rai Lubrication Condition
- Module 12 – Level Crossing Condition
- Module 13 – Access Roads Condition
- Module 14 – Fencing Condition
- Module 15 – Access Point Condition.

NAMS collects asset condition data and matches it with the SAP system. It provides "one source of truth" with a consistent approach to data acquisition that will inform asset management decision making to optimise access and resource planning.

NAMS is in place and operational for maintenance work. Aurizon are implementing an evolution of NAMS called "NAMS Next" which increases the footprint of NAMS to address all Aurizon tasks including capital work. NAMS Next will allow full visibility of asset whole of life cost from installation, through maintenance and renewal to replacement/decommissioning.

CETS and CESS provide minimum safe operating standards for the Aurizon CQCN. Their origin is in the Queensland Rail CETS and CESS prior the Queensland Rail Initial Public Offering (IPO) in 2009. These Queensland Rail engineering standards had been refined and developed over a long period. The current Aurizon and Queensland Rail CETS and CESS are similar. It is important to understand the CETS and CESS standards are minimal operational standards for a safe rail operation and maintenance action must be taken before CETS and CESS limits are reached; for example, a rail replacement will be triggered by Aurizon on reaching 80 % of the rail wear limit specified in CETS to allow time to schedule the replacement and obtain access to the track.

5.2 Network Development Plan

Aurizon documents plans for future capacity and asset improvements in the Network Development Plan (NDP). The NDP identifies potential CQCN capacity growth paths and a range of options to meet this demand for capacity.

[19] *The guidelines intent is to create an objective structure to potentially subjective terms when assessing asset condition.*
[20] *Describes a the overarching system of rating quality of assets.*

The NDP looks at the capacity demand across all systems and NDMP looks at options to address this demand through:

- Improving network time
- Improving throughput rate
- Improving train density.

The NDP then reviews capacity improvement options for each of the CQCN systems. These options include improving track infrastructure, improving signalling and train control, and different approaches to rolling stock consists. Any Aurizon capacity improvements must be implemented in close collaboration, agreement and coordination with other supply chain stakeholders.

This capital expenditure review has only a very small component of growth projects. The growth projects included are generally related to Wiggins Island Rail Projects Stage 1 (WIRP 1). Consequently, the current NDP has minimal influence on this capital expenditure claim.

5.3 Asset management and scope prioritisation

Part of the challenge of asset management is allocating limited resources to achieve the best result for a system. To address this Aurizon is implementing a Priority Scope Model (PSM). Aurizon presented this approach to the FCG team on 7 November 2019. Aurizon explained PSM approach balances five aspects:

- Safety
- Asset condition
- Total cost
- Minimising unplanned outages/incidents[21]
- Maximising use of planned track possession.

Aurizon highlighted that any increase in effort in one area will potentially lead to undesirable impacts in other areas. The only aspect not subject to trade-offs or compromise is safety. Aurizon attempt to achieve the best balance possible of these aspects. The PSM is a model to assist achieving the best balance with limited resources. The Model basically uses two inputs to determine a "Prioritisation Asset Listing". The two inputs are:

- Asset condition
- Asset location criticality.

Asset condition is determined by:

- Data from remote monitoring systems
- Track recording data
- Engineering assessments.

Asset location criticality is determined by:

- Traffic task
- Percentage of system tonnes
- Impact to throughput

Aurizon cross matches these inputs to determine the priority of work on a specific asset. For example, a poor condition/high criticality asset will be placed high on the list where a poor condition/low criticality asset will be ranked lower on the list and may not be scheduled at all given limited resources. A poor condition/low criticality asset may be temporarily managed in the medium term through operational constraints such as temporary speed restrictions.

FCG acknowledges the system has merit in providing a structured approach to maintaining a complex asset where limited resources are available. FCG also understands that this system is in the process of being implemented and there will be some evidence, but not a full implementation, during this particular capital expenditure review.

5.4 Rail Industry Group

It is worth noting that CQCN supply chain stakeholders are establishing a Rail Industry Group to facilitate collaboration, optimisation and minimise total cost of delivering coal to market. This is a work in progress but has potential to increase collaboration across the supply chain with all parties understanding as a group options and trade-offs that optimise the supply chain and minimise total cost.

[21] *Unplanned outages cause significant operational disruption and on a unit rate basis are significantly more expensive than planned maintenance activities.*

6. CAPITAL EXPENDITURE SUBMISSION

6.1 Initial submission 31 October 2019

Aurizon submitted an initial capital expenditure submission titled *Aurizon Network FY 19 Capital Expenditure Report* dated 31 October 2019. This initial submission consisted of a total value of ***$130,106,248 (excluding Interest During Construction (IDC)[22]).***

This submission grouped the projects into three categories:

- Sustaining - $121,271,876
- Growth - $238,068
- Transformation - $8,596,304
- ***TOTAL - $130,106,248***

Aurizon provided guidelines on what each category covered. Sustaining projects related to renewal or replacement of infrastructure and in previous submissions were called "capital renewal". Growth relates to projects increasing system capacity. Transformation, previously called "Other", relate to projects that don't fit neatly into the other two categories and are generally IT or technology projects.

On 1 November 2019 FCG was provided a copy of the submission and a spreadsheet detailing specific projects and values. The spreadsheet totalled ***$130,106, 249.*** However, the spreadsheet used different categories from those described above.

- Asset Renewals - $120,918,009
- Growth - $268,537
- Sustaining Other - $8,596,304
- Transformation - $323,399
- ***TOTAL - $130,106,249***

FCG queried this in an RFI and was directed to use the structuredescribed in the *Aurizon Network FY 19 Capital Expenditure Report.* This required:

- Renaming "Asset Renewal" projects "Sustaining" projects.
- Renaming "Sustaining Other" projects "Transformation" projects.

After this renaming the following breakdown of project by capital expenditure type resulted:

- Sustaining - $120,918,009
- Growth - $268,537
- Transformation - $8,919,703
- ***TOTAL - $130,106,249.***

After this renaming, although the totals are the same; two groups don't align. "Sustaining" is $353,868 higher in the October submission than on the supplied spreadsheet, "Growth" is $30,469 and "Transformation" are $323,399 lower in the submission than the supplied spreadsheet. The cause of this misalignment appears to be two projects:

- IV.00360 Network Asset Mgt System Tranche 2 - $323,399
- IV.00184 Network Capacity Model - $30,469.

The October submission appears to allocate IV.00360 and IV.00184 to "Sustaining" as "Operational Systems"[23] . FCG assess these projects as transformational and allocated them appropriately to "Transformation" projects. FCG will group the projects on this basis in the framework of the October submission:

- Sustaining - $120,918,009
- Growth - $238,068
- Transformation - $8,950,172
- ***TOTAL - $130,106,249.***

[23] FCG will not consider IDC in this report; all figures in the report will be excluding IDC.
[23] Refer page 11 of Aurizon Network FY 19 Capital Expenditure Report dated 31 October 2019.

6.2 Adjustments post submission

Several of the projects were withdrawn by Aurizon post submission. These projects were removed from the submission:

- IV.00323 Track Upgrade FY 18 - Sustaining - ($1,114,038)
- IV.00577 East End Fisherman's Landing - Transformation - $4,858,621.

The resulting grouping totals after these adjustments was:

- Sustaining - $123,411,682
- Growth - $238,068
- Transformation - $2,711,916
- ***TOTAL*** - ***$126,361,666.***

FCG completed its review on these figures and groupings representing an adjusted capital expenditure submission by Aurizon of ***$126,361,666***.

6.3 Projects submitted

Projects submitted by asset type and in order of value are in Table 6.1 below. Projects identified for a high level or full review are highlighted in the right-hand column. Of the total claim; the projects reviewed by FCG represent 50 % by number and 87 % by total value. For individual groupings:

- Sustaining - 44 % by number and 87 % by value
- Growth - 20 % by number and 46 % by value.
- Transformation - 50 % by number and 97 % by value.

Table 6.1 Aurizon Capital Expenditure Submission

Capital Expenditure Type	Project	Value (2019 AUD)	Comments
TOTAL	**TOTAL CAPITAL SUBMISSION**	**126,361,666**	
Sustaining	**Total Sustaining**	**123,411,682**	
IV.00425	Rail Renewal Program Package 1	26,572,373	Reviewed
IV.00446	Structures Renewal Package 1	15,465,451	Reviewed
IV.00476	Track Renewal Package 1	15,193,594	Reviewed
IV.00461	Turnout Renewal Package 1	14,053,345	Reviewed
IV.00452	Formation Renewal Package 1	9,851,560	Not Reviewed
IV.0449	Bridge Ballast Removal Package 1	8,567,512	Reviewed
IV.00455	Control Systems Renewal Package 1	6,875,112	Reviewed
IV.00473	Sleeper Renewal Package 1	6,317,874	Reviewed
IV.00458	Level Crossing Renewal Package 1	4,048,374	Reviewed

Capital Expenditure Type	Project	Value (2019 AUD)	Comments
IV.00049	Radio System Replacement	3,609,098	High level review completed
IV.00470	Corridor Security Package	1,381,137	High level review completed
IV.00555	Minerva Infra Upgrade	1,379,635	Not Reviewed
IV.00399	Cyclone Debbie Rectification	1,156,299	High level review completed
IV.00329	Structures Renewal FY 18	926,232	Not Reviewed
IV.00004	Traction Fault Locator Removal	881,498	Reviewed
IV.00376	FY 18 Access Points	843,497	Not Reviewed
IV.00503	Power Systems Renewal Package 1	835,307	High level review completed
IV.00346	Package 1 FY 18 Control Systems Renewal	815,826	Not Reviewed
IV.00283	Traction SCADA system	811,715	Not Reviewed
IV.00364	Turnout Renewal FY 18	696,543	Not Reviewed
A.04313	Gauge Face lubrication	564,946	Not Reviewed
IV.00334	Bridge Ballast Renewal Program FY 18	493,610	Not Reviewed
IV00467	Access Roads Package 1	478,621	Not Reviewed
IV.00374	CQ Access Roads FY 18	337,699	Not Reviewed
IV.0321	Sleeper Renewal Program	336,966	Not Reviewed
IV.00344	Formation renewal FY 18	330,989	Reviewed
IV.00343	Level Crossings Renewal Program FY 18	311,435	Not Reviewed
IV.00322	Rail Renewal FY 18	210,734	Not Reviewed
IV.00145	Autotransformer Renewal Project	185,545	Reviewed

Capital Expenditure Type	Project	Value (2019 AUD)	Comments
IV.00145	Track Upgrade FY17	154,769	Reviewed
IV.00040	Train Detection Renewal Program	14,961	Not Reviewed
IV.00261	Telecommunication Infrastructure Renewal	7,105	Not Reviewed
IV.00266	Transmission Renewal FY17	6,281	Not Reviewed
IV.00177	Structures Renewals FY17	(16,709)	Not Reviewed
IV.00316	Access Points Renewal Program	(56,746)	Not Reviewed
IV.00384	Electrical Equipment Renewal FY 18	(113,497)	Not Reviewed
IV.00144	Rail Renewals FY17	(117,009)	Not Reviewed
Growth	Total Growth	238,068	
A.01731	WIRP1: Dingo to Bluff Duplication	108,391	Reviewed
A.04599	Havilah Culverts Upgrade	73,476	Not Reviewed
A.02976	WIRP1: North Coast Line	47,818	Not Reviewed
A.03686	WIRP1: Moura System Upgrade	7,189	Not Reviewed
A.03735	WIRP1: Bauhinia North Upgrade	1,194	Not Reviewed
Transformation	Total Transformation	2,711,916	
IV.00437	Callide Infrastructure Upgrade	2,298,631	Reviewed
IV.00360	Network Asset Management System Tranche 2	323,399	Reviewed
IV.00184	Network Growth Other	30,469	Not Reviewed
IV.00495	Coppabella Walkways Relocation	59,417	Not Reviewed

7. ANALYSIS

7.1 General

The objective of the FCG review is to assess a sample of projects in detail. FCG was also instructed to complete several high-level reviews; the objective of the high-level reviews was for FCG to assess whether a detailed review was warranted.

FCG completed five high level reviews of which one was assessed as requiring a detailed review. Subsequently, a total of 19 detailed reviews were completed.

7.2 High level Business Case analyses

7.2.1 General

Five projects were selected for high level reviews. These projects were:

- IV.0399 Cyclone Debbie Rectification
- IV.00049 Radio Replacement
- IV.00470 Corridor Security
- IV.00499 Bridge Ballast
- IV.00503 Electrical Renewals.

Only IV.0499 Bridge Ballast was selected as requiring a detailed review. Commentary on these high-level reviews is below.

7.2.2 IV.00399 Cyclone Debbie Rectification

Project/Program Details

These works relate to emergency flood repairs required due to damage by Cyclone Debbie which made landfall on 28 March 2017.

Although all systems were damaged the most significant impact occurred on the Goonyella System where land slips on Black Mountain stopped all traffic for several weeks. The Goonyella System moves the greatest quantity of coal on the CQCN and this triggered an immediate requirement for critical repairs; particularly to address the geotechnical slip issues at Black Mountain.

Documents Reviewed

The following documents were reviewed:

- Debbie IAR Final to AIC Additional Funding
- Debbie Recovery_to_NIC.

Prudency of Scope

These works are assessed as prudent given the significant impact on the coal supply chain of the cyclone damage for a period of weeks.

Prudency of Cost

The capital claim for FY 19 is $1.13 m is the final claim of the total project value of $14.3 m incurred over several years.

Cyclone damage repairs, geotechnical repairs and rapid damage assessments are difficult to estimate accurately. The initial IAR was for a budget of $11.3 m. This was increased by a further request for an additional $2.8 m comprising approximately $2.0 m of additional scope and $0.8 m of overruns on the initial scope.

Prudency of Standard

Aurizon states all rectification works followed latest standards and with consideration of the latest weather and hydrology data. Figure 7.1 shows Cyclone Debbie repair works on the Black Mountain section of track.

Figure 7.1 Cyclone Debbie emergency repairs - fibre reinforced shotcrete slope stability works at Black Mountain (GA 43.097)

FCG Assessment

Given the difficulty of estimating this type of work and the urgency required for the repairs; FCG assess the scope, cost and standard of the works as most likely prudent and furthermore detailed review is not recommended.

7.2.3 IV.00049 Radio Replacement

Project/Program Details

As part of a nation-wide move initiated by the Australian Communications Management Authority (ACMA) to digital radio, Aurizon replaced analogue radio systems with digital radio. FY 19 represents the final year of a multi-year program of works. The initial Aurizon Feasibility IAR was raised on 23 December 2016.

Documents Reviewed

The following document was reviewed:

- Feasibility IAR radio System Replacement Project to AIC.

Prudency of Scope

As this was part of a nation-wide move initiated by the ACMA, Aurizon was required to initiate the progression from analogue to digital radio. Aside from the government requirement to transition; digital radio provides greater bandwidth, download and upload speed and allows greater use of better technology[24].

Prudency of Cost

The capital claim for FY 19 is $3.61 m and is the final claim of the total initial project value of $26.1 m incurred over several years. The FY 19 claim brings total project value to approximately $29.8 m indicating an overrun of approximately $3.7 m, or 14 %.

FCG did not see supporting evidence for the 14 % budget overrun, however as this was a technology project in a new area FCG believe this is likely to be the result of an underestimate in Aurizon's initial project estimate and that the costs are likely to be prudent.

Prudency of Standard

The regulatory and safety requirements for radio systems are rigid and Aurizon has little flexibility in the delivery of this technology. It is likely the standard will be prudent.

FCG Assessment

Given the ACMA requirement to transition to digital radio, the nature of implementing new technology projects and the external standard constraints; FCG assess the scope, cost and standard of the works as most likely prudent and furthermore detailed review is not recommended.

7.2.4 IV.00470 Corridor security

Project/Program Details

The Corridor Security Program is aimed at renewing priority assets to meet current safety and engineering standards. FY 19 is the initial year of a corridor, road interfaces and turnouts at priority sites over a three-year program (FY 19 to FY 21). The total program forecast value is $30.7 m.

Documents Reviewed

The following documents were reviewed:

- IAR 18-24 FY 19 Corridor, Road Interface and Turnouts
- Other Civil Renewals FY 19 – LC, AR, AP, T, CSF 21.3.18 Final to AIC.

[24] *A simple practical example is that digital technology allows the use of iPads to access real time engineering data from cloud-based systems. This is directly applicable to Aurizon's Network Asset Management System (NAMS).*

Prudency of Scope

Scope of works under this program of works relate to assets in the rail corridor and rail/road interfaces to maintain or bring these assets up to current safety standards. As a program of works the intent of this scope is reasonable. However, given the early stage of this program of works; FCG is not able to assess prudency of scope for FY 19.

Prudency of Cost

The capital claim for FY 19 is $2.86 m and is the first claim in a program of works with a total value of $30.7 m incurred over several years. The IAR forecast an initial cost for the first year of $2.23 m (including [redacted] contingency for labour rates). Given the early stage of this program of works; FCG is not able to assess prudency of cost.

Prudency of Standard

The basis of works is to maintain or bring assets up to meet current safety standards. Consequently, the standard is likely to be prudent.

FCG Assessment

Given the relatively small expenditure of $2.86 m on the first year of a program with a total forecast cost of $30.7 m; this program has essentially only just started. Any assessment would be of little value as final cost and scope achieved is unknown. As FY 19 is first part of a 3-year program of works, it is recommended that Aurizon consider withdrawal of this project from its FY 19 capital expenditure claim and re-submit when the program is more progressed. This project should be reported as a multi-year program with clear descriptions of scope achieved, costs incurred and resources utilised on a year by year basis. The final report on this project should contain this detail and reconcile the full program of works.

7.2.5 IV.00449 Bridge Ballast

Project/Program Details

Ballast on bridge decks is subject to several factors that cause deterioration of the quality of the ballast to the extent that it must be replaced. The alternative to not replacing the ballast is to impose a speed restriction on the bridge which leads to undesirable operational and maintenance impacts.

The intent of this program is to move from fix on failure events to planned renewals. The scope includes 12 bridges, totalling 1.629 km, for programmed for FY 19.

Documents Reviewed

The following document was reviewed:

- FY 19 Track Structure Support Renewal Program_BB_S_F.

Prudency of Scope

FY 19 program prioritised and ranked these works as safety and operational critical works. This is likely to be prudent scope.

Prudency of Cost

Total initial program capital expenditure allowance was $44.8 m over FY 19 to FY 21 for a range of track structure support works. The allocation under this program for FY 19 was $36.4 m. In this FY 19 total $5.6 m was allocated to bridge ballast renewal. The actual spend on bridge ballast in FY 19 was $8.6 m representing a significant over run against the budget for these works for FY 19[25]. This does not necessarily indicate a lack of prudency as more scope may have been completed than anticipated for the first year of a three-year program.

[25] *Project IV.0449 had general contingency allowances for FY 19 of $5.9 m in addition to the ballast renewal allowance.*

Prudency of Standard

Standards for ballast quality and installation are documented in CETS and CESS. It is likely the works will be prudent for standard.

Recommendation

FCG recommend this project for a detailed review to validate scope, cost and standard. This recommendation is made due to the misalignment in expected cost for FY 19, $5.6 m, against an actual of $8.6 m.

7.2.6 IV.00503 Electrical Renewals

Project/Program Details

In FY16 Aurizon amended the strategy for electrical assets, allowing for minimal renewal of critical equipment at nominated sites to sustain the asset until a longer-term solution on how Aurizon recovers the costs of its investment in electric traction assets is agreed. FY 19 is the third year of a five-year program of works.

Documents Reviewed

The following documents were reviewed:

- IAR 18-31 Electrical Renewal Program (signed CFO Decision Minute)
- Electrical Assets Renewal Program FY 19_POST NIC FINAL1.

Prudency of Scope

Aurizon note that given deferment of works across last five years, the identified scope of works under this IAR are all deemed critical and must proceed.

As a program of works the intent of this scope is reasonable. However, given the early stage of this program of works; FCG is not able to assess prudency of scope for FY 19.

Prudency of Cost

Total capital expenditure for the project is $12.7 m over three years allocated as:

- FY 19 - $9.8 m
- FY 20/21 - $2.4 m
- Contingency [redacted] m.

Actual claimed expenditure for FY 19 is $2.7 m which is significantly below the anticipated progress. Given the early stage of this program of works; FCG is not able to assess prudency of cost.

Prudency of Standard

The regulatory and safety requirements electrical systems are rigid, and Aurizon has little flexibility in the delivery of this technology. It is likely the standard will be prudent.

FCG Assessment

Given part way through an overall program of works, with insufficient information on past budget / expenditure, difficult to provide a clear assessment. FCG recommend that Aurizon consider withdrawal of this project from the FY 19 capital expenditure claim and re-submit when the program has progressed further. This project should be reported as a multi-year program with clear descriptions of scope achieved, costs incurred and resources utilised on a year by year basis. The final report on this project should contain this detail and reconcile the full program of works.

7.3 Detailed Assessment of asset renewal projects

7.3.1 General

The projects selected in decreasing order of value are shown in Table 7.1 below.

Table 7.1 Project sample reviewed

Capital Expenditure Type	Project	Value (2019 AUD)
TOTAL	**TOTAL REVIEWED**	**101,486,867**
Sustaining	**TOTAL ASSET RENEWAL VALUE REVIEWED**	**98,756,446**
IV.00425	Rail Renewal Program Package 1	26,572,373
IV.00446	Structures Renewal Package 1	15,465,461
IV.00476	Track Renewal Package 1	15,193,594
IV.00461	Turnout Renewal Package 1	14,053,345
IV.0449	Bridge Ballast	8,567,512
IV.00455	Control Systems Renewal Package 1	6,875,112
IV.00473	Sleeper Renewal Package 1	6,317,874
IV.00458	Level Crossing Renewal Package 1	4,048,374
IV.00004	Traction Fault Locator Removal	881,498
IV.00344	Formation renewal FY 18	440,989
IV.00145	Autotransformer Renewal Project	185,545
IV.00145	Track Upgrade FY17	154,769
Growth	**TOTAL GROWTH VALUE REVIEWED**	**108,391**
A.01731	WIRP1: Dingo to Bluff Duplication	108,391
Transformation	**TOTAL SUSTAINING OTHER VALUE REVIEWED**	**2,622,030**
IV.00437	Callide Infrastructure Upgrade	2,298,631
IV.00360	Network Asset Mgt System Tranche 2	323,399

7.3.2 IV.00425 Rail Renewal Program Package 1

Project/Program Details

Rail profile is consumed through rail traffic and through maintenance grinding. Rail traffic, particularly heavy rail traffic, leads to Rolling Contact Fatigue (RCF) just below the surface of the rail. Maintenance grinding controls RCF by incrementally moving this stressed zone lower to avoid fatigue failures internally at one level of the rail. The rail profile can also be affected by the wheel /rail interface. On straight sections of track this is easily managed however on curves the wheel rail interface can be impacted by train speed and track cant. A non-optimal wheel rail interface can excessively wear the rail. Rail on tight curves under heavy loads tends to wear the most quickly from a combination of traffic impact and maintenance grinding.

Aurizon's FY 19 Rail Renewal Program forms part of an ongoing rolling program of rail replacement works on the CQCN. The purpose of this program is to identify damaged or worn rail in order to proactively prioritise and carry out renewal works to ensure rail assets remain compliant with the CETS.

Review Summary

A summary of the assessment of the rail renewal program is in Table 7.2 below.

Table 7.2: IV.00425 Rail Renewal Program Package 1 summary

Prudency	
Scope	✓ [26]
Cost	✓ [27]
Standard	✓ [28]

Cost	AUD 2019
Aurizon claim	26,572.373
FCG Adjustment	0
FCG Recommendation	26,572.373

In general, FCG found that Aurizon has implemented an effective rail renewal program based on accurate and regular measurements of rail wear. In addition, Aurizon is refining its rail wear data collection and encouraging innovation to extend rail life.

FCG have two comments on the rail renewal:

- In some cases, it appears rail may have been replaced marginally early, however considering the challenges of scheduling rail replacement projects on a busy network and the major consequences of an unplanned rail failure, adopting a conservative approach is prudent.
- In some cases, uneven wear was evidenced on high and low rails at the same location. This could indicate a misalignment of operational speed and cant.

[26] *Quality of documentation for scope is rated as High Quality. At a strategic intent level, the scope is defined very well in the IAR. Amendments to scope at commencement and throughout FY 19 works can be evidenced. Time frame in the IAR appears to have been achieved.*

[27] *Quality of documentation for cost is rated as High Quality. The cost aspects of the IAR are described in detail. Cost aspects of the FY 19 claim, $26,572,373, are described in terms of total project costs to date against project progress and planned costs. The scope completion date and actual delivery dates achieved are clear.*

[28] *Quality of documentation for standard is rated as High Quality. Aurizon describe in detail the nature of the project on completion.*

Prudency of Scope

The rail renewal works carried out under this project are categorised as Critical Works or Unallocated Works.

Critical Works are sections of rail where head wear is nearing maximum allowable limits as outlined within CETS Module 2. The CETS limits are minimum operating limits and if they are exceeded the track is deemed unsafe. Aurizon initiate rail renewal planning when head wear reaches 80 % of the acceptable wear. These works are identified in advance, planned and executed in collaboration with other supply chain stakeholders as they stop traffic.

Unallocated Works are works carried out in response to field inspections identifying defects, accelerated or varied wear rates from field inspections. These works are unplanned, need urgent action, relate to short lengths of rail, and have constraints regarding access and resources. They tend to have undesirable operational impacts and are expensive from a unit rate perspective. The unit rates (per km rail) for Unallocated Works are higher than for Critical Works because of the disproportionate impact of mobilisation and demobilisation for small quantities of rail.

Below is a summary of the scope of works under IV.00425 Rail Renewal Program Package 1.

Table 7.3: Summary of Rail Renewal program included in FY 19 submission

		Goonyella	Blackwater	Moura	Newlands	Unallocated (Fix on Fail)	Total
No. of Rails	IAR	228	230	98	20	75	651
	Actual	217	235	26	59	-	537
Length (km)	IAR	24.630	24.840	10.580	2.160	8.100	70.310
	Actual	23.287	25.494	2.757	6.477	-	58.015

The prudency of scope assessment from the guideline template is included in Table 7.4 below.

Table 7.4: Prudency of scope for project IV.00425 Rail Renewal 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	The works are consistent with Aurizon Asset Management Policy.
2	Requirements with Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	It is expected Access Agreements between Aurizon and Rail Users (and any access conditions) were fully complied with as far as they apply to rail renewal works.
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	Network tonnage above 230 million tonnes in FY 18. Projects are aimed at maintaining acceptable reliability of achieving target BRTT. TSR have been applied on some sections where high wear or defects were identified as a short or medium term asset management strategy.
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 records	CETS Module 2, Section 2.12.2 and Appendix 2.F.1. Governing criteria for site selection is rail head wear % (calculated from table and side wear data). Inspection of removed rail confirmed rail head wear nearing CETS limits. This information supports sites selection under FY 19 works rail head wear data has been captured by Aurizon's Rail Inspection Vehicle (RIV). This retained data is used to predict future, location-specific head wear rates to determine when rail head wear will reach maximum allowable limits (See Note 1). As Unallocated Works are in response to a clear defect or failure identified in the rail, the scope of these 38 sites is considered reasonable.

Item	Factors	FCG Guidance Notes	FCG Findings
5	Relevant Network Plan	Whole of supply chain consideration	Rail renewal projects were scheduled in coordination with the wider supply chain. Planned and pre-emptive replacements of these worn assets avoid unplanned failures and is in the interest of efficient whole of supply chain operation.
6	Requirements with Access Agreements	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	Accommodation for current contracted demand and potential future demand	Access seekers Access holders Customer specific expenditure has been approved by the customer concerned	No negotiations required with access seekers. Access holders were engaged through regular maintenance shut planning processes. No specific customer expenditure on this project.
8	Age and condition of assets	Review of relevant submissions	Site selection from IAR through to completion was reviewed and revised as budgets and the latest rail head wear data deemed necessary. The site visit to FY 19 sites and field measures of rail head wear on removed rail validated the wear data provided (See Note 2). The data supports the sites carried out in FY 19, and the site visit validated these sites. FCG has no evidence these projects feature in submissions to QCA.

Note 1. Retention and use rail head wear data

Rail head wear data has been retained by Aurizon and used to predict future head wear. This allows Aurizon to predict the remaining life of the rail; when it reaches the maximum allowable rail head wear permissible under CETS Module 2.

This information is presented graphically by Aurizon allowing the reviewer to clearly see this information and predict wear rate. An example of Aurizon's table wear tracking is shown below in Figure 7.2 and an example side wear tracking is shown in Figure 7.3.

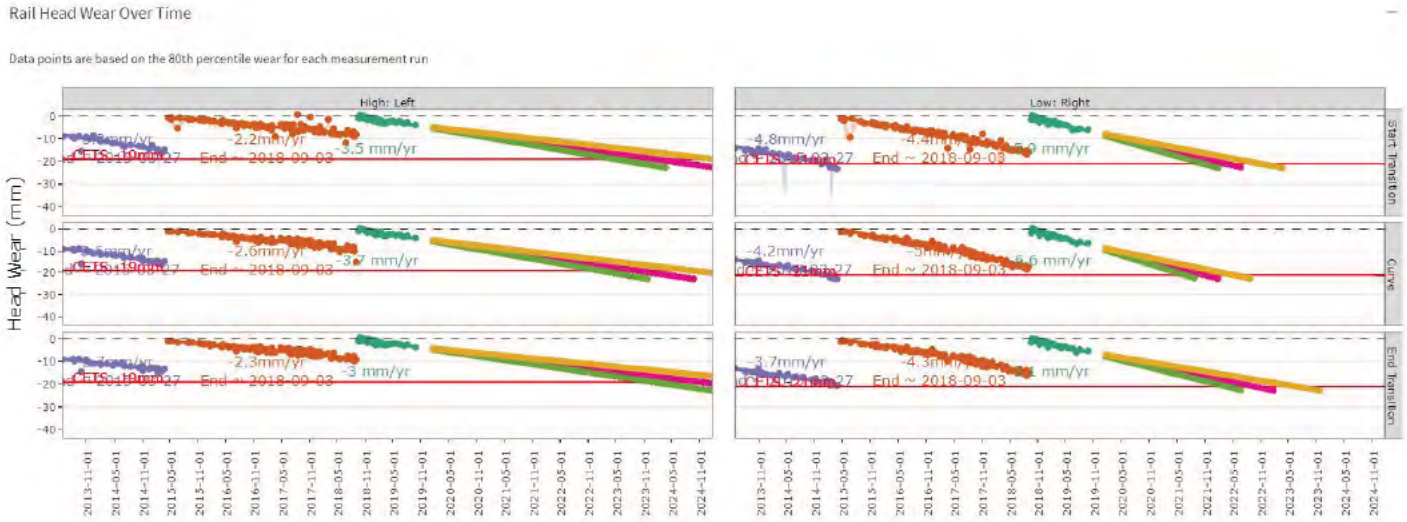


Figure 7.2: Rail head table wear tracking method used by Aurizon (historical, current and projected)

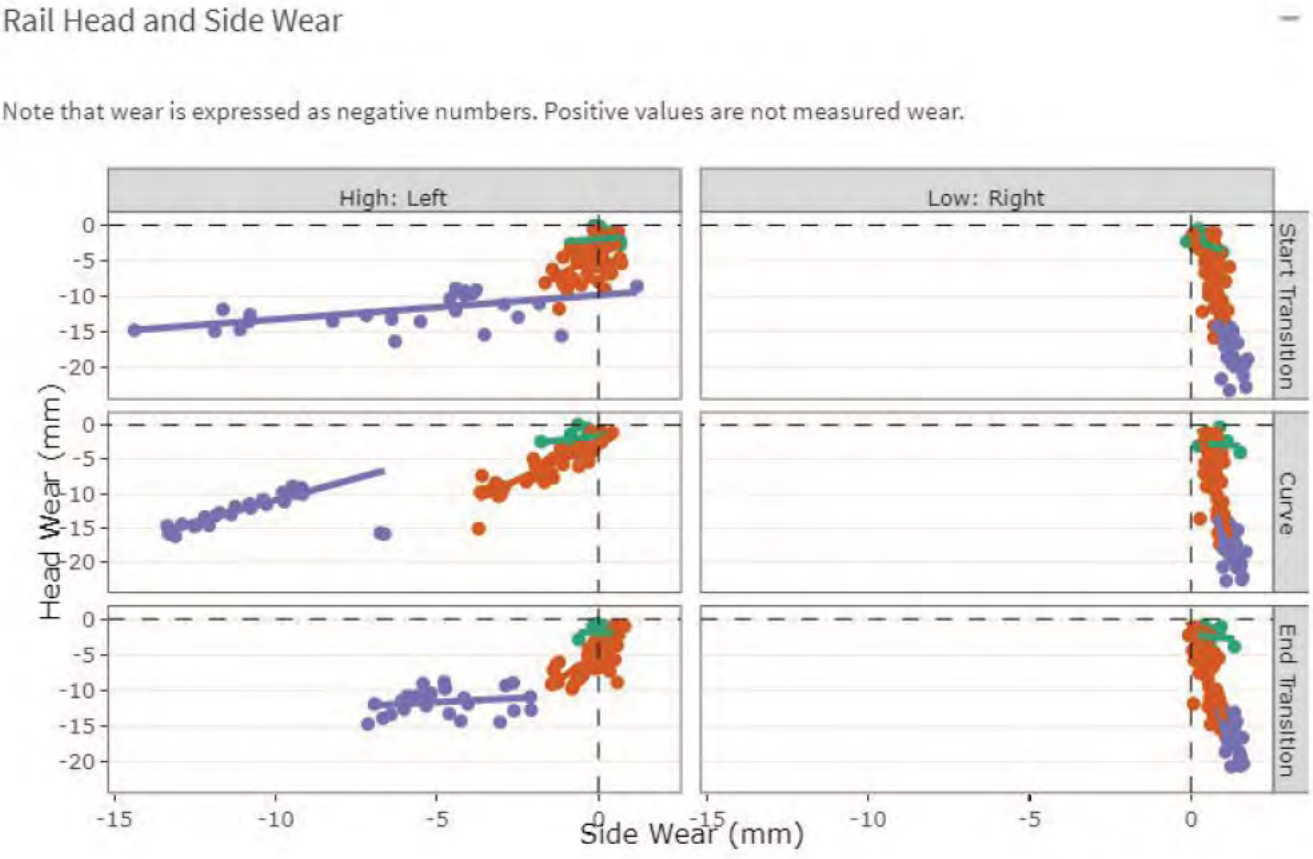


Figure 7.3: Rail head table wear tracking method used by Aurizon (historical, current and projected)

Aurizon's development of this rail wear monitoring system should be commended. It is effective and:

- Provides the basis for selection of rail sites for works within the rolling Rail Renewal Program
- Allows better timing of works to optimise the length of life for each rail
- Provides a guide on rail performance under operational loads.

Note 2. Site Visit

During the site visit in December 2019, several FY 19 Rail Renewal sites were visited. At these sites, the rail removed was stockpiled within the rail corridor, allowing field measure of the table wear.

At all locations visited, the table wear recorded on removed rail was between 15mm – 18mm. These readings aligned with rail wear data provided before the site visit; supporting the need for rail renewal works at the nominated sites.[29]

Figure 7.5: Head flow and table wear on removed rail[30]

Figure 7.6 – Field table wear measurement on removed rail

The condition of the existing rail removed at the rail renewal sites, as detailed by Aurizon with its rail head wear data and the visual field inspections carried out by the FCG team validated that these works were required to maintain rail asset standards.

Prudency of Cost

Aurizon capital expenditure report states $26,572,373 for the renewal of 58.015 km of rail in FY 19. The completion report for these works stated a total of 58.015 km of Critical Works were carried out and 38 additional sites as Unallocated Works. Most costs for rail renewal works are materials and labour costs.

Regarding material costs, Aurizon have two suppliers of head hardened (HH) 60kg/m rail (Japan and Austria). These suppliers provided prices for this program of works in a competitive procurement model. The Japanese company [redacted] was selected on the basis that it could meet Aurizon's HH 60kg/m rail quality requirements and meet delivery demand milestones and requirements.

[29] *It could be assessed that table wear of 15 mm may be too early to replace the rail. However, rail renewal will close a line to traffic and the renewal project must be planned and coordinated with all stakeholders up to 12 months in advance. Leaving a marginal quality rail in place could cause an unplanned failure which will lead to undesirable operational impacts and higher unit costs. These factors mean it is conservative and prudent to replace the rail earlier rather than later and risk an unplanned failure.*

[30] *This figure shows that at this site the operational speed and rail cant may be misaligned and consequently leading to uneven wear on high and low rails; leading to plastic flow on this low rail.*

The prudency of cost guideline template is included in Table 7.5 below.

Table 7.5: Prudency of cost for project IV.00425 Rail Renewal 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	Sites selected were those with rail head wear nearing maximum allowable limits to maintain compliance with CETS Module 2. These sites were prioritised and ranked based on shortest projected time frame to reach maximum rail head wear limits to longest. Works at each site was valued, and the number of sites where works were completed in FY 19 were the number from highest to lowest priority that the budget would allow.
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	Rail Renewal Program Costs (Total): • Budgeted in Initial Approval Request (IAR): $32,791,651* • Claimed amount: $26,572,374 • Actual Cost (SAP): $27,155,662** * Excludes Management Reserve ** Claimed amount equals total cost less both IDC and $584,289 for assets not commissioned before end of FY 19. Rail Renewal Unit Rates • Budgeted in IAR: [redacted] • Actual: [redacted]* (Refer Note 1) One site with a relatively significantly higher unit rate was the Curragh load out. This site was 50m long at a cost of $856,090, or approximately $17 m /km. This work would be more correctly described as concrete works with a rail element. The project encountered poor existing concrete and had the additional complications of working around an operating mine.
3	Circumstances prevailing in the market for: Engineering, equipment supply and construction labour materials.	Market conditions Procurement policy Possible application of benchmarking Project management	Rail procurement is competitive by pricing between suppliers for the best rate and terms. Labour is provided from Aurizon internally unless resource constraints dictate otherwise. If external suppliers used, the works are priced by three pre-approved service providers in a competitive situation.

Item	Factors	FCG Guidance Notes	FCG Findings
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	Critical Works are planned, with site selections based upon rail wear data and forecast rail wear rates. These works allow Aurizon to engineer the scope and achieve the best cost of renewal possible. Taper rails is the common method of tie into existing rail at the start and end of renewal sites. For Unallocated Works, the priority objective is keeping the track in service.
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 time frames • 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	Site works are planned ahead to align with mine maintenance windows where possible. Where minor rail renewal works can be completed without a shutdown window in a safe and cost-effective manner, this was done. Access Holders are notified where potentially impacted by rail renewal works.
6	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Note 1. Rail renewal unit rates

The Forecast FY 19 unit rate was prepared based upon a top down estimate with consideration of the following factors:

- The Rail Scope for FY 19
- Material Cost increases
- Market resource demand risk
- Multi-year procurement benefits
- Project key benefits.

The Actual FY 19 Unit Rate for the FY 19 Program of works, [redacted]/km, is slightly higher than that achieved in previous years. It is noted that:

- The Critical Works unit rates were only 2.5% higher than those achieved in FY17
- The Actual FY 19 Unit Rate achieved for Critical Works was lower than that Forecast within the
- Investment Approval Request Document

The actual cost for this project were also within the forecast budget.

Unit rates for the rail renewal works program are as outlined below:

- Forecast FY 19 unit rate for Critical Works - [redacted]/km
- Actual FY 19 unit rate for Critical Works only - [redacted]/km
- Actual FY 19 unit rate for Critical & Unallocated Works - [redacted]/km
- Estimated actual FY 19 unit rate for Unallocated Works only - [redacted]/km[31]

Unit rate check shows Critical Works achieved lower rate than planned under the FY 19 IAR. Unallocated Works had a unit rate over 10 times higher than Critical Works. This is a result of full mobilisation and demobilisation costs for small lengths of renewal works at short notice.

FCG notes this order of magnitude difference on a unit rate basis between the actual rates achieved for Critical Works, delivered in a planned framework, and the Unallocated Works, delivered in an unplanned reactive framework. Adding the operational impact to this difference in unit rates reinforces the value of proactive preventive maintenance.

Prudency of Standard

Compliance of the CQCN Rail Network with CETS is mandatory as a minimum for safe operation. The purpose of the Rail Renewal Program is to remove sections of rail nearing the limits of rail head wear to continue to comply with these standards.

The prudency of standard guideline template is included in Table 7.6 below

Table 7.6: Prudency of standard for project IV.00425 Rail Renewal 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	As current access was maintained it is expected Access Agreements between Aurizon and Rail Users (and any access conditions) were fully complied with as far as they apply to rail renewal works. Full compliance with CETS – is mandatory by Aurizon.

[31] *Estimated as no lengths of rail provided. From the site visit, it is clear these works are very small (up to 10m), so we have assumed 200m total rail for actual costs of $1,024,000 to calculate this unit rate.*

Item	Factors	FCG Guidance Notes	FCG Findings
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	Historical tonnage for FY 19 was approximately 230 million tonnes. Currently running trains at 20 minute headway across the network.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not over designed	Installation in accordance with 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 was carried out based on rail head wear data. These selected sites were ranked.
5	Design standards contained within the Safety Management System	CETS	CETS Module 2. Conversion of Table and Side Wear Measurements to Rail Head Wear % (Appendix 2F, Table 2.20). Rail Head Wear Limits (Section 2.12, Table 2.12).
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 Aurizon Network or Funding Users	Review of relevant submissions	Asset Completion Certificates record all applicable works standards and certify compliance. FCG has no evidence these projects feature in submissions to QCA.

7.3.3 IV.00446 Structures Renewal Package 1

Project Overview

There are currently 3,809 culverts and 339 bridges across the CQCN Network. As these structures were predominately installed during initial track construction in the 1960's and designed for lower axle load tonnage than current operations, there is a need for an ongoing renewal program to monitor and either renew or replace these assets to meet current day standards and operational requirements (as failure to do so can result in collapse of structure, resulting in loss of top and line of the overlying track and/or derailment).

The structures renewal program includes the engineering and construction works associated with renewal or replacement of structures either at or near the end of their life across the CQCN Network with new structures complaint with Australian Standards, Q100 flood levels (to top of rail) and Q50 flood levels (to top of formation).

Given the variation in size of these structures, estimates of costs for renewal works at each site are developed by Aurizon and used for internal project funding approval.

Review Summary

A summary of the assessment of the structure's renewal program is in Table 7.7 below.

Table 7.7: IV.00446 Structures Renewal Package 1 summary

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

Cost	AUD 2019
Aurizon claim	15,465,451
FCG Adjustment	0
FCG Recommendation	15,465,451

[32] *Quality of documentation for scope is rated as Average Quality. At a strategic intent level, the scope is defined very well in the IAR. Amendments to scope at commencement and throughout FY 19 can be mostly evidenced. Completed scope of works and clarity on structures not commissioned is not clear.*

[33] *Quality of documentation for cost is rated as Average Quality. The cost aspects of the IAR are described in some detail. However, the cost aspects of the 2019 claim, $15,465,451, are not clearly broken down per structure to allow consideration of total project costs to date against project progress and planned costs.*

[34] *Quality of documentation for standard is rated as Average Quality. Aurizon describe in little detail the nature of the project on completion. Asset Completion Certificates allows a measure of completeness to be determined.*

Prudency of Scope

Table 7.8 below is a summary of the scope of works executed under IV.00446 Structures Renewal Package 1.

Table 7.8: Summary of Critical Works structures per system

		Goonyella	Blackwater	Moura	Newlands	Unallocated (Fix on Fail)	Total
No. of Structures	IAR	46 culverts and 1 Bridge Bearing Replacement across the CQCN Network					47
	Project Plan	6*	30**	7	8	-	51
	Completed	4	23	5	8	8.10	40

*** Of these, three sites were included in Structures Renewal from previous years but deferred to FY 19**
**** Of these, nine sites were included from previous years but deferred to FY 19**

Of the 51 sites planned to be included at commencement of the FY 19 program of works, 12 of these were identified in previous years but deferred to FY 19 program of works. At completion of FY 19 works, a total of 40 sites were completed and commissioned.

The variance in the number of sites per system and overall is primarily the result of Aurizon's ongoing condition assessment program resulting in a change to structure condition ranking due to more (or less) rapid deterioration than expected in the period leading up to FY 19 works commencement.

The prudency of scope guideline template is included in Table 7.9 below.

Table 7.9: Prudency of scope for IV.00446 Structures Renewal 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	The works are consistent with Aurizon Asset Management Policy.
2	Requirements to comply with Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	As current access was maintained It is expected access agreements between Aurizon and rail users (and any access conditions) were fully complied with as far as they apply to Structural Renewal Works.
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	Historical tonnage for FY19 was approximately 230 million tonnes. Currently running trains at 20 minute headway spacings across the network.
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 records	Scope prioritisation is determined by field condition assessment and the structure's network criticality. Site visit to one of these structures as part of the structures field inspection process evidenced the condition of sites nearing the end of their serviceable life (Refer Note 1). Civil Engineering Structures Standards (CESS). Civil Engineering Track Standards (CETS). Compliance with applicable Australian Standards.

Item	Factors	FCG Guidance Notes	FCG Findings
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Planned and pre-emptive replacements of these worn assets avoid unplanned failures and is in the interest of efficient whole of supply chain operation.
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 required with access seekers. Access holders were engaged through regular maintenance shut planning processes. No specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA. No additional comments.

Note 1. Site Visit

Given many of the structures were installed with the initial track in the 1960's, much of the condition issues relate to long term wear and exposure to either rainfall or saltwater exposure for those assets nearer the coast.

During the site visit in December 2019, a typical culvert structure was inspected which had previously been identified from earlier field inspections as having corrosion such that renewal works may be required. This corrugated iron culvert is shown in Figure 7.7.

Figure 7.7: Culvert at Moranbah – Blair Athol at 27.890 km

It was clear from this inspection that renewal works; either lining or replacement, to prolong the life of the existing structure would be costly given the location, size of structure, and size of formation above the structure.

On this occasion the assessment of the Aurizon engineer and supervisor was that despite evidence of some corrosion this asset is not at risk of failing and asset renewal work was not required in the short term; however, ongoing monitoring was to be conducted.

Prudency of Cost

Aurizon's Feasibility IAR outlines the case for $17.983 m in budget (excluding management reserve) for the renewal of 46 culverts and one bridge bearing replacement. As previously deferred culverts form part of the scope of works, there are no Recommended Works within the scope; only Critical Works ($17.383 m) and Unallocated Works ($0.6 m).

At commencement of the FY 19 works, funding had been reduced to $16,641,698 for the sites outlined in Aurizon's project plan, delivered by structures being included within one of eight procurement packages for pricing by external providers (engineering consultants and construction contractors).

Upon completion of the program of works, the value of works claimed by Aurizon under the Capital Expenditure Report is $15,465,451.

The prudency of cost guideline template is included in Table 7.10 below.

Table 7.10: Prudency of cost for IV.00446 Structures Renewal 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 prioritisation includes consideration of the structure location and that location's criticality within the overall CQCN 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	Structures Renewal Costs (Total): • Budgeted in IAR: $17.983M* • Claimed amount: $15,465,451 • Actual Cost (SAP): $16,313,895 • Excludes Management Reserve Structures Renewal Unit Rates • No meaningful unit rate comparison possible given the variance in size and type of each structure FY 19 structural renewal works form part of a wider rolling program of structures renewal across the CQCN System. Works delivered predominately with external engineering consultants and contractor.
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 Aurizon procurement policies. Technical Services & Planning manage the assets renewal tasks and co-ordinate, rationalise and combine planned works to maximise works within closures and improve efficient delivery across the wider FY 19 works program.

The prudency of cost guideline template is included in Table 7.10 continued below.

Item	Factors	FCG Guidance Notes	FCG Findings
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	Scope prioritisation carried out to select structures for renewal, with field inspections and structure location criticality within the CQCN considered.
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 time frames • 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	All structure renewal works were carried out under track closures for safety in construction and operation. Stakeholder engagement was carried out as part of the planning process to ensure any requirements or concerns were addressed. Supply of materials by contractors performing the works minimises the risk of supply delays for works.
6	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	Costings provided are not broken down per site to allow comparison of budget against actual costs to be carried out. Unit rate costs are not meaningful for this review given the variance in type and size of structures. Cost reconciliation was provided to support the capital expenditure claimed value.

Other than minor works engineering, Aurizon contract out all engineering consulting services works for structures to external providers as there isn't the in-house design expertise to perform the hydrology modelling typically required to certify compliance with all flood level requirements. These engineering providers are pre-qualified, selected from a panel, and more than three provide a price under a competitive tender for the package(s) of work prepared by Aurizon.

Construction works at structural locations were carried out mostly by external contractors from a pre-qualified panel, with all supply of materials included under their contracts (unless elected by Aurizon to supply under its standing supply contracts). Contractors were put through a competitive tender for the works packages, with three or more providing pricing for the works.

The selection criteria for procurement of both engineering consulting and construction companies for works packages was the following:

- Experience
- Methodology and programme
- Resources and key personnel
- Price.

Differing weighting for each criterion were applied for engineering consulting and contractors to better align with the needs and importance of each criteria to the services under scope.

A sample of the structures planned was agreed to be provided. Several sites were identified as not being commenced or completed within the FY 19 program as planned; Aurizon have advised no costs for these sites were included within the claimed amount. For those that were completed, these were completed under contracts competitively priced.

Given the procurement method employed, the market has provided the test of cost prudency for the works carried out.

Prudency of Standard

Compliance of the CQCN Rail Network with CESS and CETS is mandatory to achieve minimum safe operating infrastructure. The purpose of the structure's renewal program is to replace life-expired, or near life-expired, structures to be compliant with all necessary standards and codes as well as meeting Q100 and Q50 flood level requirements for top of rail and top of formation.

External engineering consultants were engaged for all except minor works given the need for consideration of the surrounding hydrology in the final certified design. Further, samples of the practical completion certificates for construction contractors were provided to evidence both completion of works and compliance with necessary standards.

The prudency of standard guideline template is included in Table 7.11 below.

Table 7.11: Prudency of standard for project IV.00446 Structures Renewal 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	It is expected Access Agreements between Aurizon and rail users (and any access conditions) were fully complied with as far as they apply to structures renewal works.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	Historical tonnage was approximately 230 million tonnes for FY19. Currently running trains at 20 minute headway across the network.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not over-designed	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	Scope prioritisation carried out to select structures for renewal, with field inspections and structure location criticality within the CQCN considered.
5	Design standards contained within the Safety Management System	CETS CESS	Civil Engineering Structures Standards (CESS). Civil Engineering Track Standards (CETS). 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 Aurizon Network or Funding Users	Review of relevant submissions	A sample of asset completion certificates provided to evidence either works by external contractor (ITP's) or by Aurizon (practical completion certificates). Engineering consultants are required to certify their designs are compliant with all applicable standards.

7.3.4 IV.00476 Track Renewal Package 1

Project Overview

IV.00476 Track Renewal Package 1 included the renewal of 10.8 km of track at various sites across the CQCN. This track is a mix of single track, double track, bad order sidings and multiple track in yards. Track renewal consists of complete replacement of the rail and the sleepers for a length of track. The triggers for this type of repair are:

- Rail wear approaching CETS limits
- Rail exhibiting an unacceptable trend of defects
- Unacceptable track geometry
- Poor or obsolete timber or FIST sleepers.

Figure 7.8 below shows the FIST sleeper.

Figure 7.8: FIST sleepers on the Goonyella System

The FIST sleepers are precast concrete sleepers installed in the 1980's and 1990's. These sleepers have an unusual fastener arrangement where a steel pin passes through the actual sleeper. This steel pin can corrode without being detected particularly in wet, confined or coal contaminated areas. This can lead to unpredictable fastener failures. FIST sleepers are a potential risk and a maintenance liability and should be replaced if convenient[35]. However, on well drained, non-contaminated straight track they can still perform satisfactorily.

[35] *During the site visit the FCG team was shown that the last FIST sleepers between Dysart and Oakey Ck had been removed in FY 19.*

Review Summary

A summary of the review of the track renewal package assessment is in Table 7.12 below.

Table 7.12: IV.00476 Track Renewal Package 1

Prudency	
Scope	✓ [36]
Cost	✓ [37]
Standard	✓ [39]

Cost	AUD 2019
Aurizon claim	15,193,594
FCG Adjustment	1,018,672
FCG Recommendation	[redacted]

Prudency of Scope

Details of the sites in the 2019 capital expenditure claim is shown in Table 7.13 below. Direct costs in this table are taken from the IV.00476 Project Completion Report dated 30 September 2019.

Table 7.13: Components of the Track Renewal package in the FY 19 claim

Item	Site	Approved Length (m)	Actual Length (m)	Actual Cost ($,000)	Actual Rate ($,000 per km)
		10,375	**10,821**	**11,233**	**1,038**
	Goonyella System	**4,554**	**4,809**	**4,482**	**932**
1	107.910 Mindi to 109.760 Braeside (Both)	1,850	1,850	1,952	1,055
2	100.602 Waitara to 100.833 Waitara (4 rails)	220	424	297	700
3	135.349 Tootoolah to 136.537 Macarthur Jn (Both)	1,188	1,216	860	707
4	123.390 Mindi to 124.686 Sth Walker Jn (Both)	1,296	1,319	1,373	1,041

[36] *Quality of documentation for scope is rated as Average Quality. All scopes except the Moura Bad Order Sidings were clearly defined.*
[37] *Quality of documentation for cost is rated as Average Quality. All costs were well explained except the Moura Bad Order Sidings.*
[38] *Quality of documentation for standard is rated as High Quality. Required standard of completed works was clearly defined and understood.*

Item	Site	Approved Length (m)	Actual Length (m)	Actual Cost ($,000)	Actual Rate ($,000 per km)
	Blackwater System	**3,769**	**3,805**	**3,947**	**1,037**
5	1.379 to 1.809 Callemondah Yard (8 rails)	430	433	540	1,248
6	44.898 Westwood to 45.331 Westwood	433	433	269	622
7	47.144 Westwood to 47.468 Windah (Both)	324	334	388	1,162
8	49.388 Westwood to 50.252 Windah DN	876	877	705	804
9	79.360 Tunnel to 79.663 Edungalba	303	309	657	2,122
10	96.376 Aroona to 96.430 Duaringa	54	54	48	886
11	180.660 to 182.009 Boonal Balloon Loop	1,349	1,365	1,340	981
	Moura System	**2,052**	**2,207**	**2,806**	**1,271**
12	4.237 Boundary Hill Balloon	1,546	1,701	2,526	1,485
13	0.325 Earlsfield Bad Order Siding	356	356	134	375
14	155.220 Belldeen Bad Order Siding	150	150	146	971

The assessment of prudency of scope for IV.00476 is shown in Table 7.14 below.

Table 7.14: Prudency of scope for project IV.00476 Track Renewal

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	The works are consistent with Aurizon Asset Management Policy.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	As this project maintains capacity at current agreed levels FCG assumes that the project aligns with 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	The works are required to maintain agreed BRTT. The only alternative is to replace the worn or defective rail and the unsatisfactory sleepers. TSR are applied on some sections where high wear or defects were identified as a short or medium term maintenance strategy. SFAIRP analyses are not required for these projects.
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 records	Evidence exists of effective monitoring of rail wear and measurements that support rail renewal. These sites are also sites of the high maintenance and unreliable FIST sleepers and, as part of an incremental phase out of these sleepers, these were replaced. For an example of defective top and line (See Note 2). Inspection of removed rail at critical works sites confirmed rail head wear nearing CETS limits (See Note 1). This information supports sites selection under FY 19 works. Rail head wear data has been captured by Aurizon's Rail Inspection Vehicle (RIV). CETS Module 2, Section 2.12.2 and Appendix 2.F.1. Compliance with CETS Module 2 for all rail assets required. Governing criteria for site selection is rail head wear % (calculated from table and side wear data).

Item	Factors	FCG Guidance Notes	FCG Findings
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Planned and pre-emptive replacements of these worn assets avoids unplanned failures and is in the interest of efficient whole of supply chain operation.
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 required with access seekers. Access holders were engaged through regular maintenance shut planning processes. No specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	Site selection from IAR through to completion was reviewed and revised as budgets and the latest rail head wear data was considered. FCG has no evidence these projects feature in submissions to QCA.

Note 1. Rail renewal

A trigger for a track renewal project is wear on the rail head approaching 80% of its acceptable limit as per CETS. Aurizon's method for monitoring rail wear has been adequately described in Section 7.3.2. Rail Renewal.

In situations where this is occurring, and other track or structure defects are in evidence, a track renewal may be required. Track renewal adds sleeper replacement, some ballast work and some formation work to the scope.

Note 2. Track defects and condition

Track characteristics that support a track renewal in preference to a rail renewal include:

- Track geometry defects that recur even after resurfacing operations
  (Figure 7.9 below shows a top and line defect on the Goonyella System)

- Sleepers, fasteners or ballast in poor condition
  (Figure 7.10 below shows the Boonal Balloon Loop with the old timber sleeper track partially renewed with new on concrete).

Figure 7.9: Track geometry defect west of Mindi on the Goonyella System.

Figure 7.10: Timber sleepers and failing fasteners at Boonal Balloon Loop being replaced by concrete sleepers and Pandrol fasteners.

Prudency of Cost

FCG was provided with several documents that listed the costs associated with this project. These documents were:

- An initial project scope, with costs, extract from a P6 report; subsequently proved to be inaccurate
- A revised project scope report, with costs, from a P6 report
- A Project Completion Report.

The three documents had slightly different costs, for example the P6 report has direct costs for track renewal projects over 14 sites as $11,119,352 whereas the Project Completion Report has this value at $11,233,326 for the 14 sites and describes some other direct costs not listed on the P6 program. FCG will rely on the costs in the Project Completion Report.
The costs listed in the Appendix B on page 11 of the Project Completion Report are:

- Direct Costs related to specific sites - $11,233,326
- Direct Costs related to Glued Insulated Joints - $968,271
- Direct Costs related to defects - $9,011
- Direct Costs related to System Wide - $45,638
- Indirects - $1,918,767.

This gives a total project value of ***$14,174,922*** comprising $12,256,256 of direct costs and $1,918,767 of on-site and off-site indirects, approximately 15.6% of direct costs (with 9.7% on site indirects and 5.9% off site).

FCG have not included direct costs against projects described as "(removed)" in Appendix B. Aurizon did not include these projects in the P6 cost reports either.

FCG has also not included two line items in the "Project Wide" costs. These are an item called "FY 18 Spend/Common" valued at $964,420 and an item described as "BMF Redundancy" valued at $23,122. The first item refers to FY 18 costs and has no supporting detail and the second item has no accompanying supporting description or detail.

The assessment of prudency of cost for IV.00476 is shown in Table 7.15 below.

Table 7.15: IV.00476 Track Renewal prudency of cost assessment

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 works are consistent with Aurizon Network Asset Management Policy.
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	Generally, the costs are reasonable in terms of the scale, nature and complexity of the projects. Average direct cost for a kilometre of track renewal was $1.038 million across the program with a range from $375k per kilometre for a Bad order Siding to a high figure of $2.122 million for a small remote mainly project on the Blackwater System at 79.360 km Tunnel. This range of cost is reasonable. In regard to indirects; a ratio to direct costs of 9.7% on site overheads and 5.9% off site overhead is a good ratio. Smaller projects have a larger unit rate which reflects the disproportionate impact of mobilisation and demobilisation.

Item	Factors	FCG Guidance Notes	FCG Findings
3	Circumstances prevailing in the market for: engineering, equipment supply and construction labour materials	Access seekers Access holders Customer specific expenditure has been approved by the customer concerned	Aurizon adopt a mix of competitive procurement of materials and subcontract resources and utilisation of internal resources. The external resources are generally under long term panel arrangements. This is a reasonable approach understanding that a level of internal capability is essential for emergency repairs and specialist skills.
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	Inspection of removed rail at critical works sites confirmed rail head wear nearing CETS limits and obsolete FIST sleepers with corroded fasteners. This information supports sites selection under FY 19 works rail head wear data that has been captured by Aurizon's Rail Inspection Vehicle (RIV).
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 time frames • 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	Works planned ahead align with mine maintenance windows where possible. Access Holders are notified where potentially impacted by track renewal works.
6	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Prudency of Standard

The assessment of prudency of standard for IV.00476 is shown in Table 7.16 below.

Table 7.16: IV.00476 Track Renewal prudency of standard assessment

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	The Goonyella System is central to the access agreements. Aurizon is required to keep this track at a state of high reliability. As this project maintains capacity at current agreed levels FCG assumes that the project aligns with current access agreements.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	The works are required to maintain agreed BRTT and tonnages. No evidence of TSRs was identified for these sites. These repairs are not aimed at faults that create a TSR rather they are proactive and aimed at avoiding unplanned rail failures due to rail breaks from defects or wear.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	Projects are installed consistent with the 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	The projects are consistent with Aurizon Asset Management Planning.
5	Design standards contained within the Safety Management System	CETS CESS	Projects are installed consistent with the 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 Aurizon Network or Funding Users.	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

7.3.5 IV.00461 Turnout Renewal Package 1

Project Overview

The scope of this project includes:

- Unallocated reactive works
- Design and replacement of turnouts
- Removal of turnouts
- Design of turnouts.

There are four governance documents that are relevant to this review:

- IAR dated May 2017
- Primavera P6 schedule dated July 2018
- Project Execution Plan dated January 2019
- Monthly report for IV.00462 dated September 2019[39].

Aurizon provided a Feasibility IAR for turnout renewal as part of the supporting document for the FY 19 Turnout Renewal package. However, the specific IAR provided addressed design and construction works for turnout renewal works in FY 18 only, with some allowance for design of turnout renewal in FY 19; that is the IAR does not directly address funding for turnout replacement works for FY 19. Notwithstanding the details of the IAR the requirement to renew turnouts does exist. Consequently, this is a valid capital expenditure claim.

Review Summary

A summary of the FCG review of turnout renewal is in Table 7.17 below.

Table 7.17: Summary of the FCG review of IV.00461 Turnout Renewal

Prudency	
Scope	✓[40]
Cost	✓[41]
Standard	✓[42]

Cost	AUD 2019
Aurizon claim	14,053,345
FCG Adjustment	0
FCG Recommendation	14,053,345

[39] *It is unknown to FCG why this report has a different project number, i.e. IV.00462 not IV.00461.*
[40] *Quality of documentation for scope is rated as Average Quality. At a strategic intent level, the scope is defined very well in the IAR. Amendments to scope at commencement and throughout FY 19 can be mostly evidenced.*
[41] *Quality of documentation for cost is rated as Average Quality. The cost aspects of the IAR are described in some detail. However, the cost aspects of the 2019 claim, $14,053,345, are not clearly broken down per structure to allow consideration of total project costs to date against project progress and planned costs.*
[42] *Quality of documentation for standard is rated as High Quality. Aurizon describe in detail the nature of the project on completion.*

Prudency of Scope

Turnouts are a high maintenance asset on the rail system. They incur traffic wear primarily to:

- Switch and stockrails
- Bearers
- Rail Bound Manganese (RBM)[43] Vees.

Figures 7.11 and 7.12 are before and after photographs of a damaged Rail Bound Manganese (RBM) vee at Waitara with clear signs of impact. The photograph of the damaged vee provides an idea of the impact loads these assets endure.

Figure 7.11: Damaged RBM Vee at Waitara in 2016 during the Condition Based Assessment

Figure 7.12: The same RBM Vee site refurbished under the FY 19 capital works

[43] *RBM is a process that creates a hardened surface on the vee of the turnout to mitigate the effect of wheel impacts on the vee.*

Aurizon, with its current asset management systems, can reasonably anticipate annual requirements for turnout renewals. FCG notes that Aurizon's "Feasibility Investment Approval Request "does allow requests for projects that have durations longer than 3 years. FCG suggests that it may have merit for future IARs for turnout renewal to address works over a longer period; perhaps the duration of an undertaking period; this would facilitate annual reviews.

Aurizon's IAR for turnout renewal from May 2017 identified the potential need for replacement of 10 turnouts in FY 19 and allowed budget for design of these turnout replacements. It appears in FY 18 nine turnouts were renewed.

An extract of a Primavera program dated July 2018 shows 13 turnouts to be renewed in FY 19:

1. KD.3083 BINBEE BEER complete by October 2018
2. KD.3090 EAGLEFIELD CK complete by November 2018
3. KD.3087 CALLEMONDAH CH289A complete by January 2019
4. KD.3088 CALLEMONDAH GE290A complete by January 2019
5. KD.3089 CALLEMONDAH GE290B complete by January 2019
6. KD.3076 BAJOOL complete by April 2019
7. KD.3074 BROADLEA complete by May 2019
8. KD.3075 BROADLEA complete by May 2019
9. KD.3077 CALLEMONDAH complete by May 2019
10. KD.3078 CALLEMONDAH complete by May 2019
11. KD.3079 CALLEMONDAH complete by May 2019
12. KD.3080 CALLEMONDAH complete by May 2019
13. KD.3086 CALLEMONDAH complete by May 2019.

The January 2019 PEP adjusted this number to six:

1. CALLEMONDAH CH289A
2. CALLEMONDAH GE290A
3. CALLEMONDAH GE290B
4. CALLEMONDAH GE261A
5. CALLEMONDAH GE262A
6. COMET 12 Pts.

The September 2019 reported four completed:

1. CALLEMONDAH CH289A - design complete
2. CALLEMONDAH GE290A - complete
3. CALLEMONDAH GE290B - design complete
4. CALLEMONDAH GE261A - complete
5. CALLEMONDAH GE262A - progress not clear
6. COMET 12 Pts - complete
7. WAITARA - refurbishment complete.

The progressive decreasing of full renewals from 13 planned to six in the PEP to a quantity of four delivered indicates a potential delaying of full renewals. Although this is an indication of prudency, internally, Aurizon should investigate whether this approach is sustainable in the mid to long term.

The prudency of scope template is completed in Table 7.18 below.

Table 7.18: Prudency of scope for project IV.00461 Turnout Renewal Package 1

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	The works are consistent with Aurizon Asset Management Policy. Aurizon have a standing order for the supply of turnouts. As turnouts are such a key component of the rail system, and a key potential location for trouble, it is essential a high quality supply source is assured. Aurizon's turnout supplier is well regarded in the industry and used by many other below rail organisations. Turnouts are installed to Aurizon requirements and standards.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	It is expected Access Agreements between Aurizon and rail users (and any access conditions) were fully complied with as far as they apply to turnout renewal works.
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	Projects are aimed at maintaining acceptable reliability of achieving target BRTT. TSR applied on some sections where high wear or defects identified as a short or medium term maintenance strategy.
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 records	Aurizon use track geometry and faults reporting to identify turnout assets that need renewal. The iterative nature of Aurizon's scoping of these works illustrates that although planning is undertaken for anticipated turnout replacement Aurizon is not rigidly committed to replacement. It appears where possible Aurizon extends the life of these assets by component replacement.

Item	Factors	FCG Guidance Notes	FCG Findings
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Planned and pre-emptive replacements of these worn assets avoids unplanned failures and is in the interest of efficient whole of supply chain operation.
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 required with access seekers. Access holders were engaged through regular maintenance shut planning processes. No specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	Site selection from IAR through to completion was reviewed and revised as budgets and the latest rail head wear data was made available. FCG has no evidence these projects feature in submissions to QCA.

Prudency of Cost

The assessment of prudency of cost for IV.00461 is shown in Table 7.19 below.

Table 7.19: Prudency of cost for project IV.00461 Turnout Renewal Package 1

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 works are consistent with Aurizon Asset Management Policy.
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	Generally, the cost is reasonable in terms of the scale, nature and complexity of the projects. Smaller projects have a larger unit rate which reflects the disproportionate impact of mobilisation and demobilisation. The IAR allocated $16.157 m and contingency of [redacted] m for the Turnout Renewal Program for FY 18. FCG assume a similar figure has been allocated for FY 19 although the IAR does not specifically refer to FY 19 construction works. In FY 19 the following occurred: • 99 reactive repairs • 4 renewals • 3 removals • 12 designs. It is not possible to benchmark this work however $14.053 m for the year, compared to an IAR for FY 18 of $17.627 m indicates prudency of cost and a potential underspend.
3	Circumstances prevailing in the market for: engineering, equipment supply and construction labour materials.	Market conditions Procurement policy Possible application of benchmarking Project management	Aurizon adopt a mix of competitive procurement of materials and subcontract resources and utilisation of internal resources. The external resources are generally under long term panel arrangements. This is a reasonable approach understanding that a level of internal capability is essential for emergency repairs and specialist skills.

Item	Factors	FCG Guidance Notes	FCG Findings
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	Aurizon support proposed turnout renewal works using track geometry data, ground penetrating data (GPR) and visual inspections. FCG inspected a completed turnout renewal at Waitara. This inspection validated a damaged turnout identified during the 2016 CBA, and identified as part of the FY19 scope, had been repaired. By delaying turnout renewal in lieu of component replacement, Aurizon is demonstrating minimisation of whole of life costs.
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 time frames • 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	Works planned align with mine maintenance windows where possible. Access Holders are notified where potentially impacted by turnout works.
6	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Prudency of Standard

The assessment of prudency of standard for IV.00461 is shown in Table 7.20 below.

Table 7.20: Prudency of standard for project IV.00461 Turnout Renewal Package 1

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	The Goonyella System is central to the access agreements. Aurizon is required to keep this track at a state of high reliability. As this project maintains capacity at current agreed levels FCG assumes that the project aligns with current access agreements.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	The works are required to maintain agreed BRTT and tonnages. No evidence of TSRs was identified for these sites. These repairs are not aimed at faults that create a TSR rather they are proactive aimed at avoiding unplanned rail failures due to turnout failures from defects or wear.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	Projects are installed consistent with the 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	The projects are consistent with the Aurizon Asset Management Planning.
5	Design standards contained within the Safety Management System	CETS	Projects are installed consistent with the 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 Aurizon Network or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

7.3.6 IV.00449 Bridge Ballast Renewal Package 1

Project Overview

The renewal of bridge ballast in order to improve and maintain safety and engineering standards of CQCN assets forms part of Aurizon's overall Track Structure Support Program.

With approximately 19km of ballast across 258 bridges across the CQCN, Aurizon's rolling program of bridge ballast renewal works aims to replace fouled ballast, ensuring the track can drain freely and can absorb and transfer operational loads from trains evenly.

The Bridge Ballast Renewal Program works the renewal and replacement of ballast depth and profile in accordance with Civil Engineering Track Standard (CETS) limits at locations along the CQCN which have been prioritised for works within FY 19.

Works carried out include:

- Replace life-expired ballast
- Improve and smooth the change in stiffness between the bridge and its approaches
- Install ballast matting on the bridge decks to prolong ballast life

All sites were considered Critical Works, with no Unallocated or Recommended Works included.

Review Summary

A summary of the assessment of the bridge ballast renewal package 1 is in Table 7.21 below.

Table 7.21: IV.00449 Bridge Ballast Renewal Package 1 summary

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

Cost	AUD 2019
Aurizon claim	8,567,512
FCG Adjustment	(58,050)
FCG Recommendation	8,509,462

In general, FCG found that Aurizon has implemented an effective bridge ballast renewal program based on accurate and regular inspections and measurements of ballast contamination.

It appears there have been two sites[47] removed from the scope that have incurred costs of $58,050. FCG understands this is engineering or other preliminary work and suggest that this amount be removed from this claim and included in a future claim when those sites have been completed. FCG assess these costs should be assessed for prudency as part of the complete scope of work for a specific bridge when that bridge is included in a capital expenditure claim.

[44] *Quality of documentation for scope is rated as High Quality. At a strategic intent level, the scope is defined well in the IAR. Amendments to scope at commencement and throughout FY 19 can be mostly evidenced. Time frame in the IAR appears to have been achieved.*

[45] *Quality of documentation for cost is rated as High Quality. The cost aspects of the IAR are described in detail. Cost aspects of the 2019 claim, $8,567,512, are described in terms of total project costs to date against project progress and planned costs. The scope completion date and actual delivery dates achieved are clear.*

[46] *Quality of documentation for standard is rated as High Quality. Aurizon describe in detail the nature of the project on completion.*

[47] *Moura System Byelee-Main 0.802 km and Goonyella System Dalrymple Bay 0.332-0.315 km.*

Prudency of Scope

A summary of the Unallocated Works scope of the FY 19 works under IV.00449 Bridge Ballast Renewal Package 1 is in Table 7.22 below.

Table 7.22: IV.00449 Bridge Ballast Renewal Package 1 summary

		Goonyella	Blackwater	Moura	Newlands	Unallocated (Fix on Fail)	Total
No. Of Bridges	IAR	6	2	2	2	0	**12**
	PMP	9	2	2	2	0	**15**
	Actual	9[48]	4	1[49]	2	0	**16**
Length (m)	IAR	No Breakdown Provided					**1.629**
	PMP	1,247	518	116	195	0	**2076**
	Actual	1,554	583	159	443	0	**2.739**

Initial scope for works was based on quantitative condition rating and qualitative assessments of bridge site. The quantitative condition rating is derived from GPR monitoring data, track geometry and resurfacing history. Qualitative assessments ratings are based upon field inspections of the bridge ballast by Aurizon's inspectors.

The assigned track criticality value is added to its quantitative condition rating to generating the CRA value for each bridge. The sites selected for the FY 19 program were those scoring higher, that is ranked most critical. The number of sites carried out in FY 19 being determined by how far the funding extends; starting at the most critical and working down the list.

[48] *A 10th bridge site on Goonyella System (Daly Bay 0.332-0.315km) has $0 budget / actual costs of $10,133.26 and has been removed from scope.*

[49] *A 2nd bridge site on Moura System (Byellee-Main 0.802km) has budget of $2,434.32 / actual of $47,927.09 and has been removed from scope.*

Prudency of Scope

The prudency of scope assessment for IV.00449 Bridge Ballast Renewal is in Table7.23 below.

Table 7.23: Prudency of scope for project IV.00449 Bridge Ballast Renewal Package 1

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	The works are consistent with Aurizon Asset Management Policy.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	It is expected Access Agreements between Aurizon and Rail Users (and any access conditions) were fully complied with as far as they apply to bridge ballast renewal works. All Access Agreements required are assumed to be in place to allow FY 19 works to be executed.
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	Network tonnage was approximately 230 million tonnes for FY19. Projects are aimed at maintaining acceptable reliability of achieving target BRTT. TSR were applied on some sections where poor ballast condition was identified as a short or medium term maintenance strategy.
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 records	Qualitative inspections were carried out to support quantitative condition assessments (See Note 1). Quantitative Ratings include GPR, track geometry (top and short twist) and resurfacing history. Track criticality value for each bridge location identified and part of final priority ranking derived. Bridge Ballast replacement along 2,739 m of rail; nearly 32% higher quantity than planned. Two bridge sites were removed from scope, three bridge sites were added to scope. This quantity represents nearly 12% of the entire bridge ballast across the CQCN Network. Site constraints, including access from bridge abutments and narrow work area at height impact the achievable productivity of renewal works (See Note 2).

Table 7.23: Prudency of scope for project IV.00449 Bridge Ballast Renewal Package 1 Continued

Item	Factors	FCG Guidance Notes	FCG Findings
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Planned and pre-emptive replacements of these worn assets avoids unplanned failures and is in the interest of efficient whole of supply chain operation.
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 required with access seekers. Access holders were engaged through regular maintenance shut planning processes. No specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	Site selection from IAR through to completion was reviewed and revised as budgets and the latest ballast condition and track geometry data was available. FCG has no evidence these projects feature in submissions to QCA.

Note 1. Scope Prioritisation

The method of scope prioritisation, thus selection, is thorough and sound. The monitoring data utilised in this condition rating framework is in accordance with CETS Module 1 (Track Monitoring). A completed renewel project is shown in Figure 7.13.

Note 2. Site Validation

During the Site Visit to the CQCN Network, several bridges were inspected along the Goonyella System where renewal works were expected to take place within the FY 20 period. Visual inspections were only possible from either abutment of the proposed bridges (for safety reasons), however some fouling of ballast at the abutments of sites where works were planned for FY 20 was evident.

The condition of bridge ballast at approaches to bridges due for completion within FY 20 program displayed visible fouling not seen at bridge sites completed under FY 19 renewal sites, an example is shown at Figure 7.14.

It was also clear that the approaches to the bridge either side were contaminated with coal dust; this is shaken off the wagons as it transitions from the approach formation sublayer to the rigid bridge (and vice versa) due to the change in stiffness either side of the bridge.

The sites inspected, particularly those recently completed and scheduled to be completed within FY 20/21, support the method and final listing of scope priority bridge sites developed by Aurizon.

Figure 7.13: Bridge with ballast renewed in FY 19 at Wotonga on the Goonyella System

Figure 7.14: Coal dust contamination on the approach to a bridge on the Goonyella System

Prudency of Cost

Aurizon Capital Expenditure Submission requests approval of $8,567,512 for the renewal of 2,739 m of bridge ballast across 16 sites within FY 19. Under the Feasibility Investment Approval Request, 12 sites totalling 1,629 m were identified for works under the FY 19 program. Based on a FY 19 forecast rate of [redacted]/m, these works were valued at $5.636 m (excluding management reserve).

Immediately prior to commencement of FY 19 Works, the funding allocation for these works was increased to $8.500 m. This resulted in an additional three sites being added to the scope and a revised total length of planned bridge ballast renewal works of 2,076 m. The End of Year Report for these works confirmed that, with approved scope changes, a total of 2,739 m of bridge ballast works across 16 sites were ultimately completed under the FY 19 Program at an actual cost of $8.769 m.

The prudency of cost template for Project IV.00449 Bridge Ballast Renewal is shown in Table 7.24.

Table 7.24: Prudency of cost for project IV.00449 Bridge Ballast Renewal Package 1

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 priorities established from consideration of qualitative and quantitative assessments. Budget allocations for this package being increased where others decreased shows Aurizon recognise the wider network need for ballast renewal works.
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	Bridge Ballast Renewal Costs (Total): • Budgeted in IAR: $5,636,000* • Claimed amount: $8,567,512 • Actual Cost (SAP): $8,785,586.74 * Excludes Management Reserve Bridge Ballast Renewal Unit Rates[50] • Budgeted in IAR: [redacted]/m • Assigned Budget*: [redacted]/m • Actual Costs1: [redacted]/m *Based on $8.5 m Budget at start FY 19 for 2,076m of works
3	Circumstances prevailing in the market for: engineering, equipment supply and construction labour materials.	Market conditions Procurement policy Possible application of benchmarking Project management	Expected increase in demand for labour and materials in the rail industry. Procurement managed through Aurizon's Project Delivery Contract Management Team, in accordance with Aurizon procurement policies. Unit rate for FY 19 built up from FY17 actuals rather than FY 18 (due to insufficient FY 18 data). Any external resources are engaged from minor works panel of providers and existing Standing Offer Agreements (SOA's). These providers have previously negotiated rates for works arrived at in a competitive situation.

[50] *Unit Rate based upon Actual Costs as captured in SAP. FCG reviewed Aurizon's project management and SAP data systems for these projects and it appears these systems may not be being used to their full potential in terms of managing budget and cost. FCG assess this as out of scope for this project however are open to discuss further with Aurizon if requested.*

Item	Factors	FCG Guidance Notes	FCG Findings
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	Works scope included works 20 m either side of the bridge to allow for splay sets, ballast matting and geogrid installation. The ballast matting will assist ballast performance under operational loads where crossing from rail on ground to rail on bridge (and vice versa). Qualitative inspections carried out to support quantitative condition ratings. Quantitative ratings include GPR, track geometry (top and short twist) and resurfacing history.
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 time frames • 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	All ballast renewal works performed under full service shutdown. It is expected Access Agreements between Aurizon and rail users (and any access conditions) were fully complied with as far as they apply to ballast renewal works. Increased budget for FY 19 Works allowed additional sites to be completed. All works considered Critical Works, thus able to be completed in a cost effective manner given the planned and scheduled nature of the works.
6	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	Bridge ballast renewals are not part of Aurizon's maintenance allowance budget under the ballast undercutting program.

A comparison of the unit rates for the bridge ballast renewal works program shows the following:

- Forecast FY 19 Unit Rate ([redacted] m / [redacted] m) - [redacted]/m
- Assigned Budget FY 19 Unit Rate ([redacted] m / 2,076 m) - [redacted]/m
- Actual FY 19 Unit Rate [redacted] m / 2,739 m) - [redacted]/m.

The unit rate achieved is nearly 10% lower than the forecast FY 19 rate; and over 20% less than that assigned at the start of the FY 19 works program. This is a strong indicator that Aurizon have achieved prudency of cost; particularly given market factors and past costs were factored into the forecast rate.

The following sites are identified by Aurizon as being removed from the project scope, however, have actual costs recorded in the capital expenditure claim:

- Dalrymple Bay 0.332-0.315km - actual cost recorded $10,133.26
- Byellee-Main 0.802km - actual cost recorded $47,917.09.

Documentation has not been provided to support the validity of actual costs at these two sites removed from the scope ($58,050.35 in total). FCG recommendation is that this value be deducted from the FY 19 capital expenditure claim and incorporated in a future claim after these two bridges are completed.

Prudency of Standard

Compliance of the CQCN with CETS is mandatory. The purpose of the bridge ballast renewal program of works is primarily to replace life-expired ballast with new ballast as well as take measures to better smooth the change of track stiffness at approaches to the bridge (including installation of ballast matting) to obtain optimal long-term performance.

The prudency of template for Project IV.00449 Bridge Ballast Renewal is shown in Table 7.25.

Table 7.25: Prudency of standard for project IV.00449 Bridge Ballast Renewal Package 1

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	It is expected Access Agreements between Aurizon and Rail Users (and any access conditions) were fully complied with as far as they apply to bridge ballast renewal works. Full compliance with CETS is mandatory.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	Historical tonnageor FY 19 is approximately 230 million tonnes. Currently running trains at 20 minute headway across the network.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	AZN.NA.SPC.12.6135.009 Works in accordance with CETS - Module 4 (SAF/STD/0077/CIV/NET).

Item	Factors	FCG Guidance Notes	FCG Findings
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	A combination of qualitative information (field inspections) and quantitative measurements (ballast depth, extent and depth of fouling, RIMS defects, track geometry) were identified for each bridge across the CQCN. This information was combined with the track criticality rating of the bridge to determine a prioritised list of bridges. Track criticality rating is determined from consideration of location, tonnage transported across the bridge and other network factors.
5	Design standards contained within the Safety Management System	CETS	Civil Engineering Track Standards (CETS) • Module 4 – Bridge Ballast • Module 5 – Rail for Special Applications Track Stability Manual V5.0 • Aurizon Standard Drawings • 2232 – Structure Gauge Electric Lines • 2234 – Structure Gauge Non-Electric Lines • 2064
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 Aurizon Network or Funding Users	Review of relevant submissions	Asset Completion Certificates record all applicable works standards and certify compliance. All work sites had asset completion certificates.

7.3.7 IV.00455 Control Systems Renewal Package 1

Project Overview

The Control Systems Renewal Program is a rolling program of asset renewals funded annually.
Assets renewed under this program include:

- Train control systems
- Interlockings
- Train detection systems
- Asset protection systems
- Telecommunications.

Aurizon's claim is only for assets commissioned during the period, and does not include incomplete, uncommissioned assets. Aurizon reported total expenditure on the program of $15.6 m, of which the amount included in this capital claim (for commissioned assets only) was $6.9m.

Review Summary

A summary of FCG's review of the control systems renewal package is included at Table 7.26 below.

Table 7.26: IV.00455 Control Systems Renewal Package 1

Prudency	
Scope	✓[51]
Cost	✓[52]
Standard	✓[53]

Cost	AUD 2019
Aurizon claim	6,875,112
FCG Adjustment	0
FCG Recommendation	6,875,112

[51] *Quality of documentation for scope is rated as High Quality. At a strategic intent level, the scope is defined well in the IAR. Amendments to scope at commencement and throughout FY 19 can be mostly evidenced. Time frame in the IAR appears to not have been achieved for many of the individual scope items.*

[52] *Quality of documentation for cost is rated as Average Quality. Some misalignment was evidenced between SAP data and claimed amounts.*

[53] *Quality of documentation for standard is rated as High Quality. Certificates of Completion mostly evidence works completed to standard.*

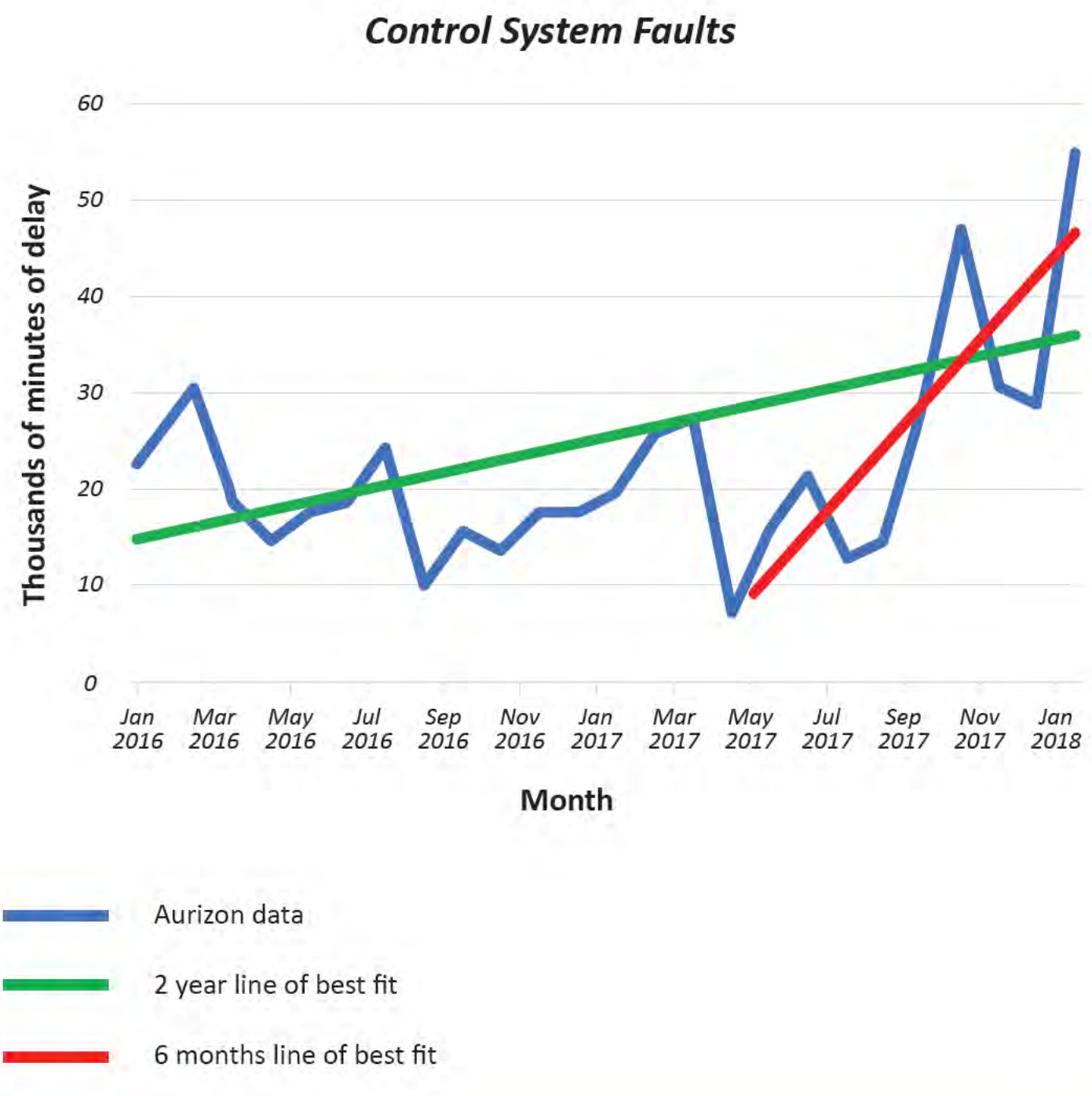
Prudency of Scope

In the original approved business case for the program as documented in the IAR, there were 503 individual scopes of varying complexities and substance included in the program for FY 19. After the approved IAR there was a scope and budget challenge process which resulted in a reduction of 24 % to the program which was confirmed through an approved change notice. The revised and approved FY 19 budget for the program was $20 m with a commensurate reduction in scope.

Aurizon provided evidence of completion in the form of certificates for 53 scopes during the period. Aurizon's end of year report for the program stated there were in total 193 scopes completed.

FCG found while researching the data provided by Aurizon that there had been significant and increasing contribution from control system equipment failures to network disruptions, see Figure2.15 below. Considering this trend FCG expected significant end of life replacements of ageing assets and technology upgrades in a structured program designed to deal with the deteriorating control system reliability.

Figure 7.15: Increasing trend in control system faults



The template for prudency of scope is included in Table 7.27 below.

Table 7.27: Prudency of scope for project IV.00455 Control Systems Renewal Package 1

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	Aurizon's internally approved business case (IAR) states: "priority sites across the Central Queensland Coal Network (CQCN) under Aurizon's annual Asset Renewal Program". FCG's review of the claimed scope is that it satisfies this requirement. FCG's conclusion is that the claimed scope is consistent with these objectives and that the scope is prudent and efficient.
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 Agreement are being addressed.
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	IAR states: "This investment program will maximise the performance and reliability of network assets whilst maintaining the performance of critical operational safety systems." As such the scope of this program ensures the network continues to deal with its demand. FCG found that network stoppages due to control system faults have increased over recent times. This indicates that Aurizon may be under-scoping some control system renewals. FCG's conclusion is that the performed scope meets this objective.
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 records	Data provided on p6 of IAR indicates delays due to control system faults are increasing, see graph in Figure 7.15, making control system improvements and life expired replacements an increasing priority. Potentially the investment should be higher to reduce lost time and improve Aurizon revenue and client service. As far as this capital claim, FCG's conclusion is that, in respect of this factor, it is prudent and efficient. FCG in reviewing the supplied data identified some improvements that Aurizon could make for future reviews (See Note 1).

Item	Factors	FCG Guidance Notes	FCG Findings
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Planned and pre-emptive replacements of these worn assets avoids unplanned failures and is in the interest of efficient whole of supply chain operation. Data from main line weighbridges installed and replaced under this program is to be shared with stakeholders to allow them to identify and address issues with their systems, thereby improving supply chain efficiency.
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. Network control system assets, particularly those dealing with operational safety, must be kept functioning. Several the project systems described in the IAR and in the performed scope are life expired renewals and technology improvements of safety systems, including train detection and interlockings.
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 Aurizon Network or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Note 1: Comments on documents supplied by Aurizon:

During the assessment FCG identified three areas where in future reviews the documentation would simplify the analysis and improve documentation quality:

- Duplication of documents
- Scope change documentation
- Approach to multi-package projects.

FCG note that in some cases Aurizon included duplicates of documents titled differently in their submission. FCG recommend in future Aurizon attempt to avoid this as it has the potential to lead to confusion and complication.

FCG suggest concise and accurate documentation linking specific scope changes with budget changes should be provided in future submissions to facilitate future capital expenditure reviews.

Aurizon have included several yearly packages of multi-year programs of works within its capital expenditure claim for FY 19. FCG acknowledge that the delineation between yearly packages within multi-year programs can be difficult to clearly define. In future submissions, FCG recommend that more focus be placed on reporting these types of programs in a multi-year context. This would require more detail on progress and expenditure prior the specific capital expenditure claim and also the forecasted expenditure to the completion of the program.

Prudency of Cost

The template for prudency of cost is included in Table 7.28 below.

Table 7.28: Prudency of cost for project IV.00455 Control Systems Renewal Package 1

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 control system capital works claimed are part of a 3 year rolling program of end of life replacements and technology upgrades aligning with system wide priorities. The program is delivered by a dedicated control system capital works team. FCG's assessment of Aurizon's costs of delivering the claimed elements of the control system capital works program is that they were prudent and efficient.
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	Evidence provided by Aurizon and verified by FCG is that costs expended are within the budgets set, and the approved program is being progressively delivered in a methodical manner. Several claimed elements of the program deliver first hand supply chain improvements, in main line weighbridges whose data is to be shared with stakeholders, thereby contributing to their ability to optimise and enhance their own operations. FCG's benchmarking of metrics derived from Aurizon's cost of delivery information against industry norms found Aurizon's expenditure to be prudent and efficient.

Item	Factors	FCG Guidance Notes	FCG Findings
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 was no evidence that the costs of delivery of the claimed elements of the control system capital works program were negatively impacted by resource constraints or other market forces. The program procurement was performed through Aurizon's centralised procurement office through their normal rigorous market testing process. There is no evidence of waste nor re-work. In respect of this factor, the claimed costs were found to be prudent and efficient.
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	It is clear from changes made to the program scope during the claim period that there were several scope inclusions necessary to deal with emergencies. Otherwise the program scope and its costs, as part of the three year forward view, was developed to be able to be delivered efficiently, and to be consistent with the Asset Maintenance and Renewal Policy. In the early part of the review period, the program was subject to high level scrutiny and further refined to reduce its budget for this period by 24%. Together these considerations led FCG to conclude that the costs of program delivery in respect of Aurizon's asset management planning was prudent and efficient.
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 time frames • 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	FCG assessed the costs of delivery of the claimed elements of the control system that, as part of a three year rolling program, the delivery process was mature, well proven and controlled. The completion of scope and the cost performance compared to budget indicates the program was being executed in a controlled fashion.
6	Any other matters in the submissions to the QCA by Aurizon Network 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

The template for prudency of standard is included in Table 7.29 below.

Table 7.29: Prudency of standard for project IV.00455 Control Systems Renewal Package 1

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 control system capital works program minimises downtime of the network due to outages by renewal of existing systems and the implementation of system improvements. FCG's investigations revealed that all control system program scope, and expenditure arising, was relevant to efficient network usage. The standards adopted in the execution of the scope were appropriate for its duty.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	The standards implemented in the performance of the control system capital program scope were appropriate for the system duty.

Item	Factors	FCG Guidance Notes	FCG Findings
4	Consistency with the Asset Management Plan	Reasonable consideration of standard and configuration of adjacent infrastructure Scope priority assessments	FCG has reviewed the claimed elements of the Control System capital works program against Aurizon's Asset Maintenance & Renewal COMMON POLICY AZN. NA.POL.00.6120.001 and found no discrepancies.
5	Design standards contained within the Safety Management System	CETS	The control system capital works program is integral to rail safety management. FCG found that the standards applied in performance of the claimed elements of the control system capital works program were prudent and efficient.
6	Laws and the requirements of any Authority	Rail Safety National Law (RSNL) and Regulation Office of the National Rail Safety Regulator (ONRSR)	FCG did not find any changes to law or Authority requirements relevant to the control system capital works program.
7	Any other matters in the submissions to the QCA by Aurizon Network 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.

7.3.8 IV.00473 Sleeper Renewal Package 1

Project Overview

The FY 19 Sleeper Renewal Package 1 continues a rolling program of sleeper replacement which commenced in 2011. Works typically involved in this rolling program include:

- Replacement of ineffective timber sleepers to ensure track integrity and reduce the increased risk of sleeper failure.
- Replacement of existing 22.5 tal Sleepers with FIST fasteners across the CQCN as the clips are becoming severely corroded with 28 tal full-depth concrete sleepers or low-profile concrete sleepers (where location and lower loads / operating loads permit) with black or galvanised Pandrol e-clip fastenings (to meet current and future axle loads).

The current day tonnage being hauled is greater than that the network was originally designed for when much of the network's sleepers were installed. Given this, the rolling program of removing 22.5tal concrete sleepers with FIST fasteners serves two purposes:

- Removal of the FIST fasteners addresses the condition assessment challenges and history of 'fix on fail' works required at locations with these fasteners.
- Allows Aurizon to install sleepers designed to service current and future operational tonnages across the network in accordance with CETS Module 3 – Sleepers and Fasteners.

The prioritisation of sleepers for renewal and their location is determined by a combination of the condition assessment of sleepers and the criticality of sleeper location in the wider network. All works within this package are considered Critical Works, with no budget provision for Unallocated or Recommended Works.

Additionally, the location of sleepers identified as high priority for renewal works was considered to identify whether, with some additional works between, teams could be mobilised to do a larger volume of sleeper 'clusters' per mobilisation. Where this is achievable, a larger number of sleepers can be replaced per mobilisation, thus delivering better economy of scale for the works within the program.

Given the large number of sleepers which fall just outside the budget cut-off for works, the condition assessments at sites just outside the initial scope had their frequencies increased and - where changes to scope were required due more rapid deterioration than expected, these were recorded in the Program Management Change Request Register.

Review Summary

A summary of FCG's review of the sleeper renewal package is included at Table 7. 29 below.

Table 7.29: IV.00473 Sleeper Renewal Package 1

Prudency	
Scope	✓ [54]
Cost	✓ [56]
Standard	✓ [57]

Cost	($,000)
Aurizon claim [55]	$6,317,874
FCG Adjustment	$0
FCG Recommendation	$6,317,874

[54] *Quality of documentation for scope is rated as High Quality. At a strategic intent level, the scope is defined very well in the IAR. Amendments to scope at commencement and throughout FY 19 can be mostly evidenced. Time frame in the IAR appears to have been achieved.*

[55] *Includes costs already expended on scope prior to deferment from FY 19 program due to a reduction in funding.*

[56] *Quality of documentation for cost is rated as High Quality. The cost aspects of the IAR are described in detail. Cost aspects of the 2019 claim, $6,317,874, are described in terms of total project costs to date against project progress and planned costs at a project level. The scope completion date and actual delivery dates achieved are clear.*

[57] *Quality of documentation for standard is rated as High Quality. Aurizon describe in detail the nature of the project on completion.*

Prudency of Scope

Initial funding approved for FY 19 Sleeper Renewal Package 1 allowed for the upgrade of 5,044 concrete and 14,255 timber sleepers across the Blackwater, Goonyella and Moura System to 6,149 full-depth 28 tal concrete sleepers, 13,150 low-profile 20 tal concrete sleepers for the line between Burngrove to Nogoa, and a small number of timber sleepers at sidings and non-main line locations where concrete sleepers were not a viable option (19,299 sleepers in total).

Following reduced funding prior to commencement of the FY 19 works, this scope was reduced to 5,155 sleepers in total – 3,951 sleepers across four sites on the Blackwater System and 1,204 sleepers across two sites on the Goonyella System.

The final scope delivered under FY 19 Sleeper Renewal Package 1 was the following:

- 8,190 sleepers in the Blackwater System
- 1,362 sleepers in the Goonyella System.

This increased number of sleepers from that planned in June 2018, was ultimately achieved due to an approved Change Requests during the FY 19 works period for additional funds and utilizing plant and labour already mobilized where productivity was maximised and efficiencies realised.

The prudency of scope template for project IV.00473 Sleeper Renewal is in Table 7.30 below.

Table 7.30: Prudency of scope for project IV.00473 Sleeper Renewal Package 1

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	The works are consistent with Aurizon Asset Management Policy.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	It is expected Access Agreements between Aurizon and rail users (and any access conditions) were fully complied with as far as they apply to rail renewal works.
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	Network tonnage was approximately 230 million tonnes in FY19. Consists currently at 20 minute headway. Projects are aimed at maintaining acceptable reliability of achieving target BRTT. TSR applied on some sections where high wear or defects identified as a short or medium term maintenance strategy.

The prudency of scope template for project IV.00473 Sleeper Renewal is in Table 7.30 continued.

Item	Factors	FCG Guidance Notes	FCG Findings
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 records	Sleepers damaged due to derailment or other factors can lead to track gauge issues. Removal of timber sleepers nearing the end of their serviceable life (degrading due to age / climate perishing). Existing 22.5 tal sleepers with FIST fasteners across the network are difficult to inspect for corrosion, which can lead to sudden defect detection requiring urgent works (See Note 1). Rolling program to replace 22.5 tal sleepers using FIST clips with code complaint 28 tal concrete sleeper is part of the renewal program.
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Planned and pre-emptive replacements of these worn assets avoids unplanned failures and is in the interest of efficient whole of supply chain operation. Beyond sleeper prioritization, the identification of reasonable 'clusters' of sleepers (which include the high priority sleepers requiring renewal) was carried out to assist with achieving works efficiencies.
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 required with access seekers. Access holders were engaged through regular maintenance shut planning processes. No specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of r elevant submissions	Site selection from IAR through to completion was reviewed and revised as budgets and the latest rail head wear data deemed necessary. FCG has no evidence these projects feature in submissions to QCA.

Note1: Site Visit.

At the December 2019 site inspection, it was clear there remained a significant number of the 22.5 tal FIST concrete sleepers and fasteners, as shown in Figure 7.16. Given these fasteners connect to a rod through the rail, the only method of inspecting any corrosion is to manually remove some of the ballast around the sleeper and under the rail to view the fastener; sometimes a torch is required.

This was manually done for one fastener during the site visit to demonstrate the challenges; this took about 2-3 minutes. To inspect all fasteners across the network in a similar manner is not realistic; consequently, the decision to phase these fasteners out and replace with current 28 tal concrete sleepers configured for Pandrol E clips.

Clear benefits realised from this rolling program of removal of FIST fasteners includes:

- The ability to inspect and more reliably assess condition of fasteners provides Aurizon more confidence and certainty in its monitoring and renewal works prioritization.
- Pandrol fasteners are quicker and easier to replace than a corroded or defective FIST fastener.
- There will be less unplanned Unallocated Works, or 'fix-on-fail', required in the future; which has a higher Unit Rate cost due to the unplanned and urgent nature of any repairs required.

Figure 7.16: Examples of FIST fasteners on 22.5 tal concrete sleepers in the background and Pandrol e-clips on 28 tal concrete sleepers in the foreground

Prudency of Cost

Aurizon's Capital Expenditure Report states $6,317,874 was spent on the renewal of 9,552 sleepers within the FY 19 works program.

Aurizon initially approve $11,830,000 of funding for the replacement of 19,299 timber and 22.5tal concrete sleepers with 6,149 28tal full-depth concrete sleepers and 13,150 20tal low-profile concrete sleepers.

All the sleeper's works were Critical Works, with no funding provided for Unallocated or Recommended Works.

Just prior to commencement of the FY 19 works program, the funding available was reduced to $3,369,409, though this was increased to $4,140,932.46 due to fixed costs already allocated. Due to this, the scope of works planned to be delivered within FY 19 was significantly reduced.

The final scope delivered for the FY 19 program, in line with SAP actual costs provided, totalled $6,430,136.10.

Most costs for sleeper renewal works are materials costs (28 tal full-depth, 20 tal low-profile concrete sleepers with Pandrol e-clip fasteners, or a very small number of timber sleepers) and labour costs.

Regarding sleeper costs, Aurizon has an existing supply contract for 28 tal full-depth concrete sleepers and for the low-profile 20 tal low-profile concrete sleeper. Pandrol e-clips are sourced through existing supply contracts, with the supply rates previously provided and negotiated under a competitive procurement process.

For the small number of timber sleepers provided, these were priced by pre-qualified providers in a competitive procurement process.

Regarding labour costs, Aurizon's Infrastructure Delivery Team used internal resources where possible, however some works were completed by external service providers.

Internal resources typically will have a set or standard cost, with maximising the amount of sleeper renewal works at a single site being the primary manner of being able to keep the unit rate cost down.

For works by external service providers, Aurizon have a pre-qualified panel of providers for sleeper renewal works who were asked to price packages of works against each other. The final selection criteria were cost, safety, quality and availability.

A check of the unit rates for FY 19 Sleeper Renewal Works for prudency shows the following:

- Forecast FY 19 Unit Rate (Critical Works) - [redacted] each
- Actual FY 19 Unit Rate (Critical Works) - [redacted] each.

The forecast unit rate for FY 19 has been derived from the FY 18 actual unit rate achieved, adjusted for planned target reduction in labour and mob/demob costs, forecast sleeper material cost increase and expected increased costs due to market demand of materials.

In addition to the check on unit rate, due to efficiencies and savings realised on delivery of planned works, additional sleeper renewal works (to those planned) were able to be completed. FCG assess the costs realised to be prudent for the works delivered.

The prudency of cost template for project IV.00473 Sleeper Renewal is in Table 7.31 below.

Table 7.31: Prudency of cost for project IV.00473 Sleeper Renewal Package 1

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	Planned and pre-emptive replacements of these worn assets avoids unplanned failures and is in the interest of efficient whole of supply chain operation. Beyond sleeper prioritization, the identification of reasonable 'clusters' of sleepers (which include the high priority sleepers requiring renewal) was carried out to assist with achieving works efficiencies.
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	Sleeper Renewal Costs (Total): Budgeted in IAR: $11,830,000* Claimed amount: $6,317,874 Actual Cost (SAP): $6,430,136 * Excludes Management Reserve Sleeper Renewal Unit Rates Budgeted in IAR: [redacted] each Actual: [redacted] each** ** Includes expenditure of funds for scope not carried out following funding reduction; actual unit rate for scope performed would be less than this value.
3	Circumstances prevailing in the market for: engineering, equipment supply and construction labour materials.	Market conditions Procurement policy Possible application of benchmarking Project management	Currently Aurizon has an established negotiated contract with a sleeper supplier for full depth 28 tal sleepers. Where small quantities of ballast are required, there are many suppliers who charge between [redacted]/tonne and [redacted]/tonne, providing a competitive market. The supplier in closest proximity to the works site is typically given the works (as any cost differential in supply is negligible when compared to increased haul distance). Where external contractors utilised, these are from a pre-qualified panel of providers. Several panel providers price the works, with final selection based on cost, safety, quality and availability.

The prudency of cost template for project IV.00473 Sleeper Renewal is in Table 7.31 continued below.

Item	Factors	FCG Guidance Notes	FCG Findings
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	Rolling program of removal of 22.5 tal concrete sleepers and timber sleepers with 28 tal concrete sleepers with Pandrol e-clips will lead to more efficient and reliable condition assessments. There will be less Unallocated Works required in the future as the FIST fasteners are hard to assess and first signs of issues can be on failure, which will ensure Aurizon achieve an overall lower unit rate per sleeper renewed (i.e. More can be achieved for same funding).
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 time frames • 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	Sleeper renewal works require track shutdown to be performed safely. Scope of works planned to minimise the number of mobilisations (thus keeping costs down). All sleeper renewal works were completed by the end of FY 19 period as planned.
6	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	Costs attributable to scope initially within FY 19 program of works but removed with funding reduction in June 2018 are included but not readily identifiable (or breakup of direct and/or indirect costs).

Prudency of Standard

Compliance of the CQCN Rail Network with CETS is mandatory.
The purpose of the sleeper renewal program is to remove clusters of exiting sleepers:

- Nearing the limits of service life
- Currently using FIST Fasteners with 22.5tal concrete sleepers
- Where sleeper defects are evident.

The prudency of standard template for project IV.00473 Sleeper Renewal is in Table 7.31 below.

Table 7.31: Prudency of standard for project IV.00473 Sleeper Renewal Package

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	It is expected access agreements between Aurizon and rail users (and any access conditions) were fully complied with as far as they apply to sleeper renewal works. Full compliance with CETS is mandatory by Aurizon.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	Historical tonnage for FY2019 was approximately 230 million tonnes. Currently running consists at 20min headway across the network.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	Installation in accordance with CETS – Module 3 (Sleepers and Fasteners). Compliance with Aurizon concrete sleeper standard drawings.
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 priority based on type of sleeper and condition assessment (with consideration of wider timber and concrete sleepers with FIST fasteners removal program) and its location / criticality in the CQCN Network. Rolling program of removal of 22.5 tal concrete sleepers and timber sleepers will lead to more efficient and reliable condition assessments. There will be less Unallocated Works required in the future as the FIST fasteners are hard to assess and first signs of issues can be on failure, which will ensure Aurizon achieve an overall lower unit rate per sleeper renewed (i.e. More can be achieved for same funding).

The prudency of standard template for project IV.00473 Sleeper Renewal is in Table 7.31 continued below.

Item	Factors	FCG Guidance Notes	FCG Findings
5	Design standards contained within the Safety Management System	CETS	Civil Engineering Track Standards (CETS) - Module 3, Sleepers and Fasteners. Aurizon Standard Drawings: • 2234 "Structure Gauge Electrified Lines" • 2232 "Structure Gauge Non-Electrified Lines" Track Stability Manual V5.0.
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 Aurizon Network or Funding Users	Review of relevant submissions	Asset completion certificates record all applicable works standards and provide evidence of compliance.

Aurizon have provided asset completion certificates which both identify applicable standards (including CETS and Aurizon standard drawings) and certify compliance for sleeper renewal work locations.

It is evident that all works have been completed in accordance with standards identified as applicable to the CQCN Network.

7.3.9 IV.00458 Level Crossing Renewal Package 1

Project Overview

Across the CQCN Network there are many rail and road interfaces (i.e. level crossings). The type and size of level crossing is dependent on the location of the crossing in the CQCN Network and the level of road traffic crossing the rail assets.

The purpose of this program is to renew priority assets in line with engineering and safety standards, with sites having a risk score higher than 4 in Aurizon's Australian Level Crossings Assessment Model Assessments for the five year rolling program being selected for renewal works.

Within this renewal works package there are several differing works identified for action at level crossing sites which have been identified as being a priority to address in order to meet safety and engineering standards.

These include the following works:

- Level Crossing renewals; complete renewal of the level crossing, including:
  - Replacement of formation
  - Installation of drainage
  - Replacement of ballast
  - Renewal and/or adjustment of sleepers
  - Replacement of rail
  - Adjustment of track alignment, overheads and/or GIJ's
  - Installation of flangeways
  - Re-instalment of asphalt or gravel for vehicle access (within rail corridor)
  - Renewal of degraded and/or missing signage.
- Decommissioning of level crossings given the significant risk at each, the managed removal of level crossings from the CQCN is a stated aim of this program of works.
- ALCAM is a risk assessment tool used by Aurizon at its level crossings to specify key risks, prioritise any works and ensure appropriate controls are in place to maintain the safety of private and public road users. An ongoing program of ALCAM assessments is required for Aurizon to maintain its rail operational accreditation.
- Signage Upgrades: objective is to ensure the correct signage is at each level crossing and is visible or legible.
- Active Protection: measures include the installation of flashing lights or lights and boom. The need for this is determined from ALCAM assessments and reported incidents.

The objective of the review is to consider the decisions made on scope prioritisation, determine whether costs to complete works are reasonable, and works have been completed to the necessary standards.

Review Summary

A summary of FCG's review is in Table 7.31 below.

Table 7.29: IV.00473 Sleeper Renewal Package 1

Prudency	
Scope	✓ [58]
Cost	✓ [59]
Standard	✓ [60]

Cost	($,000)
Aurizon claim	$4,048,374
FCG Adjustment	0
FCG Recommendation	$4,048,374

[58] *Quality of documentation for scope is rated as High Quality. Amendments to scope at commencement and throughout FY 19 can be mostly evidenced. Time frame in the IAR appears to have been achieved.*

[59] *Quality of documentation for cost is rated as High Quality. The cost aspects of the IAR are described in detail. Cost aspects of the 2019 claim, $4,048,374, are described in terms of total project costs to date against project progress and planned costs at a project level. The scope completion date and actual delivery dates achieved are clear.*

[60] *Quality of documentation for standard is rated as High Quality. Aurizon describe in detail the nature of the project on completion.*

Prudency of Scope

Critical, Unallocated and Recommended Works were all provisioned for within the initial Feasibility IAR funding request. Prior to commencement of FY 19 works, this previously approved funding was reduced. As a result, the scope of Critical Works was reduced and no funding provision for Unallocated and Recommended Works was retained.

A summary of the FY 19 scope of works under IV.00458 Level Crossings Renewal Package 1 is in Table 7.32 below.

Table 7.32: Summary of Completed FY 19 Level Crossing Renewal Package 1 Works

	Goonyella	Blackwater	Moura	Newlands	Total
Renewal Sites [Actual]	2[61]	0[62]	0	3	**5***
Site Decommission [Actual]	0	1	0	0	**1**
ALCAM Assessments [Actual]	No Breakdown of Site Numbers per System Available				**42**
Drainage Install [Actual]	0	1	0	0	**1**
Signage Upgrades [Actual]	3	17	1	0	**21**
Active Protection [Actual]	0	1	0	0	**1**

Critical Works retained within the FY 19 Level Crossings Renewal Package 1 included design services for planned FY 20 works, major renewals and closure of level crossings, signage upgrades and ALCAM assessments.

[61] *These sites were incomplete at 30 June 2019, with line marking of the crossing and signage upgrades outstanding.*
[62] *Asset maintenance works (rail and sleeper renewal) at Warren Road level crossing had costings and asset completion certificates completed as a major renewal site, however, was not recorded as a major renewal site within Aurizon's End of Year Report.*

The prudency of scope template for project IV.00473 Sleeper Renewal is in Table 7.33 below.

Table 7.33: Prudency of scope for IV.00458 Level Crossing Renewal Package 1

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	The works are consistent with Aurizon Asset Management Policy.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	It is expected Access Agreements between Aurizon and rail users (and any access conditions) were fully complied with as far as they apply to rail renewal works. Design and Renewal works to meet compliance requirements of the Transport Rail Safety Act 2010.
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	Network tonnage for FY2019 was approximately 230 million tonnes. Projects are aimed at maintaining acceptable reliability of achieving target BRTT. TSR applied on some sections where high wear or defects were identified as a short or medium term assessment management strategy. Other works were included within this package (drainage works at crossing site, active protection, early design for FY 20 works, additional signage upgrades, asset maintenance) , however these all were either negotiated minor works with landholders and/or access holders (in lieu of larger level crossing works) or support future program of works for level crossing renewals.
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 records	ALCAM (Australian Level Crossing Assessment Module) assessment of level crossings used for prioritisation of crossings for FY 19 and rolling program of works. Site inspection of level crossings scheduled for FY 20/21, as identified by Aurizon on site, provided support of its prioritization of sites for renewal works (see Note 1).

The prudency of scope template for project IV.00473 Sleeper Renewal is in Table 7.33 continued below.

Item	Factors	FCG Guidance Notes	FCG Findings
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Planned and pre-emptive replacements of these worn assets avoids unplanned failures and is in the interest of efficient whole of supply chain operation.
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 required with access seekers. Access holders were engaged through regular maintenance shut planning processes. No specific customer expenditure on this project.
8	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	Site selection from IAR through to completion was reviewed and revised as budgets and the latest rail head wear data deemed necessary. FCG has no evidence these projects feature in submissions to QCA.

Note 1. Site Visit

At the December 2019 site visit, inspections of level crossing sites at different life stages were conducted. This included some recently renewed level crossing sites and some other sites where renewal works were scheduled in the forward rolling program of works.

Sites with dual track were able to have renewal works completed by shutting down one line and keeping the other in operation. Sites with single lines only were required to have renewal works done under full shutdown.
At sites which were identified as requiring renewal works in FY 20/21, a range of issues were evident. This included:

- Ballast fouling at the rail entry and exit to the level crossing due to the rail behaving differently under operational loads as it crossed onto (and leaves) the level crossing
- Ballast movement out from under the sleepers, both those under the level crossing bitumen and a number either side at the entry and exit of the rail to the level crossing
- Evidence that, under operational loads, ballast pumping is occurring which affects the integrity of the sleepers and rail as well as damage the surrounding bitumen, as shown in Figure 7.17 below
- Old or worn signage which required replacement.

Figure 7.17: Example of bitumen damage due to ballast pumping

Other sites visited which had renewal works recently completed showed no evidence of such issues.

In addition to this, the installation of flangeways to the rail for the length of the bitumen crossing address the location within the crossing where most maintenance is required appears to have merit. Installation of these rubber flangeway, as shown in Figure 7.18 below, gives:

- The flangeway gives bitumen layers a 'hard edge' to lay up to, providing a smoother transition across rail for vehicular traffic and thus reducing longer term maintenance needs.
- The flangeway minimises the risk of broken bitumen / other material being against the rail, thus reducing likelihood of future operational and maintenance issues.

Figure 7.18: Level Crossing renewed in FY 19 scope

Aurizon prioritises its level crossings works using a combination of ALCAM Assessments and visual inspections, with consideration of network priority. This is a sound process which is supported further from our inspection of level crossings sites scheduled for renewal works in FY 20/21.

With regards to other minor works claimed under FY 19 program of works, 21 level crossings were identified by Aurizon (or in conjunction with coal operators) as priority locations requiring signage upgrades to meet necessary safety standards. There was also one level crossing decommissioned and a continuation of ALCAM assessments across the CQCN Network. All these works were identified as safety and operational critical works.

Prudency of Cost

Aurizon provided for Critical Works (planned), Unallocated Works (Fix on Fail) and Recommended Works scope within its Feasibility IAR funding request of $5.858M.

Prior to commencement of FY 19 Level Crossing Renewal Package 1 works, the funding was reduced to $4,194,759 (excluding management reserve) and thus resulted in a reduced scope of Critical Works and no retained budget provision for Unallocated or Recommended Works.

Despite some further changes to the budget and further removal / addition of scope, Aurizon's Capital Expenditure Report states $4,048,374 was expended for all level crossing works within FY 19.

The prudency of cost template for project IV.00473 Sleeper Renewal is in Table 7.34 below.

Table 7.34: Prudency of cost for project IV.00458 Level Crossing Renewal Package 1

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 level crossing renewal program is in alignment with the Aurizon asset management policy.
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	Level Crossing Renewal Costs (Total): • Budgeted in IAR: $5,858,000[63] • Claimed Amount: $4,048,374 • Actuals (SAP): $4,063,359.81 Level Crossing Unit Rates. Highly variable based on size and extent of renewal works at individual crossings. Budgeted in IAR: [redacted]/site Actual (See Note 1): [redacted]/site
3	Circumstances prevailing in the market for: engineering, equipment supply and construction labour materials	Market conditions Procurement policy Possible application of benchmarking Project management	Aurizon Technical Services & Planning team have a proven record in delivering these works. Though level crossing costs can vary significantly based on size of crossing / extent of works, Aurizon derived its budget estimate from past year costs for similar sites.

[63] *Excludes Management Reserve, Includes $559,000 for Unallocated Works and $105,000 for Recommended Works. The actual and claimed figures do not include these allowances for Unallocated and Recommended Works.*

The prudency of cost template for project IV.00473 Sleeper Renewal is in Table 7.34 continued below.

Item	Factors	FCG Guidance Notes	FCG Findings
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	Aurizon are installing flangeways at all level crossing renewal sites to increase life of pavement and rail at crossing interfaces, thus reducing future maintenance and opex expenditure. Ongoing ALCAM Assessments carried out on all level crossings. Two decommissioning sites planned were not proceeded with following further negotiations with landholders and Aurizon's Asset Manager.
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 time frames • 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	Track closures required for all major renewal works, managed in coordination with access holders. One level crossing removal at Gogango removes the existing rail – road interface, thus removing the risk of incident to private and public traffic. An additional 11 sites had signage upgrades completed within FY 19 program at request of the Access Holder ([redacted]). An increase in the number of sites where ALCAM Assessments were carried out was achieved.
6	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Procurement of materials and labour was co-ordinated by the project delivery contract management team within Aurizon.

Aurizon have provided the cost reconciliation of the Capital Expenditure Report value to support. Other information provided (including SAP outputs) reported a total cost slightly different to that claimed; however this is due to residual amounts claimed and/or entered after 30 June 2019, which is not unexpected for such programs of works.

Unit rates for the level crossings renewal program are as shown below:

- Forecast FY 19 Unit Rate (Critical Works) - [redacted]/site
- Actual FY 19 Unit Rate - [redacted]/site.

The budgeted and actual costs for the five major Level Crossing renewal sites are in Table 7.35 below.

Table 7.35: Planned and budgeted level crossing costs

	Planned (Project Plan(	Actual (EOY Report)	Difference ($)	Variance (%)
Bowen Development Rd (Newlands)	(Project Plan)	Actual	+$31,839	**+7.96%**
Aerodrome Rd (Newlands)	(EOY Report)	Difference	-$132,802	**-34.31%**
Collinsville Elphinstone Rd (Newlands)	($)	Variance	+$30,403	**+10.08%**
Saraji Mine Access (Goonyella) *	(%)	$418,440	-$58,509	**-12.27%**
Coppabella Mine Access (Goonyella) *	$533,854	$700,869	+$167,015	**+31.28%**
Subtotal	**$2,079,019**	**$2,116,965**	**+37,946**	**+1.83%**

*** These Level Crossings Sites were incomplete at 30 June 2019, with crossing line marking and signage upgrades not completed until August 2019**

It is noted that two of the five level crossing renewal sites were not fully completed as of 30 June 2019. These were:

- Saraji Mine Access, Goonyella System (scheduled works 28-30 April 2019, delayed due to wet weather impacting works)
- Coppabella Mine Access, Goonyella System (holding plus permanent works of the crossing completed by May 2019).

For both sites, line marking of the crossings and signage upgrades remained outstanding as of 30 June 2019; these were completed by August 2019.

Except for the Coppabella Mine Access level crossing the actual costs for sites were within reasonable margins to be considered prudent. The Coppabella mine access renewal required two mobilisations; one to align with the major user carrying out its own major maintenance works; increasing the renewal cost.

Prudency of Standard

Compliance of the CQCN Rail Network with CETS is mandatory. The purpose of the Level Crossing Renewal Program is to upgrade the crossing and associated signage, line-marking and other safety assets in order to maintain operational safety, which is reviewed as part of Aurizon's rolling ALCAM Assessments program. This is a key requirement to maintaining its rail operational accreditation.

The prudency of standard template for project IV. 00458 Level Crossing Renewal is in Table 7.34 below.

Table 7.36: Prudency of standard for project IV.00458 Level Crossing Renewal Package 1

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	It is expected Access Agreements between Aurizon and rail users (and any access conditions) were fully complied with as far as they apply to Level Crossing Renewal Works. Full compliance with CETS – Networks Safety Management Plan is mandatory by Aurizon.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	Historical Tonnage in FY 19 was approximately 230 million tonnes. Currently running consists at 20min headway across the network.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	Adherence to all other identified Australian Standards and the Traffic Management Plan developed and approved internally by Aurizon . Full compliance with CETS is mandatory.
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	Installation of flangeways at level crossings is designed to increase life of pavement and rail at crossing interfaces. ALCAM Assessments utilised to determine priority sites for the rolling program.

Item	Factors	FCG Guidance Notes	FCG Findings
5	Design standards contained within the Safety Management System	CETS	Compliance with applicable CETS and CESS Standards required. Full compliance with all applicable standards achieved.
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 Aurizon Network or Funding Users	Review of relevant submissions	Asset Completion Certificates record all applicable works standards and certify the completion and compliance of works as outlined within Aurizon Network's Capital Expenditure Report.

Review of a selection of the Asset Completion Certificates evidences scope completion as outlined, and that all applicable standards have been met with the works within. Aurizon have sought to meet all applicable standards and obligations on it and provided documentary evidence to support works completed meet these standards.

In addition, the ALCAM Assessments carried out by Aurizon carried out under this works package are critical as a risk assessment tool to specify key risks, prioritise works and ensure appropriate controls are in place to manage its safety obligations and maintain its rail operational accreditation.

7.3.10 IV.00004 Traction Fault Locator Renewal

Project Overview

This project included the renewal of 147 traction fault locator units. The traction fault location system allows remote identification of the location of traction faults in the network, thereby facilitating their rectification. Without an effective fault location system, determination of the fault location is an arduous and extended manual process during which train services are interrupted. The network's traction fault location devices were at the end of their service life, having been in service for decades, and failures were occurring.

Review Overview

A summary of FCG's review of IV.00004 Traction Fault Locator Removal is in Table 7.37 below.

Table 7.37: IV.00004 Traction Fault Locator Renewal

Prudency	
Scope	✓ [64]
Cost	✓ [65]
Standard	✓ [66]

Cost	AUD 2019
Aurizon claim	881,498
FCG Adjustment	-
FCG Recommendation	881,498

Prudency of Scope

The program capital application with appropriate justification was approved on 19 September 2014 and was originally planned to be completed in FY15 and FY16. The program activities included design development of a new suitable fault location device, its bench and field testing, followed by progressive replacement of the devices throughout the network.

Aurizon reported that:

- The design phase for the renewal program took longer than anticipated as the specification required revision after the design had commenced
- Considerably more testing of prototypes was required than anticipated
- Although delayed, the outcome of the design development of the new devices was very successful.

Aurizon further reported that as a result of the design and development delays, the final 111 units of the program were installed in FY 19, some 3 years after the original plan.

Prudency of Cost

The total budget originally approved for the program was $4.35 m including contingency. Of this, $2.02 m was scheduled for the FY15 year of the program and $2.30 m for FY16. Current, amended budgets according to the SAP Actuals Report.xlsx issued by Aurizon for the purposes of the review of the FY 19 Capital Claim, were:

- Assigned budget - $3.35 m
- Released budget - $2.93 m
- Cost plan - $3.93 m

[64] *Quality of documentation for scope is rated as High Quality. Amendments to scope at commencement and throughout FY 19 can be mostly evidenced.*
[65] *Quality of documentation for cost is rated as Average Quality. The cost aspects of the IAR are described in detail and valued at $881,498. There appears to be some misalignment with some SAP data and the capital expenditure claim.*
[66] *Quality of documentation for standard is rated as High Quality. Certificates of Completion mostly evidence works completed to standard.*

Expenditure throughout the program, according to the SAP Actuals Report was:

- Prior actuals on the project - $1.99 m
- Total program to date - $2.87 m
- Forecast final total on the program - $2.87 m

The expenditure on the project for the last seven months of FY 19, including some cost reversals which would be for journaling away of accruals, was less than $10 k, which supports Aurizon's contention that the project has been concluded in FY 19.

Expenditure by cost classification is shown in Table 7.38 below.

Table 7.38: IV.00004 Traction Fault Locator Removal cost breakdown

	Description	Cost
Direct	Aurizon field labour	220,202
	Rectification resolution labour	83,057
	Materials	12,442
	Equipment hire	258,289
	Total Directs	**573,990**
	Engineering and design labour	255,328
	Project management and other	52,180
	Total Indirects	**307,508**
	Project Total	**881,498**

The bulk of the equipment costs, which are also relatively high, are for on-track vehicles. FCG's conclusion in respect of these costs is that they are internal charges for Aurizon's own fleet, for which project allocation often lags the timing of the actual activity.
Prudency of Standard

The relatively high Engineering and Design costs, at 29%, is consistent with first principles design and development which in FCG's view is extremely difficult to budget with any accuracy.

Given that:

- The overall program has been completed significantly under the original approved budget
- For less than the current amended budget
- QCA's FY 18 review of the program found that it was being completed prudently and efficiently
- The program is complete.

FCG finds the FY 19 capital claim to be prudent and efficient.

7.3.11 IV.00344 Formation Renewal FY 18

Project Overview

The scope of Project IV.00344 Formation Renewal is the planned and emergency repair of formations to ensure safe and reliable operation and reduce maintenance costs of the CQCN.

Review Overview

A summary of FCG's review of IV.00344 Formation Renewal FY 18 is in Table 7.38 below.

Table 7.37: IV.00004 Traction Fault Locator Renewal

Prudency	
Scope	✓[67]
Cost	✓[68]
Standard	✓[69]

Cost	AUD 2019
Aurizon claim	330,989
FCG Adjustment	0
FCG Recommendation	330,989

Prudency of Scope

Formation renewals are important and challenging asset renewal projects to organise. They are important because they arrest the deterioration of a track system. They are challenging because they require a long possession of the track, excavation well below the track bed and careful coordination of all construction resources to recommission the track for operations. An easy option for a maintainer is to hold the track geometry with resurfacing but prudent requires the initiation of a more complex formation renewal when resurfacing does not hold the geometry. Formation renewals are an important and challenging aspect of rail asset management. They are assessed as prudent and efficient scope.

Prudency of Cost

This program of works was scheduled to be delivered over FY 18. The FY19 claim reflects the final small elements f this project that overlapped into FY 19.

The largest costs in the capital claim for FY19 are:

- Labour - $107,627
- Plant - $105,678
- Consulting Fees - $72,103
- Contractors - $26,091.

Theses cost indicate final earthworks around formation rebuild sites and completion of "As Built" documentation.
This range of costs is reasonable at the closing out of a program of works. The Aurizon cost tracking could be improved by better allocation of cots sto individual sites allowing some benchmarking of per kilometre cost of formation renewal at individual sites. The cost data as provided to FCG by Aurizon was not in a form that allowed this benchmarking to be completed.

As the scope of this review is the $330, 989 claimed for the closing out of this larger program of works, and this program of works in total was completed for $12,567,280 against an approved budget of $13,432,000, FCG assess the claim as prudent. It should be noted that QCA have previously approved the bulk of this project value as FY 18 capital expenditure; a previously approved value of $12,236,291.

Prudency of Standard

Standards for formation renewals are well defined and documented. The standard for these works is assessed as prudent.

[67] *Quality of documentation for scope is rated as Average Quality. Sufficient documentation was provided to support this claim.*
[68] *Quality of documentation for scope is rated as Average Quality. Sufficient documentation was provided to support this claim.*
[69] *Quality of documentation for standard is rated as Average Quality. Standards for formation renewal are well defined and documented.*

7.3.12 IV.00145 Autotransformer Renewal Project

Project Overview

This project was a 5-year program of end-of-life autotransformer replacement on the Blackwater and Goonyella Systems. The program was due to be complete in FY17. The program replaced 100 aged and failing autotransformers in the two systems. The autotransformers had been installed during the initial 1987 electrification of the system; most autotransformers were greater than 25 years old.

Figure 7.19: Autotransformers at 123.027 KM on the Goonyella System (Mindi to Tootoolah)

Review Overview

A summary of FCG's review of IV.00145 Autotransformer Renewal Project is in Table 7.39 below.

Table 7.39: IV.00145 Autotransformer Renewal Project summary

Prudency	
Scope	✓ [70]
Cost	✓ [71]
Standard	✓ [72]

Cost	AUD 2019
Aurizon claim	185,545
FCG Adjustment	-
FCG Recommendation	185,545

[70] *Quality of documentation for scope is rated as High Quality. Individual sites in the program were specified in detail.*
[71] *Quality of documentation for cost is rated as High Quality. The project was managed to budget and costs transparent.*
[72] *Quality of documentation for standard is rated as High Quality. Numerous standards are in place for power systems installation.*

Prudency of Scope

Aurizon advised that the FY 19 expenditure was for late costs, remnants and defects resolution from the prior work. No actual autotransformer installations from the FY17 program were completed in the current period.

Prudency of Cost

The IAR for the entire program was approved on 19 May 2015. Total budget $23.1 m. Of this total, $4.5 m was scheduled for the FY17 year of the program.

Expenditure, according to the SAP Actuals Report issued by Aurizon:

- Prior actual on this project:
- FY 18 - $1.44 m
- Previous years (including FY 18) - $3.24 m
- Total program to date - $3.43 m
- Forecast total on the program - $3.43 m

There was no expenditure on the project for the last 4 months of FY 19 and minimal expenditure for the 8 months preceding that. Budgets according to the SAP Actuals Report:

- Assigned budget - $3.45 m
- Released budget - $3.45 m
- Cost plan - $3.46 m

The actual costs for the FY17 component are below the budgeted costs for the project; $3.43 m against $3.46 m.

Prudency of Standard

FCG's conclusion from review of this expenditure is that it is routine defect resolution and late cost accrual which is normal for such programs. The overall project cost will remain within its adjusted budget.

The autotransformer replacement program is clearly unavoidable for safe, environmentally responsible and interruption minimised network operations. The FY 18 expenditure was reviewed in the previous assessment and found to be prudent and efficient.

FCG finds there are no grounds for the FY 19 claimed expenditure to be considered not prudent or inefficient.

7.3.13 IV.00145 Track Upgrade FY17

Project Overview

IV.00145 Track Upgrade is the final capital expenditure claim of a three-year track upgrade that extended from FY17 through to FY 19.

This program was aimed at:

- Replacing FIST sleepers with 28 tal Pandrol E-clip sleepers
- Renewing pads, clips and insulators
- Replacing worn rail with 60 kg/m head hardened rail
- Renewing ballast and formation where required
- Signalling and Overhead Line Equipment modifications where they were impacted.

Review Overview

A summary of FCG's review of IV.145 Track Upgrade FY17 is in Table 7.40 below.

Table 7.40: IV.00145 Track Upgrade FY17

Prudency	
Scope	✓[73]
Cost	✓[74]
Standard	✓[75]

Cost	AUD 2019
Aurizon claim	*154,769*
FCG Adjustment	*0*
FCG Recommendation	*154,769*

Prudency of Scope

The individual sites were scoped in detail through the monitoring of wear rates on rails, the review of track geometry data, ground penetrating radar inspection, fault records and field inspections. Sites in the initial project request were specified in detail to the metre. This indicates the accuracy and integrity of data available in Aurizon's asset management system. The scope was authorised by Aurizon's CFO on 13 April 2016.

Prudency of Cost

The initial project budget, approved in Cost Plan FY16 as at June 2016, was $26,924,000. Total project cost on completion was $26,891,624. The planned kilometres to be completed was 17.930 km; where 19.307 km completed. The project was completed on time and on budget with more scope delivered.

This cost performance of this project has been closely monitored. The project was delivered to budget with a small amount of extra scope completed. The project completion report is dated "November 2012" in the footer; this appears to be a typo and FCG assumes this was meant to be November 2019. Minor error aside the project completion report is succinct and effective; particularly valuable is the section of the completion report on the identification of risks and opportunities.

Risks that were realised include:

- Delays due to scope changes, and emergency works
- Difficulty of obtaining adequate possession windows
- Inability to obtain single line closures.

Opportunities realised include the use of a road profiler to remove spoil, grouping of works, disposal of waste to landfill at minimal cost and addressing OHLE and signalling modifications in smaller sections.

Prudency of Standard

FCG assesses that the scope was delivered in accordance with CETS and applicable Australian standards.

[73] *Quality of documentation for scope is rated as High Quality. Individual sites in the program were specified in detail.*
[74] *Quality of documentation for cost is rated as High Quality. Evidence provided supported that the project cost performance was carefully tracked. Some risks were realised; however, these were balanced with several opportunities being realised and a completion of a project on budget.*
[75] *Quality of documentation for standard is rated as High Quality. CETS and Australian standards clearly define standards to be achieved.*

7.4 Assessment of growth projects

7.4.1 Summary

Growth projects are major projects that increase network capacity. The Wiggins Island Rail Project Stage 1 (WIRP1) included a major upgrade of the Blackwater System to enable increased tonnages to the newly constructed Wiggins Island Coal Export Terminal (WICET) north of Gladstone. WIRP 1 required extensive stakeholder consultation and agreement.

7.4.2 A.01731 WIRP1: Dingo to Bluff Duplication

Project Overview

Wiggins Island Rail Projects Stage 1 (WIRP1) was a major capacity improvement to the CQCN to provide coal to the newly constructed first coal loader at Wiggins Island. The upgrades were mainly on the Blackwater System and generally included the duplication of single track with passing loop track sections and signaling upgrades.

Review Overview

A summary of FCG's review of A.01731 WIRP1 Dingo to Bluff Duplication is in Table 7.41 below.

Table 7.41: A.01731 WIRP1 Dingo to Bluff Duplication

Prudency	
Scope	✓[76]
Cost	✓[77]
Standard	✓[78]

Cost	AUD 2019
Aurizon claim	108,391
FCG Adjustment	0
FCG Recommendation	108,391

Prudency of Scope

The scope of this submission is the finalisation of As Built documentation and consists primarily of a commission to AECOM to complete this work; with some allowance for internal Aurizon costs.

Prudency of Cost

FG assess these costs as reasonable to close out WIRP1.

Prudency of Standard

FCG assess the standard as reasonable. AECOM have completed many projects for Aurizon including as built documentation.

[76] *Quality of documentation for scope is rated as Average. Although the WIRP1 program had significant scope definition due to the size of the project and stakeholder negotiations required; scope definition for this capital expenditure claim was minimal.*
[77] *Quality of documentation for cost is rated as Average. SAP data is consistent with the capital claim. Transparency of the nature of the contract value with AECOM is not clear.*
[78] *Quality of documentation for standard is rated as Average. FCG was not able to review specific deliverables from AECOM.*

7.5 Assessment of transformation projects

7.5.1 Summary

Aurizon considers "Transformation" projects as projects which: "often involve information technology (IT) and Operating Technology (OT) programs, projects to improve operational efficiency and environmental or sustainability programs."[79] Aurizon have submitted four projects in this category in the FY 19 capital expenditure claim. These projects are:

- IV.00437 Callide Infrastructure Upgrade[80] - $2,298,631
- IV.00360 Network Asset Management System Tranche 2 - $323,399
- IV.00184 Network Growth Other - $30,469
- IV.00495 Coppabella Walkways Relocation - $59,417.

FCG reviewed two of these projects; IV00437 and IV.00360.

7.5.2 IV.00437 Callide Infrastructure Upgrade

Project Overview

The Callide spur connects the Callide Mine to the Moura System and then through to RGTCT and the Callide power station. The spur is 16 km and non-electrified. It is one of the older rail lines in the CQCN; initially commissioned in 1953. Until recently the spur was subject to ad hoc railings from the Callide mine only.

The stakeholder requested access for up to 4.5 million tonnes per annum (mtpa). This tonnage will be reached through staged increases starting at 1.6 mtpa on 1 September 2017 through 3.2 mtpa within ten years and then 4.5 mtpa in the future. The Callide infrastructure upgrade project was a group of capital works valued at $6.5 m in order to support the entry of a stakeholder into an Access Agreement with Aurizon to be able to transport this tonnage. Aurizon's assessment of the condition of the Callide spur is that "higher Callide tonnages will increase the risk of track failures and require increasing reactive maintenance to address ongoing rail breaks, track formation and other issues".

Consequently, Aurizon has recommended:

- $6.5 m of infrastructure of upgrade
- Permanent 60 km/hr and 40 km/hr speed restrictions. [81]

Review Summary

A summary of FCG's review is in Table 7.42 below.

Table 7.42: IV.00437 Callide Infrastructure Upgrade Summary

Prudency	
Scope	✓[82]
Cost	✓[83]
Standard	✓[84]

Cost	AUD 2019
Aurizon claim	2,298,631
FCG Adjustment	0
FCG Recommendation	2,298,631

[79] *Aurizon Network FY 19 Capital Expenditure Report Page 11.*
[80] *This appears to be allocated to Transformation in Aurizon Network FY 19 Capital Expenditure Report, however the IAR describes it as Sustaining.*
[81] *Currently 80 km/hr.*
[82] *Quality of documentation for scope is rated as High Quality. It is clear that effective engagement with the stakeholder and consequent high-quality documentation of scope was achieved.*
[83] *Quality of documentation for cost is rated as High Quality. Detailed costing of scope was completed. Negotiation with the stakeholder was conducted. This scope and costing were reviewed and signed off by all levels up to CEO of Aurizon.*
[84] *Quality of documentation for standard is rated as High Quality. Aurizon has achieved an effective balance of infrastructure upgrade and reasonable operational constraints.*

Prudency of Scope

The prudency of scope template for project IV.00458 Callide Infrastructure Upgrade is in Table 7.43 below.

Table 7.43: Prudency of scope for IV.00458 Callide Infrastructure Upgrade

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	This project is consistent with Aurizon system wide priorities and aims at providing acceptable transit time reliability for coal extracted at the Callide Mine.
2	Requirements of Access Agreements	Review of Access Agreements Stakeholder acceptance of standard of works	This project is the result of direct negotiations with the stakeholder. Aurizon has minimised cost by constructing to imposed operational lower speeds and consequently constructing less costly asset.
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	Aurizon have assessed that tonnages will increase from the historical low ad hoc tonnages to a consistent 4.5 mtpa, as requested by the stakeholder. This will consequently increase the rate of unplanned failures on this spur. Aurizon considered alternatives and decided to proceed with a balanced approach of necessary capital works minimised to some extent by imposing speed restrictions of 40 and 60 km/hr. FCG assess this as a prudent approach.
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 records	Aurizon arrived at a condition assessment of the system to inform capital works through reviewing: • Track geometry data • Site inspections • Geotechnical inspections • Ground penetrating radar data • Fault records. Aurizon interpolated these results for additional tonnages to identify works required. The works in order of cost impact from highest to lowest include: • Formation repairs • Rerailing • Structures • Sleeper replacement • Turnout renewal.

Item	Factors	FCG Guidance Notes	FCG Findings
5	Promotion of an economically efficient operation	Whole of supply chain consideration	Aurizon considered whole of supply aspects through the inclusion of permanent speed restrictions. This indicates that, in this case, capital cost can be reduced with no impact on supply chain performance by slowing trains down.
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	This project is the result of direct negotiations with the stakeholder.
8	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Prudency of Cost

The works in order of cost impact from highest to lowest include, with allowances for FY 19:

- Formation repairs - $1.2 m
- Rerailing - $0.9 m
- Structures - $0.8 m.

It should be noted that in FY 18 funds were allocated to turnout renewal, sleepers and turnout works.

FCG assess these costs as prudent in the context of aiming at increasing the capacity of 16 km of legacy track. FCG suggest that they may even be low and the potential for additional formation renewal works exists; however, the reason Aurizon have imposed permanent speed restrictions may have been to mitigate this particular risk.

The prudency of cost template for project IV.00458 Callide Infrastructure Upgrade is in Table 7.44 below.

Table 7.44: Prudency of cost for IV.00458 Callide Infrastructure Upgrade

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 consistent with Aurizon system wide priorities and aims at providing transit time reliability for coal extracted at the Callide Mine.
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	Aurizon's costs are reasonable for this scope.
3	Circumstances prevailing in the market for: engineering, equipment supply and construction labour materials.	Market conditions Procurement policy Possible application of benchmarking Project management	Aurizon will deliver this work through a combination of internal resources, external panel subcontract agreements and external panel supply agreements.

Item	Factors	FCG Guidance Notes	FCG Findings
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	Aurizon arrived at a condition assessment of the system to inform capital works through reviewing: • Track geometry data • Site inspections • Geotechnical inspections • Ground penetrating radar data • Fault records. Aurizon interpolated these results for additional tonnages to identify works required. The works in order of cost impact from highest to lowest include: • Formation repairs • Rerailing • Structures • Sleeper replacement • Turnout renewal.
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 time frames • 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	These projects were delivered meeting the requirements of the RSNL and ONRSR. The project was negotiated directly with the impacted stakeholder and total project cost was minimised. Aurizon should be commended on pursuing the permanent speed restrictions to reduce the capital cost while minimising whole of supply chain impact. Time frame was agreed with the stakeholder and achieved.
6	Any other matters in the submissions to the QCA by Aurizon Network or Funding Users	Review of relevant submissions	FCG has no evidence these projects feature in submissions to QCA.

Prudency of Standard

The prudency of cost template for project IV.00458 Callide Infrastructure Upgrade is in Table 7.45 below.

Table 7.45: Prudency of cost for IV.00458 Callide Infrastructure Upgrade

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 the result of direct negotiations with the stakeholder.
2	Current and likely future usage	Historical tonnages Below Rail Transit Times (BRTT) Temporary Speed Restrictions (TSR)	Historical ad hoc tonnages have been up to 2.6 mtpa. Future demand tonnages will be up to 4.5 mtpa.
3	Relevant Australian design and construction standards	Reasonable standard to meet the scope and not overdesigned	Full compliance with CETS – Networks Safety Management Plan is mandatory.
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	Reasonable standard consistent with requirement and adjacent infrastructure. Aurizon should be commended on pursuing the permanent speed restrictions to reduce the capital cost.
5	Design standards contained within the Safety Management System	CETS	This project is the result of direct negotiations with the stakeholder.
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 Aurizon Network or Funding Users	Review of relevant submissions	Asset Completion Certificates record all applicable works standards and certify the completion and compliance of works as outlined within Aurizon Network's Capital Expenditure Report.

7.5.3 IV.00360 Network Asset Management System Tranche 2

Project Overview

IV.00360 Network Asset Management System Tranche 2 (NAMS2) is a project aimed at expanding the footprint established by NAMS 1. NAMS 1 established an integrated digital asset management system for track systems and civil assets. NAMS 2 extends this footprint to control systems, electrical assets and mechanised production. NAMS1 was commissioned in February 2017.

Aurizon's description of NAMS2 is:

"Network Asset Management System (NAMS) is a transformational program deploying standardised maintenance processes supported by a single, accurate data repository and a world class maintenance system. Value will be delivered through reduced unplanned network downtime, reduced cost of asset information to inform preventative maintenance strategies, and efficiency achieved through improved scheduling, work order management and execution."

Review Overview

A summary of FCG's review of A.01731 WIRP1 Dingo to Bluff Duplication is in Table 7.38 below.

Table 7.37: IV.00360 Network Asset Management System Tranche 2 Summary

Prudency	
Scope	✓[85]
Cost	✗[86]
Standard	✓[87]

Cost	AUD 2019
Aurizon claim	323,399
FCG Adjustment	(323,399)
FCG Recommendation	0

[85] *Quality of documentation for scope is rated as High Quality. At a strategic intent level, the scope is defined very well in the IAR. The IAR also describes in detail the implementation of NAMS2. Time frame in the IAR appears to not have been achieved.*

[86] *Quality of documentation for cost is rated as Average Quality. The cost aspects of the IAR are described in some detail. However, the cost aspects of the 2019 claim, $323,399, are not described in terms of total project costs to date against project progress. The scope completion date and actual delivery dates achieved are not clear.*

[87] *Quality of documentation for standard is rated as High Quality. Aurizon describe in detail the nature of the project on completion.*

Prudency of Scope

NAMS 2 extends the NAMS footprint to control systems, electrical assets and mechanised production. During the site visit FCG witnessed firsthand the positive impact on NAMS in terms of the assessment of rail wear; this type of accurate, consistent and integrated digital system is demonstrating the capability to understand the actual condition of assets. A reasonable understanding of the condition and wear rates of assets allows optimal whole of life planning.

Aurizon has identified in the IAR that central to achieving approval as capital expenditure is assuring the stakeholders understand and approve of the value of the investment. Aurizon states in the IAR.

"Network has sought to mitigate this risk by providing information sessions to stakeholders on NAMS as part of broader communication and increased transparency."

FCG assess, that as a concept, it is prudent and efficient to investigate extending the NAMS footprint to other systems. Aurizon are looking towards world class asset management.

Prudency of Cost

The IAR for NAMS Tranche 2 was for a total of $6.890 m following on from an approved investment in Tranche 1 of $35.580 m. The $6.980 m includes a [redacted] contingency allowance. This allowance for the project assessed as prudent given the potential returns described in the IAR.

Although the IAR provides comprehensive detail on estimated costs, no information has been provided on the costs to date. The ideal supporting document would be a Project Close Out report matching project spend to budget. In the absence of this for a project in progress the following would be expected:

- Total project costs to date
- Costs claimed this period
- Project progress to date
- Estimated cost to completion.

FCG is unable to establish a position on prudency for the FY 19 claim of $323,399. FCG recommend Aurizon resubmit this capital expenditure claim when the project is further progressed, and the points above can be assessed.

Prudency of Standard

FCG assesses the standard of the completed project as well defined by Aurizon. There is little guidance available in terms of published standards for this type of project as these systems tend to be bespoke. Notwithstanding this lack of guidance from standards, Aurizon is clearly aiming at a world class asset management system and has tapped into external expertise to access world best practice.

8. CONCLUSION

8.1 General

FCG assess the Aurizon capital expenditure submission to be generally prudent and efficient in terms of scope, cost and quality. FCG supports an FY 19 capital expenditure claim of ***$122,745,101*** in comparison with Aurizon's submission of ***$126,361,666.***

FCG are recommending amendments to projects. Three of these projects relate to programs of work where FCG assess that insufficient progress has been made to support a capital expenditure claim and one relates to a transformational project that should be submitted as a capital expenditure claim reflecting this transformational nature.

Aurizon has implemented several robust and effective asset management processes and some initiatives, such as the rail head wear tracking system and Network Asset Management System are commendable. However, in two areas FCG assess that Aurizon may be under scoping asset renewals and this may not be sustainable in the longer term; these areas are control systems and turnout renewals.

8.2 Summary

Details of FCG's project reviews of Aurizon's FY 19 capital assessment is shown in Table 8.1 below. This table has traffic light coding to show:

- Projects where FCG's assessment differs from Aurizon
- FCG's assessment of the quality of Aurizon documentation.

Table 2 Legend

Code	Meaning
✓	FCG assesses as prudent for this claim
✗	FCG assesses as not prudent for this claim
	FCG adjusted Aurizon's claim for this project
	FCG that supporting documentation was high quality
	FCG that supporting documentation was average quality
	FCG that supporting documentation was poor quality
	FCG conducted a high-level review and cannot comment on documentation quality
	FCG did not review this project

Table 8.1: Detailed assessment of projects

Capital Expenditure Type	Project	Submitted Value (2019 AUD)	FCG Assessment Value (2019 AUD)	Documentation Quality		
				Scope	Cost	Standard
TOTAL	**TOTAL CAPITAL SUBMISSION**	**126,361,666**	**122,745,101**			
Sustaining	**Total Sustaining**	123,411,682	120,118,516			
IV.00425	Rail Renewal Program Package 1	26,572,373	26,572,373	✓	✓	✓
IV.00446	Structures Renewal Package 1	15,465,451	15,465,451	✓	✓	✓
IV.00476	Track Renewal Package 1	15,193,594	14,174,922[88]	✓	✓	✓
IV.00461	Turnout Renewal Package 1[89]	14,053,345	14,053,345	✓	✓	✓
IV.00452	Formation Renewal Package 1	9,851,560	9,851,560			
IV.0449	Bridge Ballast Removal Package 1	8,567,512	8,509,462[90]	✓	✗	✓
IV.00455	Control Systems Renewal Package 1[91]	6,875,112	6,875,112	✓	✓	✓
IV.00473	Sleeper Renewal Package 1	6,317,874	6,317,874	✓	✓	✓
IV.00458	Level Crossing Renewal Package 1	4,048,374	4,048,374	✓	✓	✓
IV.00049	Radio System Replacement	3,609,098	3,609,098			

[88] *Project IV.00425: Additional cost data received during final Aurizon fact check of draft report.*
[89] *FCG note less turnouts were renewed than initially planned for and this may have impacts in the mid or long term in the form of Unallocated Works.*
[90] *Project IV.00449: $58,050 costs from bridges removed from scope not substantiated.*
[91] *FCG suggest the faults trend indicates additional control system renewal may be required.*

Capital Expenditure Type	Project	Submitted Value (2019 AUD)	FCG Assessment Value (2019 AUD)	Documentation Quality		
				Scope	Cost	Standard
IV.00555	Minerva Infra Upgrade	1,379,635	1,379,635			
IV.00470	Corridor Security Package	1,381,137	0 [92]	✓	✗	✓
IV.00399	Cyclone Debbie Rectification	1,156,299	1,156,299	✓	✓	✓
IV.00329	Structures Renewal FY 18	926,232	926,232			
IV.00004	Traction Fault Locator Renewal	881,498	881,498	✓	✓	✓
IV.00376	FY 18 Access Points	843,497	843,497			
IV.00503	Power Systems Renewal Package 1	835,307	0 [93]	✓	✗	✓
IV.00346	Package 1 FY 18 Control Systems Renewal	815,826	815,826			
IV.00283	Traction SCADA System	811,715	811,715			
IV.00364	Turnout Renewal FY 18	696,543	696,543			
A.04313	Gauge Face Lubrication	564,946	564,946			
IV.00334	Bridge Ballast Renewal Program FY 18	493,610	493,610			
IV00467	Access Roads Package 1	478,621	478,621			

[92] *Project IV.00470: Capital expenditure claim too early in program; $1.4 m costs to date with full program costs of $30.7 m.*
[93] *Project IV.00503: Capital expenditure claim too early in program; $0.8 m costs to date with full program costs of $12.7 m.*

Capital Expenditure Type	Project	Submitted Value (2019 AUD)	FCG Assessment Value (2019 AUD)	Documentation Quality		
				Scope	Cost	Standard
IV.00374	CQ Access Roads FY 18	337,699	337,699			
IV.0321	Sleeper Renewal Program	336,966	336,966			
IV.00344	Formation Renewal FY 18	330,989	330,989[94]	✓	✓	✓
IV.00343	Level Crossings Renewal Program FY 18	311,435	311,435			
IV.00322	Rail Renewal FY 18	210,734	210,734			
IV.00145	Autotransformer Renewal Project	185,545	185,545	✓	✓	✓
IV.00145	Track Upgrade FY17	154,769	154,769	✓	✓	✓
IV.00040	Train Detection Renewal Program	14,961	14,961			
IV.00261	Telecom Infrastructure Renewal	7,105	7,105			
IV.00266	Transmission Renewal FY17	6,281	6,281			
IV.00177	Structures Renewals FY17	(16,709)	(16,709)			
IV.00316	Access Points Renewal Program	(56,746)	(56,746)			
IV.00384	Electrical Equipment Renewal FY 18	(113,497)	(113,497)			
IV.00144	Rail Renewals FY17	(117,009)	(117,009)			

[94] *Project IV.00344: Capital expenditure claim supporting information provided during Aurizon final review discussions.*

Capital Expenditure Type	Project	Submitted Value (2019 AUD)	FCG Assessment Value (2019 AUD)	Documentation Quality		
				Scope	Cost	Standard
Growth	**Total Growth**	238,068	238,068			
A.01731	WIRP1: Dingo to Bluff Duplication	108,391	108,391	✓	✓	✓
A.04599	Havilah Culverts Upgrade	73,476	73,476			
A.02976	WIRP1: North Coast Line	47,818	47,818			
A.03686	WIRP1: Moura System Upgrade	7,189	7,189			
A.03735	WIRP1: Bauhinia North Upgrade	1,194	1,194			
Transformation	Total Transformation	2,711,916	2,388,517			
IV.00437	Callide Infrastructure Upgrade	2,298,631	2,298,631	✓	✓	✓
IV.00360	Network Asset Mgt System Tranche 2	323,399	0 [95]	✓	✗	✓
IV.00184	Network Growth Other	30,469	30,469			
IV.00495	Coppabella Walk-ways Relocation	59,417	59,417			

[95] *Project IV.00360: Capital expenditure claim too early in a significant transformation program; $0.3 m costs to date with full program costs of $6.9 m.*

APPENDICES

REFERENCES

All requested Aurizon management, cost and quality assurance documentation for renewal projects (commercial in confidence) as part of Request for Information (RFI) process agreed between QCA and Aurizon.

Aurizon letter FY 19 Capital Expenditure – Amendment dated 22 November 2019

Aurizon letter FY 19 Capital Expenditure – Amendment dated 19 December 2019

Asset Management Policy

Asset condition inspection guidelines:

- Module 00 – Overview
- Module 01 – Rail
- Module 02 – Insulated Rail Joint (IRJ)
- Module 03 – Sleeper Condition
- Module 04 – Turnout Condition
- Module 05 – Ballast Condition
- Module 06 – Track Geometry Condition
- Module 07 – Track Formation Condition
- Module 08 – Culvert Condition
- Module 09 – Bridge Condition
- Module 10 – Track Drainage Condition
- Module 11 – Rail Lubrication Condition
- Module 12 – Level Crossing Condition
- Module 13 – Access Roads Condition
- Module 14 – Fencing Condition
- Module 15 – Access Point Condition.

Civil Engineering Track Standards CESS)

Civil Engineering Structural Standards (CESS)

Network Asset Management System (NAMS)

Network Development Management Plan

APPENDIX A

EXTRACT OF ACCESS UNDERTAKING

Schedule E

Regulatory Asset Base

2.2 Prudency and efficiency

(a) The QCA must approve including capital expenditure into the Regulatory Asset Base if that capital expenditure is for the prudent and efficient value of the assets that are used or intended to be used by Aurizon Network to provide the service taken to be declared under section 250(1)(a) of the Act.

(b) In determining the prudency and efficiency of capital expenditure, the QCA must have regard to the following:

(i) the scope of works for the project (including whether the requirement for the works is prudent and efficient) which must include having regard, where relevant, to:

(A) any relevant Network Development Plan;

(B) the need to accommodate what is reasonably required to comply with Access Agreements and Train Operations Deeds;

(C) the need for new capital expenditure projects to accommodate the current contracted demand and potential future demand that Aurizon Network, acting reasonably, considers is required within a reasonable timeframe;

(D) the age and condition of existing assets, the need for asset replacement capital expenditure projects and the extent of consistency with the Asset Management Plan;

(E) the extent to which the capital expenditure project promotes the economically efficient operation of, use of or investment in the Rail Infrastructure, whether present or future (for example, in relation to extending the life of assets whose economic and/or functional life would otherwise have expired, reducing future operating and maintenance costs or improving the capability or capacity of existing assets, systems and processes);

(F) Aurizon Network's legislative and tenure requirements, including relating to rail safety, workplace health, safety and environmental requirements;

(G) the outcomes of consultation (if any) about the capital expenditure project, with Access Seekers and Access Holders whose Access Charges (or likely Access Charges) would be affected by including the amount of capital expenditure for the capital expenditure project into the Regulatory Asset Base;

(H) the Renewals Strategy and Budget; and

(I) any other matters in submissions to the QCA by Aurizon Network or Expansion Funders;

(ii) the standard of works for the project (including whether the standard could be expected to deliver the requirements for that project without it being overdesigned or likely to deliver a capital works project which is beyond the requirements of its scope) which must include having regard, where relevant, to:

(A) he requirements of Railway Operators and what is reasonably required to comply with Access Agreements and Train Operations Deeds;

(B) current and likely future usage levels;

(C) the requirements of relevant Australian design and construction standards;

(D) if applicable, the extent of consistency with the Asset Management Plan;

(E) Aurizon Network's design standards contained within the Safety Management System;

(F) all relevant Laws and the requirements of any Authority (including the Safety Regulator);

(G) the Renewals Strategy and Budget; and

(H) any other matters in submissions to the QCA by Aurizon Network or Expansion Funders; and

(iii) whether the costs of that project are prudent and efficient, having regard to the scope and standard of work undertaken or to be undertaken for the project which must include having regard, where relevant, to:

(A) any relevant Network Development Plan;
(B) the level of such costs relative to the scale, nature, cost and complexity of the project;
(C) the circumstances prevailing in the markets for:
    (1) engineering, equipment supply and construction;
    (2) labour; and
    (3) materials;
(D) the Asset Management Plan;
(E) Aurizon Network's actions, or proposed actions, in relation to:
    (1) safety during construction and operation;
    (2) compliance with environmental requirements during construction and operation;
    (3) compliance with Laws and the requirements of Authorities;
    (4) minimising disruption to the operation of Train Services during construction;
    (5) accommodating reasonable requests of Access Holders and End Users to amend the scope and sequence of works undertaken to suit their needs;
    (6) minimising total project cost which may at times not be consistent with minimisation of individual contract costs;
    (7) aligning other elements in the Supply Chain; and
    (8) meeting contractual timeframes and dealing with external factors;
(F) the Renewals Strategy and Budget; and
(G) any other matters in submissions to the QCA by Aurizon Network or Expansion Funders.

APPENDIX B

ASSESSMENT FLOWCHART

Capital Expenditure Prudency and Efficiency

KEY YES NO

Is the Scope Prudent and Efficient?

Is the project supported by a Business Case or Feasibility Study? Is the project consistent with the asset management strategy?

Is there a reasonable expectation of the demand for capacity to support the project?

Is the extent of the project reasonable considering the age and condition of the assets; and the infer-facing infrastructure?

Does the project support whole of supply chain efficiencies?

Is the project supported by evidence of customer approval, consultation and any relevant submissions to the QCA?

Standard is Prudent

Standard is Not Prudent

Is the Cost Prudent and Efficient?

Is the procurement delivery methodology selected for the project reasonable?

Was the minimisation of whole of life costs considered adequately?

Was a cost competitive procurement process used to complete the project?

Do the elements of the project benchmark reasonably against similar projects?

Is the project unique enough that warrants relationship type contracting (e.g. Alliancing)?

Cost is Prudent

Cost is Not Prudent

Is the Standard Prudent and Efficient?

Does the standard reflect the demand for capacity and type of traffic?

Is the standard consistent with the asset management strategy?

Is the standard consistent with established Aurizon standards?

Has the standard been developed through engineering rigour with an RPEQ sign off?

Is the standard consistent with discussions with or submissions by stakeholders

Scope is Prudent

Scope is Not Prudent

APPENDIX C

FCG CAPITAL EXPENDITURE REVIEW TEMPLATE

Review template

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 time frames • 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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