Queensland Rail's Draft Access Undertaking 2 (DAU2) Explanatory Document

14 August 2018

Commercial-In-Confidence

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1. Background

1.1 Queensland Rail's network

Queensland Rail is a statutory authority established by the Queensland Government under the Queensland Rail Transit Authority Act 2013 (Qld).

Figure 1: Queensland Rail's Systems

Queensland Rail's purpose is to provide a safe, reliable, on-time, value for money and customer focussed rail service that benefits the community, supports industry and is integrated with the public transport system.

Queensland Rail's network extends more than 6,600 kilometres across the state and consists of the regional network and the Metropolitan System. The regional network spans more than 5,700 kilometres of track and comprises seven rail systems that convey passenger and freight services across Queensland to support the state's economy in the tourism, mining, agriculture, construction, wholesale and retail sectors.

The most significant volumes of freight are carried on the West Moreton System (thermal coal), the Mount Isa Line System (metals, minerals concentrate and chemicals) and the North Coast Line System (intermodal freight and sugar). These three systems carried approximately 97 per cent of the freight tonnage transported on Queensland Rail's network in 2016-17.

The regional systems connect to the Metropolitan System, which provides metropolitan passenger train services in Brisbane. Queensland Rail's Citytrain primarily services the commuter passenger market in South East Queensland, with more than 53 million passenger trips undertaken in the 2016-17 financial year.

The operators currently providing freight transportation services on Queensland Rail's systems are:

- Aurizon Operations, which provides transportation of all types of freight on each of Queensland Rail's systems except the Tablelands System; and
- Pacific National, which provides transportation of general freight on the North Coast Line and Metropolitan Systems and minerals and general freight on the Mount Isa Line System.

Queensland Rail does not provide any above rail freight services or compete with third party above rail passenger services. The key passenger operations on Queensland Rail's systems are:

- Citytrain service on the Metropolitan System; and
- long distance passenger services on the North Coast Line System.

Regular passenger and tourist services operate on the Mount Isa Line System, West Moreton System, Western System, Central Western System and the Tablelands System, and a small number of heritage tourist services operate on various short segments of the network.

Each of Queensland Rail's systems, with the exception only of the Mount Isa Line System, are supported by Queensland Government transport service payments in respect of its below rail infrastructure services.

The characteristics of Queensland Rail's systems are diverse and vary greatly due to differing supply chain dynamics, geography, rail corridor characteristics, interactions with other rail traffics and the substitutability of rail freight for road freight. Queensland Rail maintains fit for purpose capital and maintenance programs for each of its systems that are designed around that system's particular characteristics.

The use of Queensland Rail's below rail network is currently a 'declared service' under the Queensland Competition Authority Act 1997 (**QCA Act**). Third party access to this network is subject to '*Queensland Rail's Access Undertaking 1*' (**AU1**), which was approved by the Queensland Competition Authority (**QCA**) on 11 October 2016.

1.2 Approach to DAU2

1.2.1 Initial meetings

Queensland Rail held initial consultation with key industry stakeholders in 2017 after receiving the Initial Undertaking Notice from the QCA on 14 September 2017. Queensland Rail proposed that it would:

- ***actively engage*** industry in ongoing consultation both prior to lodgment and throughout the QCA approval process.
- adopt a ***targeted*** approach to '*Queensland Rail's Draft Access Undertaking 2*' (**DAU2**). With AU1 being in effect for only a short time after a lengthy regulatory process, it is not considered necessary to embark upon a complete rewrite for DAU2, but rather to use AU1 as the foundation. Queensland Rail is working with stakeholders to identify the existing provisions of AU1 which all agree do not require amendment.

Industry indicated support for a consultation process aimed at achieving agreed outcomes, and for changes from AU1 to be targeted to key issues rather than a complete rewrite for DAU2.

1.2.2 Detailed consultation

In developing DAU2, Queensland Rail has consulted with key industry stakeholders including New Hope, Yancoal, Aurizon Operations, Glencore, Pacific National, and the Queensland Resources Council. Industry has made valuable contributions to DAU2 positions. Where differences have remained Queensland Rail has sought that all parties have a full understanding of the rationale behind the different views.

Queensland Rail sought and accepted coal tonnage forecasts from New Hope and Yancoal. Queensland Rail also issued two consultation papers outlining Queensland Rail's proposed positions, seeking feedback on these positons.

The first consultation paper outlined proposed changes to the quarterly and annual reporting requirements, and changes to reflect changes in safety legislation.

The second paper advised all of the proposed changes for DAU2, the reasoning for the changes, as well as identifying all of the provisions that are not proposed to vary from AU1. With Queensland Rail's targeted approach Queensland Rail has proposed that the majority of AU1 does not change. Queensland Rail also provided with this paper a marked-up copy of the proposed Standard Access Agreement (**SAA**).

As well as seeking written feedback on these papers, Queensland Rail also met with industry. Working with stakeholders has decreased the number of differences, and a targeted approach has meant that resources can be focused on the key matters identified by industry and Queensland Rail. Queensland Rail has amended drafting and positions based upon industry feedback.

Queensland Rail's active stakeholder engagement will continue post lodgement. A key focus will be on the coal reference tariffs and:

- the uncertainty around tonnage levels;
- a potential loss capitalisation model; and
- the methodology for adjusting reference tariffs for coal tonnages between 2.1 million tonnes per annum (**mtpa**) and 9.1mtpa.

Queensland Rail is committed to continue to work with stakeholders on all aspects of DAU2.

1.3 The legacy of vertical integration

Queensland Rail is not vertically integrated in a way that would give it an ability and incentive to leverage any market power into a dependent market.

Queensland Rail provides below rail services on its systems but does not operate freight trains. As a result, Queensland Rail is not vertically integrated in a relevant way and has no incentive to leverage any market power in the provision of below rail services to advantage a related entity providing above rail freight transport services.

While Queensland Rail operates passenger services on each of its systems except the South Western System, it does not compete with other above rail operators providing passenger services. This was acknowledged by the QCA in relation to AU1, with the QCA noting that:

> *"Queensland Rail's existing operational structure means ring-fencing issues are unlikely to affect competition, as Queensland Rail's passenger operations do not compete with other above-rail operators' and that the QCA did not consider that this was likely to change during the term of 2016 Access Undertaking."*[1]

There is similarly no expectation that such interests are likely to arise during the term of DAU2.

Having initially inherited '*QR Network's Access Undertaking (2008) June 2010*' (**2008AU**) prior to the development of AU1, an undertaking that was developed for an integrated organisation competing in the above rail market, AU1 retains various restrictive provisions not suitable to Queensland Rail's business today.

Rather than considering Queensland Rail's current business model, AU1 maintains an unnecessary level of prescription that is in contrast to other similar access regimes covering vertically separate networks, such as the ARTC interstate access undertaking and the Western Australian Access Regime. These provisions are more appropriate to historical rail access undertakings in Queensland, which regulated the provision of access to the Central Queensland Coal Network by a vertically integrated operator.

However, in the interests of certainty and maintaining a targeted approach to DAU2, as well reaching an efficient, expeditious conclusion of the approval of DAU2, Queensland Rail has not sought to remove every element of unnecessary prescription from DAU2, or re-open issues that were the subject of extensive submissions in AU1. This is not an acknowledgement that the requirements for AU1, as now reflected in DAU2, are necessary or appropriate having regard to relevant provisions of the QCA Act. Rather, Queensland Rail has taken a pragmatic approach to DAU2.

1.4 The QCA's Declaration review

The QCA's Initial Undertaking Notice requires Queensland Rail to submit an access undertaking for the service, notwithstanding that declaration under section 250 of the QCA Act expires in September 2020, and that the QCA is currently undertaking a review of the declaration, with a view to making a recommendation to the Queensland Treasurer as to whether the service should be declared after that date.

[1] QCA, Decision - Queensland Rail's Draft Access Undertaking (June 2016), page 8.

The QCA Declaration review and the DAU2 approval process are inextricably linked and if any or all of access to Queensland Rail's network becomes undeclared, then DAU2 will fall away for these systems. This gives rise to considerable uncertainty, as it is not clear whether all or part of the service will be declared in 2020. It may be that an undertaking requires significant change if, for example, only part of the service is declared after September 2020.

DAU2 is drafted as if the currently declared service will be declared in 2020.

1.5 DAU2 uncertainty

DAU2 is being developed in a unique environment of uncertainty, where there is a concurrent declaration review (discussed above) and potential West Moreton coal volumes varying between 2.1mtpa and 9.1mtpa, around an 80 per cent spread. Queensland Rail has been working with stakeholders to develop effective ways to mitigate the uncertainty, and in particular, in relation to the West Moreton coal reference tariff.

1.6 Structure of submission

This document supports Queensland Rail's DAU2, which has been submitted to the QCA for approval. This explanatory document sets out the rationale for proposed changes Queensland Rail has put forward in DAU2. It is structured as follows:

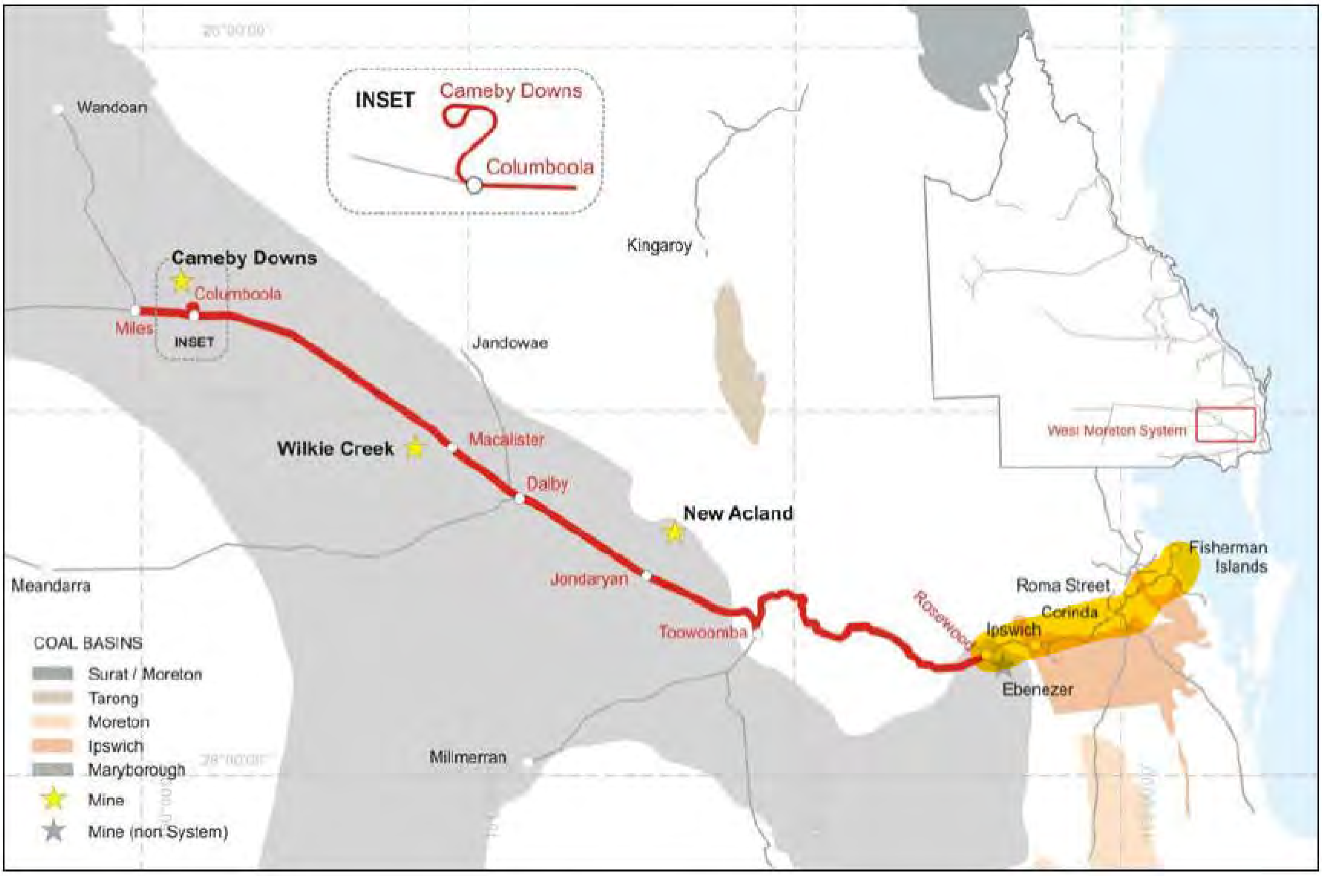
- Section 2 discusses the proposed reference tariffs for coal services on the West Moreton System, including the methodology Queensland Rail has used to develop these tariffs.
- Section 3 discusses the proposed reference tariffs for coal services on the Metropolitan System, including the methodology Queensland Rail has used to develop these tariffs.
- Section 4 sets out the proposed changes to the SAA.
- Section 5 sets out proposed changes to pricing rules, including prices for renewed contracts.
- Section 6 discusses proposed other (non-pricing) changes.
- Attachment 1: West Moreton Tonnage Forecasts from the mines.
- Attachment 2: Frontier Economics' Independent Expert Report on Asset Beta.
- Attachment 3: West Moreton System DAU2 Capital Expenditure 2020-21 to 2024-25.
- Attachment 4: GHD Peer Review of West Moreton System DAU2 Maintenance Costs 2020-21 to 2024-25.
- Attachment 5: West Moreton System DAU2 Maintenance Costs 2020-21 to 2024-25.
- Attachment 6: GHD Peer review of West Moreton System DAU2 Maintenance Costs 2020-21 to 2024-25.
- Attachment 7: HoustonKemp's Independent Expert Report on Price Differentiation.
- Attachment 8: HoustonKemp's Independent Expert Report on Contract Renewal Rights.

2. West Moreton System Reference Tariffs

2.1 Introduction

Coal carrying train services traverse Queensland Rail's West Moreton System, which spans approximately 321 route kilometres from Rosewood to Miles, and through the Metropolitan System[2] along approximately 80 route kilometres from Rosewood to the Port of Brisbane (Fisherman Islands). Both the West Moreton System and the Metropolitan System have QCA approved reference tariffs for coal carrying train services.

Figure 2: Map of Miles to the Port of Brisbane



2.1.1 System history and characteristics

Historically the West Moreton System catered for passenger, livestock, freight and agricultural products (e.g. grain and cotton) with the first section of railway line in Queensland, between Ipswich and Grandchester, opening in 1865 the railway reaching Toowoomba in 1867 and Roma in 1880.

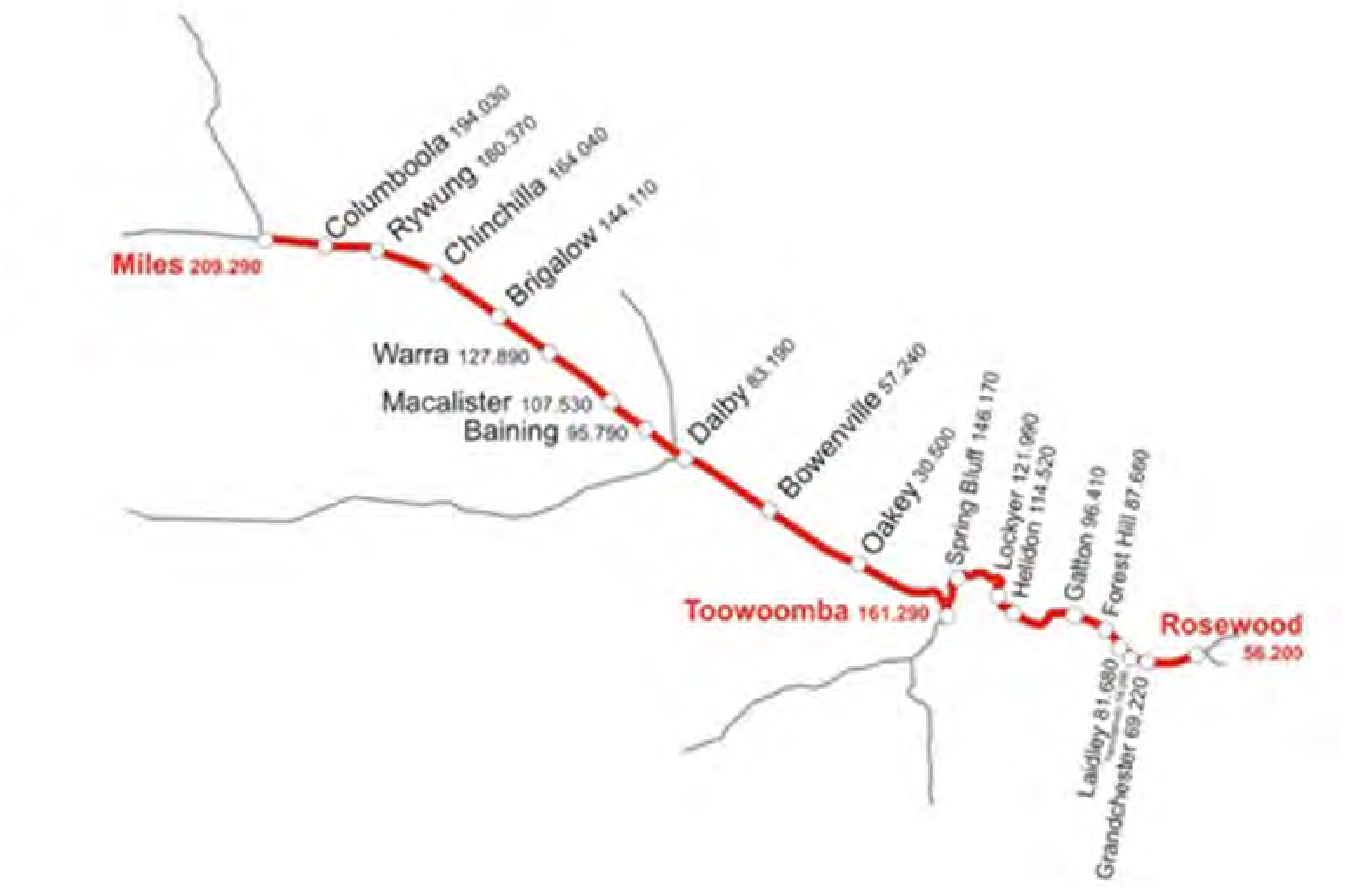
[2] The Metropolitan System means that part of the Network bounded to the north by (and including) Nambour station and to the west by (and including) Rosewood and including all branch lines comprised in that part of the Network. Coal trains travel on the System between Rosewood and the Port of Brisbane.

While coal carrying train services commenced in 1982 from mines located just west of Ipswich (in the Metropolitan System), heavy haul coal railings began on the West Moreton System from the Wilkie Creek mine in 1994, with Macalister as the loading point. Following the development of the New Acland mine, railings from Jondaryan commenced in 2002. The final Surat Basin mine utilising the West Moreton System, Cameby Downs, began operations in late 2010 transporting coal from Columboola. The Wilkie Creek mine ceased railing in early 2013 during a time of low international thermal coal prices.

The West Moreton System is unique as a coal system, with the Toowoomba Range section, originally constructed in the 1880s, problematically having a grade of 2 per cent and some 40 sharp curves. In addition, the majority of the railway from Rosewood to Columboola is founded on expansive black clays.

As the West Moreton System was initially designed to cater for non-coal traffics, this environment has meant that investment in infrastructure improvements, by both Queensland Rail and West Moreton System end-users, has been necessary to accommodate coal carrying train services. It also requires a substantial maintenance effort. Queensland Rail maintains fit for purpose maintenance and capital programs that take account of the West Moreton Systems unique characteristics, ensuring a safe and reliable network.

Figure 3: Map of the West Moreton System



2.1.2 West Moreton System rail capacity

Current traffics on the West Moreton System include train services carrying thermal coal from the two mines (New Acland and Cameby Downs), freight trains carrying grain and sometimes livestock and the Westlander long distance passenger services.

The Toowoomba Range is the capacity constraint on the West Moreton System, with a maximum capacity of 113 return train paths per week. Of these, 14 return train paths per week are preserved for non-coal freight[3] and two return train paths per week are preserved for the Westlander[4]. The coal mines and rail operators can contract up to 97 return train paths per week across the range (as these are not preserved), and can also run ad hoc train services for the remaining 16 return preserved paths (if they are not being used by freight and passenger train services). The Metropolitan System is not capacity constrained and can accommodate the 113 trains services as well as any coal or freight services that originate in the Metropolitan System and travel between Rosewood and the Port of Brisbane.

2.2 QCA Building Blocks approach

2.2.1 Building Blocks approach

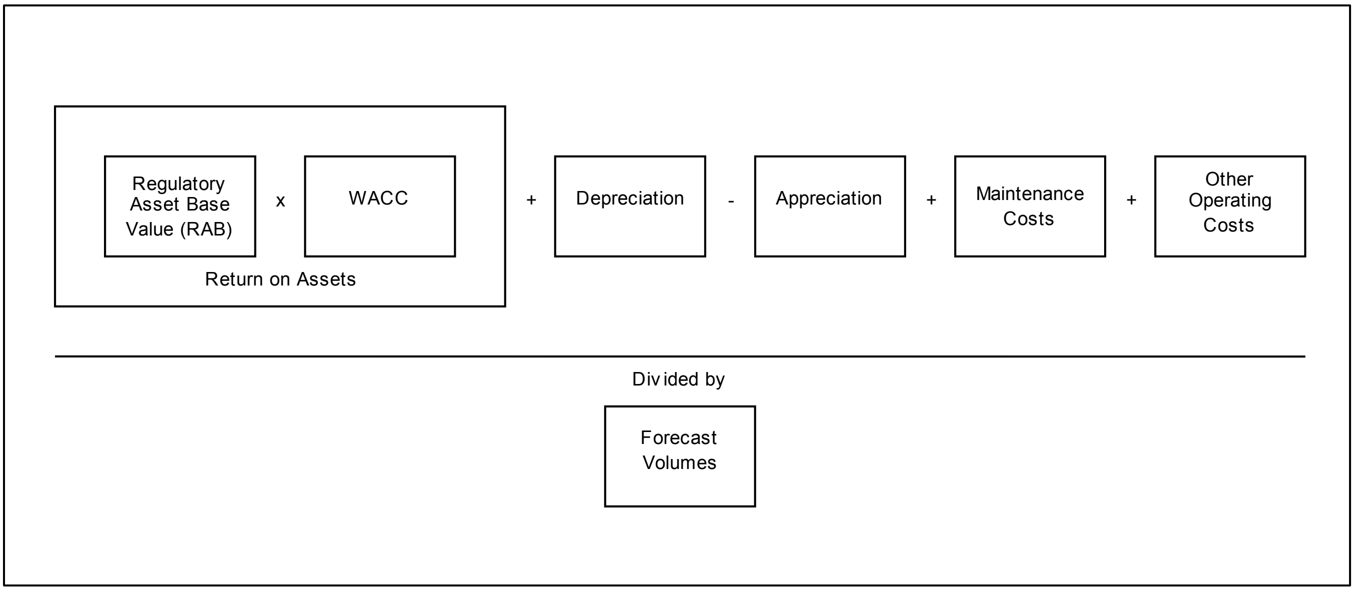
Reference tariffs are approved by the QCA for coal carrying services on both Queensland Rail's West Moreton System and the Metropolitan Systems, and for Aurizon Network's systems. Except for Queensland Rail's Metropolitan System coal reference tariff, these reference tariffs are directly calculated by the QCA through a 'building block' methodology where the QCA makes an assessment of the:

- Opening Asset Value for the System;
- Capital Expenditure over the period of the undertaking;
- Weighted Average Cost of Capital (**WACC**) (e.g. return on asset);
- Asset Depreciation;
- Asset Indexation;
- Maintenance Costs;
- Other Operating Costs;
- Gamma Adjusted Tax Payable; and
- Coal tonnages during the access undertaking period (i.e. volumes).

The approved reference tariff is then derived as a function of the forecast or contract volumes for the regulatory period. The following diagram provides a high level summary outlining the calculation of a reference tariff:

[3] These train paths are preserved under section 266A of the *Transport Infrastructure Act 1994*.
[4] These train paths are preserved under section 266A of the *Transport Infrastructure Act 1994*.

Figure 4: Reference Tariff Build Up



2.2.2 History of coal reference tariff development – A 'Building Block' approach

Coal reference tariffs in Queensland were first developed in 2001 for the central Queensland Coal region (**CQCR**) as part of the QR Limited access undertaking (**UT1**) based upon the 'building block' methodology.

Coal reference tariffs for the "Western System" (part of which is the West Moreton System) were first developed as part of QR Limited's second access undertaking (**UT2**), which was approved in 2006. The reference tariffs were agreed with industry though the QCA approval process.

On 30 June 2010 the QCA approved coal reference tariffs in the 2008AU based upon the building block methodology.

On 11 October 2016 the QCA approved the current AU1 West Moreton System reference tariffs, again based upon its building block methodology.

Queensland Rail's current coal reference tariffs are summarised in **Table 1**.

Table 1: Queensland Rail coal reference tariffs as at 1 July 2018 ($2018-19)

West Moreton System	Metropolitan System
$17.23/'000 gtk	$17.26/'000 gtk

2.3 Derivation of the DAU2 West Moreton System coal reference tariff

The following sections of Part 2 of this explanatory document set out the derivation of the DAU2 West Moreton System coal reference tariff including:

- Coal Volumes - Challenges around uncertainty [Part 2.4];
- Opening asset value [Part 2.5];
- WACC [Part 2.6];
- Capital expenditure [Part 2.7]:
- Depreciation [Part 2.8]
- Maintenance Expenditure [Part 2.9];
- Operational Expenditure [Part 2.10]; and
- The West Moreton System reference tariff [Part 2.11].

2.4 Coal volumes

2.4.1 West Moreton System coal volume uncertainty

Queensland Rail and industry face unique challenges around the development of the DAU2 reference tariffs, compared to previous rail access undertakings in Australia, particularly in relation to volume forecasts.

Access revenue from coal train services, which is collected through the reference tariff, funds the majority of the costs on the system. AU1's West Moreton System reference tariffs are based on a combination of contract and forecast ad hoc paths, which in total equates to approximately 6.25 million net tonnes of thermal coal per year being transported on the system. New Hope's New Acland Stage 2 mine (**New Acland Stage 2**) has nominal production of around 4mtpa and Yancoal's Cameby Downs mine with production of around 2.1mtpa. A third mine, Peabody's Wilkie Creek mine, ceased operations in early 2013 at a time when international thermal coal prices were low, and remains closed.

While New Hope delivers around [redacted] per cent of the coal on the West Moreton System through New Acland Stage 2, this mine is forecast to cease producing coal by mid-2020[5]:

> *"New Hope Corporation Limited ("New Hope") operates New Acland Mine ("the Mine"), located near Oakey in South-East Queensland. The coal reserves known to be economically viable within the current mining lease will be exhausted by mid-2020. The long-term future of the Mine is dependent on securing approval from the Queensland Government for a mine expansion, called New Acland Coal Mine Stage 3 Project ("NAC3")."*

[redacted]

[5] New Acland Coal Mine Stage 3 Project Financial Impact Study New Hope Group 27 September 2017 by Ernst & Young, pp. 1 & 9.

2.4.2 New Acland Stage 3

In May 2017, the Land Court of Queensland (**Land Cou**rt) recommended that the Minister for Natural Resources and Mines refuse to approve the New Acland Stage 3 development.

In May 2018, the Supreme Court of Queensland delivered its judgement in New Hope's judicial review proceeding, setting aside the Land Court's orders and remitting the matter back to the Land Court for further consideration.

This does not result in a recommendation for approval of the expansion, and given the Land Court will have to reconsider the objections in light of the Supreme Court decision, the need to obtain additional licences under the *Water Act 2000 (Qld)* and requirements for additional rail and mine infrastructure, it is unlikely the mine will be operational before commencement of DAU2 on 1 July 2020, if approvals are ultimately granted.

2.4.3 Volume Forecasts — 2.1mtpa and 9.1mtpa

As part of its customer engagement, Queensland Rail wrote to New Hope and Yancoal in September 2017 requesting tonnage forecasts for the period from 1 July 2020 to 30 June 2025. Based upon these forecasts (refer **attachment 1**), and Queensland Rail's discussions around current access applications including a current New Hope access application for [redacted] mtpa, Queensland Rail forecasts that:

- **Higher case scenario:** If New Acland Stage 3 proceeds, forecast tonnages would be around 9.1mtpa (New Hope 7mtpa and Yancoal 2.1mtpa — Yancoal's current contracted tonnages with the contract expiring in [redacted]); and
- **Lower tonnage scenario:** If New Acland Stage 3 does not proceed or is not operating when DAU2 takes effect on 1 July 2020, forecasts will be approximately 2.1mtpa during the period without New Acland Stage 3.

Queensland Rail is developing the West Moreton coal reference tariff under circumstances with potential tonnage scenarios varying by an unprecedented [redacted] per cent at the date of this submission. Very different capital, maintenance and operational expenditure profiles will be required under these differing scenarios.

As part of its consultation Queensland Rail committed to the miners to develop a building block approach for both scenarios. In doing this, Queensland Rail seeks to provide transparency and certainty for industry.

Having a QCA approved reference tariff at 9.1mtpa will provide New Hope with certainty in its investment decisions in relation to its New Acland Stage 3 development.

Queensland Rail does not intend to apply a reference tariff for Yancoal at 2.1mtpa at the building block ceiling tariff. Post submission of DAU2 to the QCA, Queensland Rail will work with stakeholders to develop a reference tariff for the 2.1mtpa scenario, which is below the 2.1mtpa ceiling tariff, for submission to the QCA for approval. Queensland will also consult with industry on the following options:

- A potential loss capitalisation (catch-up) model to recoup losses when tonnages on the system exceed a threshold; and
- The possibility of developing methodology for QCA approved reference tariffs at each mtpa point between 2.1mtpa and 9.1mtpa.

The following sections of this explanatory document work through each of the key elements of the reference tariff build up, with [Part 2.11] providing the resultant reference tariffs that Queensland Rail is seeking that the QCA approve.

2.5 Asset roll forward — DAU2 opening asset base

2.5.1 West Moreton System Common Network and Allocated Regulated Asset Base

As part of its 2016 Final Decision on AU1, the QCA approved an opening asset value of $254.5 million[6] for the West Moreton common network between Columboola and Rosewood, as at 1 July 2013.

The Regulatory Asset Base (**RAB**) for the West Moreton System is the only RAB approved for Queensland Rail.

In determining a common network RAB value for DAU2, Queensland Rail has adopted the following approach:

- roll forward the AU1 RAB, adjusting for depreciation and forecast inflation;
- assume the capital allowance and forecast for 2013-14 to 2019-20 based on forecast expenditure; and
- incorporate forecast capital expenditure over the DAU2 regulatory period (via the Capital Indicator).

In determining a coal allocated network value for DAU2, Queensland Rail has applied a revised train path allocation to the asset and capital expenditure groups.

2.5.2 Capital investment in West Moreton System

Queensland Rail's RAB is made up of assets required for the efficient provision of access to the declared service.

Originally based on a 2013 asset valuation, the RAB value is rolled forward each year at CPI escalation, depreciated, and the value of prudent capital investments, approved by the QCA as part of its ex-post annual capital approvals process.

The key strategies supporting Queensland Rail's capital expenditure plan in West Moreton System are:

- Preventative not reactive maintenance — to be achieved through better collection and analysis of asset condition data so that assets can be replaced or repaired at the optimum time
- Undertaking asset renewals that introduce modern, reliable, low maintenance, less disparate and (where possible) future-proof infrastructure assets
- More effective planning of works delivery with the aim of minimising the impacts of capital works and major maintenance on network availability and delivering improved productivity outcomes from closures
- Focus on improved cost-effectiveness by reviewing internal works processes and cost contributors and more effective utilisation of industry through appropriate packaging and tendering of works and management of delivery.

[6] QCA Final Decision, Queensland Rail's Draft Access Undertaking (June 2016), p 215

The West Moreton System was initially constructed in the 1870's. This provides challenges now stemming from the historical use of non-engineered formations built on black soil plains, unstable ash deposits from the original steam trains and the Toowoomba range is geotechnically unstable which presents its own challenges. These challenges are required to be managed carefully with a balance of capital investment and operational maintenance.

2.5.3 Capital Indicator reconciliation and RAB forecast

AU1 included an estimate of the capital expenditure likely to be spent over the period 1 July 2013 to 30 June 2020 as approved by the QCA.

Clause 1.3, Schedule E of AU1 requires Queensland Rail to submit an annual report to the QCA regarding the capital expenditure Queensland Rail considers should be included in the RAB (the RAB rollover). Submission of annual Capital Expenditure Reports during the term and the subsequent approval process by the QCA is the process used to convert estimated expenditure to actual expenditure to be added. If Queensland Rail has spent more on capital, then it will recover this in subsequent undertakings, or if it has underspent, it will be required to refund the relevant portion of access charges as approved for the next term.

The 2016-17 Capital Expenditure Report is the first to be assessed by the QCA under AU1. Because the RAB was approved as at 1 July 2013 and no subsequent assessment has been made, the 2016-17 Capital Expenditure Report includes all capital expenditure on the West Moreton System from 1 July 2013 to 30 June 2017.[7] The 2016-17 Capital Expenditure Report was submitted to the QCA on 20 December 2017. As of the time of writing, the QCA is yet to release its final decision on the Capital Expenditure Report.

As considerable time remains until AU1 expires on 30 June 2020, Queensland Rail has assumed for the purposes of the opening RAB value for AU2 that it will meet its capital expenditure estimates during the term.

2.5.4 Opening common network RAB value AU2

In determining the opening asset value, Queensland Rail has not revisited debates related to the approval of AU1, and has accepted the QCA 2016 Final Decision on the West Moreton RAB.

The AU2 RAB has been rolled forward in accordance with clause 1.1 of Schedule E of AU1. It includes:

- the opening asset value of $254.5 million, for the system from Rosewood to Columboola, as at 1 July 2013;
- addition of $16 million coal only sidings and balloon loop;
- for the three years preceding the commencement of AU1 (2013-14 to 2015-16), capital expenditure as submitted/forecast to the QCA; and
- assume the capital allowance and forecast for 2016-17 to 2019-20.

The resulting RAB opening asset value for the West Moreton common network for the AU2 regulatory period is $419.8 million as at 1 July 2020. See Figure 5 below.

[7] The QCA included an estimate of the capital expenditure likely to be spent over the period 1 July 2013 to 30 June 2020, with the Capital Expenditure Reports the process used to convert estimated expenditure to actual expenditure.

Figure 5: Waterfall of West Moreton RAB from AU1 to DAU2

The parameters for the calculation are summarised in **Table 2** below.

Table 2: RAB Parameters

Parameter Method	
CPI Indexation	The AU1 RAB is rolled-forward each year and escalated in line with actual inflation: 2013-14—3.22% 2014-15—1.51% 2015-16—1.49% 2016-17—1.83% 2017-18—1.71% For 2018-19 onwards, the RAB has been rolled forward using a forecast inflation of 2.5%, which is the midpoint of the Reserve Bank's target range for inflation and Queensland Rail's inflation forecast for AU1 and AU2.
Depreciation	Consistent with the approach applied in the QCA's AU1 Final Decision, straight line depreciation based on QCA Asset Class endorsed lives and 35 year rolling life for identified capex streams.
Capital Expenditure Actual	Capital expenditure is included as forecast in AU1. Ongoing capex claims are subject to prudency assessments as part of the capital claim process

Table 3: Asset Roll Forward—Rosewood to Columboola

	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Opening asset value	270,552[8]	284,073	304,333	325,227	349,398	373,818	398,230
Capex	12,926	24,771	26,033	28,783	30,066	27,708	25,278
Inflationary gain	8,917	4,483	4,727	6,230	6,237	9,690	10,270
Less Depreciation	(8,322)	(8,994)	(9,865)	(10,842)	(11,883)	(12,985)	(13,993)
Closing asset value	284,073	304,333	325,227	349,398	373,818	398,230	419,784

[8] Includes addition of $16 million coal only assets 2013-14

2.5.5 Opening allocated coal network RAB value AU2

The Opening Asset Value used to determine West Moreton System reference tariffs is an allocation of the common network value held in the RAB.

For AU1, the QCA determined the allocations for coal traffics on the system as presented in **Table 4**.

Table 4: Assets/Capex Allocators by Year

	2013-14—2014-15	2015-16	2016-17 to 2019-20
Pre-1995	56.2%	57.3%	58.4%
1995-2007	68.1%	69.5%	70.8%
2007-2013	68.1%	69.5%	70.8%
2013-14—2014-15	68.1%	69.5%	70.8%
2015-16—2019-20	68.1%	69.5%	70.8%
Coal-only	100.0%	100.0%	100.0%

Applying the AU1 allocations to the common network RAB produces an effective coal Opening Asset Value of $288.6 million as at 1 July 2020.

2.5.6 Changes to the train path allocation in DAU2

In DAU2, for the purposes of the allocator groups, Queensland Rail has not applied the QCA's 87 weekly return train path restriction on coal services through the Metropolitan System. **Table 5** below shows the weekly train paths available assumed in AU2. Queensland Rail has not applied an 87 train path restriction right through the AU1 and will not apply it during DAU2.

Under the QCA Act Queensland Rail is required to negotiate in good faith for available capacity and has done so throughout AU1, and will continue to do so during DAU2. Queensland Rail currently has combined contracted plus access path requests exceeding the current 97 weekly return coal path constraint on the Toowoomba Range and depending on the outcome of the New Acland Stage 3 mine development may need to consider West Moreton System infrastructure expansions to cater for all the planned coal tonnage.

Advice received from the Department of Transport and Main Roads (**TMR**) prior to the QCA's 2016 AU1 final decision was that the restriction did not apply. Additionally, Queensland Rail had not been applying the restriction. Queensland Rail has been ready, willing and able to contract up to 97 return coal train paths per week on the West Moreton System to the Port of Brisbane in addition to trains originating from Ebenezer. Queensland Rail has requested written confirmation from TMR that there is no 87 return coal train path restriction in the Metropolitan System for Queensland Rail to provide to the QCA to give the QCA comfort that no such restriction exists, or existed during AU1's term.

Queensland Rail will also lodge a draft amending access undertaking for AU1 to clarify that there is no 87 weekly return path restriction on coal services through the Metropolitan System in AU1 or AU2. In its Final Decision, the QCA assessed there was an actual effective West Moreton System capacity of 113 return paths[9].

[9] QCA Final Decision, Queensland Rail's Draft Access Undertaking (June 2016), p 154

Pre-1995 Asset/Capital Expenditure is assessed based on the determined available coal capacity in the system over the potential system capacity while newer assets are assessed against the effective system capacity.

Table 5: Weekly Return Train Paths Available

Train type	QCA Allocations in 2016 Final Decision (2016 onwards) [10]	AU2 (2020 onwards)
Coal – West Moreton to Port	80	97
Coal – Metro to Port (contracted)	7	0
Other	14	14
Passenger	2	2
Unallocated	10	
Total	113	113

The revised allocators against the common network costs for coal traffics on the system are presented in **Table 6**.

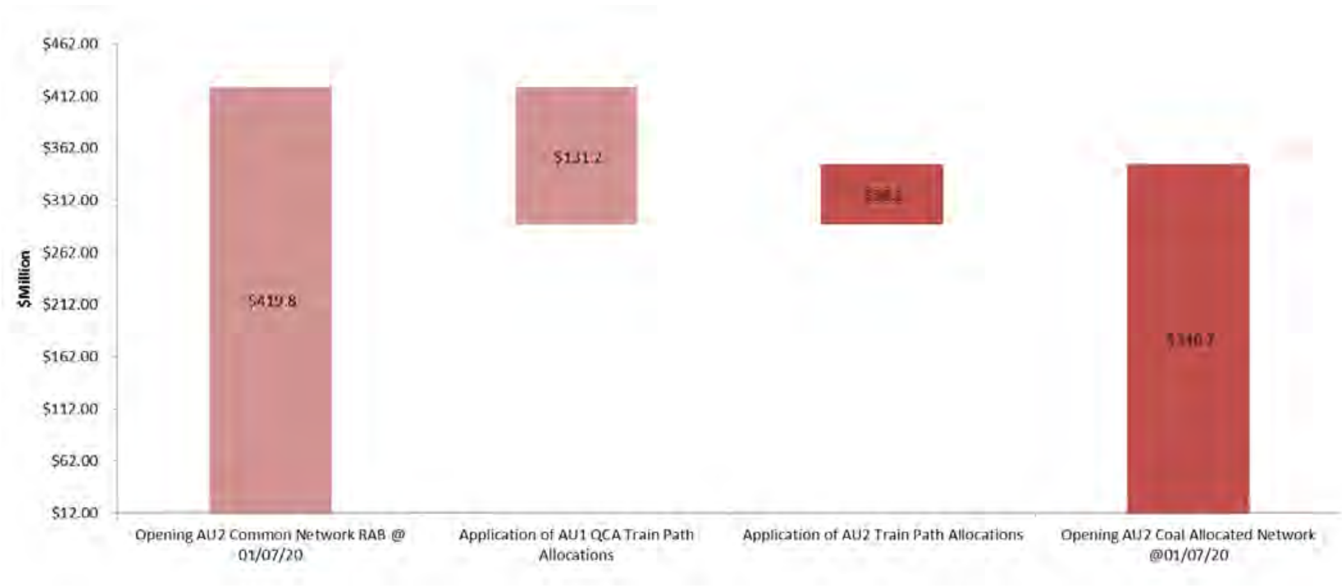
Table 6: Revised Allocators by Year

Allocators by year groups—Assets/Capex	2020-21 to 2024-25
Pre-1995	70.8%
1995—2007	85.8%
2007—2013	85.8%
2013-14—2014-15	85.8%
2015-16—2019-20	85.8%
Coal-only	100.0%

Applying the revised allocations to the common network RAB produces a new effective Opening Asset Value of $346.7 million as at 1 July 2020. The changes from the Opening AU2 RAB value to the Opening AU2 Coal Allocated Network value as a result of changes to the allocators is shown in **Figure 6**.

[10] This incorrectly includes an 87 return train path restriction through the Metropolitan System which Queensland Rail will seek to address through a draft amending access undertaking during AU1's term.

Figure 6: Changed Allocators—Allocated Regulatory Asset Base—Rosewood to Columboola



2.6 Weighted Average Cost of Capital (WACC)

2.6.1 WACC consistency with QCA UT5 Draft Decision

A key issue in relation to the development of DAU2 is to determine what is an appropriate WACC[11] rate for Queensland Rail's network. Notably, the QCA has recently released (December 2017) its Draft Decision (**UT5 Draft Decision**) on Aurizon Network's draft access undertaking (**UT5**).

The QCA's approach to WACC (including the core WACC formula and basis on which individual parameter estimates are derived) has been consistent for some time and has not changed despite significant expert opinion and argument submitted by Aurizon Network.

Queensland Rail has sought to minimise debate with respect to allowed returns by accepting the QCA's UT5 Draft Decision WACC methodology, save to update the Asset Beta and associated Equity Beta and Debt/Equity ratio (discussed below). However, if the QCA determines that a change in methodology is now appropriate, Queensland Rail may seek to make further submissions to the effect that any changes also apply to DAU2.

Additionally, Queensland Rail has chosen not to reset the time variant inputs from the UT5 Draft Decision numbers, as these numbers will vary between now and when they are set at the DAU2 approval time, likely to be in early 2020.

[11] Weighted Average Cost of Capital (WACC) is the minimum return on existing assets required to satisfy creditors, owners, and providers of capital. Combined with the regulatory asset value, the WACC determines the allowable return on assets, which forms part of the efficient cost of providing regulated services.

2.6.2 Asset Beta: Queensland Rail and Aurizon Network risk profiles

Section 168A of the QCA Act allows for access prices to generate expected revenue for the service that is at least enough to meet the efficient costs of providing access to the service and include a return on investment commensurate with the regulatory and commercial risks involved.

In using the UT5 Draft Decision WACC parameters, Queensland Rail has made one key exception, which relates to the systematic risk faced by Queensland Rail (i.e. the Asset Beta). While we use the same methodological approach as the QCA to estimate the cost of equity, through the Sharpe-Lintner CAPM formulation, Queensland Rail considers its systematic risks are very different to those faced by Aurizon Network. Queensland Rail has a very different business profile to Aurizon. The QCA recognised such differences in its 2014 draft decision on DAU1:

> *"However, the QCA notes there are also significant differences between the entities that suggest that Queensland Rail's risks are unlikely to be less than those faced by Aurizon Network. In particular, Queensland Rail:*
>
> *(a) is more exposed to movements in the economy as it is subject to a price cap. In contrast, Aurizon Network has revenue certainty through its revenue cap*
>
> *(b) obtains revenues from only two coal mines (Cameby Downs and New Acland) on the western system. In contrast, Aurizon Network's revenue is from around 50 mines and over 15 companies across the CQCR*
>
> *(c) provides for the transport of relatively low-margin thermal coal, where one mine has recently closed (Wilkie Creek). In contrast, Aurizon Network transports a large proportion of higher-margin coking coal and its coal traffic has not traditionally been related to Australian (or Queensland) economic and stock market cycles."*[12]

In AU1 Queensland Rail did not seek a separate review of its Asset Beta, but rather assumed the same Asset Beta as Aurizon. For DAU2 to estimate a suitable return that is commensurate with Queensland Rail's regulatory and commercial risks, Queensland Rail sought expert advice from Frontier Economics (refer **Attachment 2** for this advice).

Frontier followed a standard process for asset beta estimation, consistent with the approach that the QCA adopts for the services it regulates. Namely, an asset beta is estimated by combining estimates from a set of benchmark comparators for Queensland Rail's business. In performing these calculations, Frontier adopts the Conine approach to re-levering, using gamma, tax, and debt beta estimates commensurate with the QCA's most recent decisions. Since Queensland Rail's business is fundamentally different from the operation of the Central Queensland Coal Network in a number of respects relevant to systematic risk, Frontier has adopted a set of comparator businesses that differs from that used by the QCA for Aurizon Network.

As the QCA is aware, there are few very close comparators to Queensland Rail's business in Australia, or indeed in other jurisdictions. A set of comparators is therefore chosen based on matching one or all of the following key characteristics:

- Be a transport infrastructure operator;
- Be used to transport a mix of bulk freight and other kinds of freight;

[12] *QCA Draft Decision on Queensland Rail's 2013 Draft Access Undertaking October 2014, p. 143*

- Have a reasonably small number of larger customers;
- Be exposed to competition in some or all components of the business; and
- Be exposed to changes in demand from changes in global commodity prices.

Further explanation on the significance of these factors is provided in Frontier's report. Frontier's key conclusions in relation to the choice of comparators is that:

- other railroads, and ports are likely to be the closest comparators to Queensland Rail;
- airports are next closest;
- the pipeline and toll road sectors are somewhat less comparable; and
- the regulated electricity and water sector are least comparable, sharing no key risk-based features with Queensland Rail.

Frontier notes that while each of railroads, ports, airports, pipelines and toll roads potentially add relevant information to a beta estimation, it would not be wise to rely solely on any one set of comparators. Rather, each can contribute some relevant information to the task of estimating systematic risk for Queensland Rail, which will vary according to how many of Queensland Rail's key characteristics are shared with the comparator set. Weightings are developed to weight the contribution of the particular comparators, and while there is clearly a degree of judgement exercised, there is clear evidence that the asset beta should be set well above the figure adopted for the Central Queensland Coal Network.

Frontier concludes that the appropriate asset beta, based on comparators in the ports, railroads, airports and toll roads industries, is determined to be 0.77 when applying a methodology consistent with that accepted by the QCA. That is, Frontier obtained, for each potential comparator, the equity betas for the period May 2008 through to April 2018, and for the period May 2013 through to April 2018; this allows estimation of asset betas over a 5-year and 10-year window. These are de-levered according to the QCA's Conine approach.

Frontier then estimates the equity by re-levering the asset beta estimate of 0.77, again consistent with the QCA's Conine approach. Applying a benchmark gearing of 28 per cent, obtained in a manner consistent with the asset beta estimate, yields an equity beta of 0.98 under standard QCA assumptions regarding debt beta and gamma. The lower gearing used somewhat offsets the higher asset beta so that the equity beta of 0.98 is proportionally closer to the 0.8 previously used than is the prior asset beta. Please refer to **Attachment 2** for more details on the methodology and results of the Frontier Economics analysis.

Queensland Rail recognises that its proposed equity beta is higher than in its previous undertaking. However, Queensland Rail considers that the beta proposed is a more genuine reflection of its higher systematic risks – which have been borne out in recent times through highly variable flows on its network.

Table 7: DAU2 WACC Parameters

WACC Parameters	DAU2[13]	Comment
Capital Structure (% Debt)	28%	As per Frontier Economics Independent Expert advice
Debt Beta	0.12	As per QCA precedent on Aurizon UT5
Debt Rating	BBB+	As per QCA precedent on Aurizon UT5
Debt Margin incl. Refinancing	2.23%	As per QCA precedent on Aurizon UT5
Risk Free Rate	1.90%	As per QCA precedent on Aurizon UT5
Market Risk Premium	7.00%	As per QCA precedent on Aurizon UT5
Gamma	0.46	As per QCA precedent on Aurizon UT5
Corporate Tax Rate	30%	As per QCA precedent on Aurizon UT5
Inflation Rate	2.50%	As per QCA precedent on Aurizon UT5
Asset Beta	0.77	As per Frontier Economics Independent Expert advice
Equity Beta	0.98	As per Frontier Economics Independent Expert advice
Cost of Equity	8.76%	
Cost of Debt	4.13%	
WACC (Vanilla Post—Tax)	7.47%	

2.7 Capital Expenditure

2.7.1 Context

The West Moreton System's historical origins present continuing challenges for its operation. The West Moreton System was initially constructed on black soil plains with no engineered formation; resulting in regular failures requiring reconstruction to ensure suitable track geometry is maintained.

Early track standards have resulted in an alignment that is lower than contemporary standards for stand-alone heavy haul railway built specifically for coal carrying services. As a consequence of the System's age and track standard, the section between Rosewood and Miles in particular requires a higher level of intervention than would be required for a more modern, stand-alone heavy haul railway in order to safely and reliably deliver contracted tonnages.

The age and history of the West Moreton System, particularly the relationship between capital expenditure, maintenance and the value of assets was considered expensively as part of the QCA's approval of AU1—including approval of the RAB. While Queensland Rail has been slowly upgrading the quality of the track through the capital program, the same capital expenditure and maintenance issues associated with the history of the system still drive the capital and maintenance requirements for DAU2.

For the DAU2 period, Queensland Rail has proposed what it considers to be efficient maintenance costs for the West Moreton Network having regard to the age and condition of the system, and the volumes proposed to be hauled over a system that was not originally designed for this purpose.

[13] Time variant measures have not been updated post the UT5 QCA Draft Decision.

2.7.2 Proposed capital expenditure 2.1 mtpa and 9.1 mtpa

Queensland Rail has proposed 25 capital expenditure projects for the West Moreton System over the DAU2 period. Given the volume uncertainty, two capital expenditure estimates are provided reflecting the expected difference in costs for project that are tonnage dependent.

The two proposed capital expenditure forecast for the DAU2 period, both excluding interest during construction (IDC) are:

- $144.495 million ($2020-21) to support the movement of 2.1 mtpa.
- $159.384 million ($2020-21) to support the movement of 9.1 mtpa.

Attachment 3 —*West Moreton System DAU2 Capital Expenditure 2020-21 to 2024-25* provides the full detail for Queensland Rail's capital expenditure proposal.

Table 8 and **Table 9** show the proposed capital expenditure summary by corridor and year for the movement of 2.1 mtpa per annum of coal and 9.1 mtpa of coal. These are the total forecast capital expenditure for all common network assets to be used by coal train services, before allocation between coal and non-coal services.[14]

Table 8—Proposed capital expenditure 2.1 mtpa by year and corridor ($2020-21 million), excluding IDC

Corridor	2020-21	2021-22	2022-23	2023-24	2024-25	Total
Rosewood—Jondaryan	$20.878	$20.747	$12.460	$12.265	$7.158	$73.508
Jondaryan—Columboola	$15.163	$9.835	$14.454	$13.670	$17.864	$70.986
Total	**$36.041**	**$30.582**	**$26.914**	**$25.936**	**$25.022**	**$144.495**

Table 9—Proposed capital expenditure 9.1 mtpa by year and corridor ($2020-21 million), excluding IDC

Corridor	2020-21	2021-22	2022-23	2023-24	2024-25	Total
Rosewood—Jondaryan	$22.808	$23.067	$16.621	$17.440	$8.461	$88.397
Jondaryan—Columboola	$15.163	$9.835	$14.454	$11.058	$20.476	$70.986
Total	$37.971	$32.902	$31.075	$28.498	$28.937	**$159.384**

Queensland Rail has proposed that the capital expenditure projects identified in this submission be included in the capital indicator for DAU2 noting that, consistent with the drafting of DAU2, the efficient actual capital expenditure will be included in the RAB after the QCA has reviewed the commissioned projects for prudency of scope, scale and cost.

[14] It should be noted that the Queensland Government's investment to increase the height of tunnels on the Toowoomba range has not been included in this submission, as the beneficiaries of this project will be agricultural transport, not coal transport.

Queensland Rail has also assumed that individual projects (including individual projects that are part of a larger program of works) will be completed within a single year, and as a result forecast expenditure is capitalised in the year it is spent.

2.7.3 Assumptions

The proposed capital expenditure for the DAU2 period has been developed in the context of the *2018-19 West Moreton System Asset Management Plan* (AMP) which provides the strategic framework for planning capital and maintenance activities.[15]

While Queensland Rail has applied its asset management planning framework to assess the likely capital expenditure requirements for the DAU2 period, it is not possible to forecast the precise nature, amount and timing of renewals expenditure across the five year DAU2 period, particularly given the inherent uncertainty associated with the potential volume changes on the system.

Ultimately a level of asset manager judgement will be required to prioritise and plan the final asset renewal activities for DAU2, with projects to be affected by changes in tonne, asset condition and significant weather events. Queensland Rail may also need to change the indicative timing of capital works to support the efficient delivery of the capital program.

All Queensland Rail's capital expenditure projects, including for asset renewals, require the completion of a business case and these will be available for the QCA's review as part of the annual capital expenditure assessment process, when assets are commissioned. However, as some capital expenditure is not due to commence for some years, many projects have yet to have business cases developed and approved.

Options analysis has been considered at a high-level for projects, where it is technically feasible to do so. **Attachment 3** provides more detail for individual capital expenditure projects.

2.7.4 Capital expenditure, by project— 2.1 mtpa and 9.1 mtpa

Table 10 sets out the individual capital expenditure projects proposed for the DAU2 period for the 2.1 mtpa and 9.1 mtpa scenarios. Only three of the 25 capital expenditure projects proposed are considered to be tonnage dependent—these projects are for formation repair, track reconditioning and re-railing.

Table 10—Proposed DAU2 capital expenditure by project—2.1 mtpa and 9.1 mtpa ($2020-21 million), excluding IDC

Project Name	Tonnage dependent	Regulatory driver	2.1 mtpa	9.1 mtpa
Civil projects				
Timber Bridge Replacement	No	Asset Renewal	[redacted]	[redacted]
Formation Repairs	Yes	Asset Renewal	[redacted]	[redacted]
Culvert Replacement	No	Asset Renewal	[redacted]	[redacted]
Sub-total			***$63.570***	***$66.536***

[15] The current West Moreton Network Asset Management Plan is based on a continuation of the current tonnes, given the existing uncertainty about future volumes. Future plans will be amended as future coal tonnes on the West Moreton Network become more certain.

Track projects				
Track Reconditioning	Yes	Asset Renewal	[redacted]	[redacted]
Re-sleepering	No	Asset Renewal	[redacted]	[redacted]
Re-railing	Yes	Asset Renewal	[redacted]	[redacted]
Level Crossing Reconditioning	No	Asset Renewal	[redacted]	[redacted]
Concrete Sleepers With Gauge Issues On Tight Radius Curves	No	Asset Renewal	[redacted]	[redacted]
Level Crossing Transitions	No	Asset Renewal	[redacted]	[redacted]
Greasers Replacement / Upgrades	No	Asset Renewal	[redacted]	[redacted]
Sub-total			*$43.908*	*$55.832*
Signalling projects				
Trailable Facing Points Detection (Monitoring)	No	Service improvement	[redacted]	[redacted]
West Moreton Minor Signalling Renewals	No	Asset Renewal / Compliance	[redacted]	[redacted]
Signalling Pole Route Yarongmulu — Laidley	No	Asset Renewal	[redacted]	[redacted]
Level Crossing Signalling Upgrade	No	Asset Renewal / Compliance	[redacted]	[redacted]
Location Case Renewal	No	Asset Renewal / Compliance	[redacted]	[redacted]
Rangeview SER/PER Upgrade	No	Asset Renewal	[redacted]	[redacted]
Signalling LED Upgrade	No	Asset Renewal	[redacted]	[redacted]
Gatton Interlocking Renewal	No	Asset Renewal	[redacted]	[redacted]
Relay Interlocking Refurbishments	No	Asset Renewal	[redacted]	[redacted]
Sub-total			***$28.943***	***$28.943***
Telecommunications projects				
Replacement of Weather Stations	No	Asset Renewal	[redacted]	[redacted]
RMS Rollout	No	Asset Renewal / Compliance	[redacted]	[redacted]
Telecoms Rectifiers Regional	No	Asset Renewal / Compliance	[redacted]	[redacted]
Digital Telemetry Rollout	No	Asset Renewal / Compliance	[redacted]	[redacted]
Rangeview Cable Route Upgrade Copper to Fibre	No	Asset Renewal	[redacted]	[redacted]
Nera Microwave Refresh	No	Asset Renewal	[redacted]	[redacted]
Sub-total			***$8.073***	***$8.073***
Grand total			**$144.495**	**$159.384**

The projects proposed are primarily asset renewal projects. No growth projects are proposed for the DAU2 period based on either of the two scenarios.

Both the 2.1 mtpa and 9.1 mtpa scenarios included [redacted] for re-sleepering. Previously re-sleepering costs were treated as maintenance, however, Queensland Rail considers that re-sleepering activities which involve the periodic replacement of sleepers for track sections longer than 0.5 km is better defined as capital expenditure.

However, Queensland Rail has not included the costs of track lowering (ballast undercutting) in the proposed capital expenditure allowance. For the reasons outlined in the separate West Moreton Network DAU2 Maintenance Submission Queensland Rail does not consider that these costs meet the definition of an asset for the purpose of capital recognition.

Table 11—Proposed capital expenditure by year and project—2.1 mtpa ($20–21 million)

Project	2020-21	2021-22	2022-23	2023-24	2024-25	Total
Civil						
Timber Bridge Replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Formation Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Culvert Replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	***$12.435***	***$12.317***	***$12.781***	***$12.377***	***$13.660***	***$63.570***
Track						
Track Reconditioning	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Re-sleepering	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Re-railing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Level Crossing Reconditioning	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Concrete Sleepers with gauge issues on tight radius curves	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Level Crossing Transitions	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Greasers replacement / upgrades	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	***$16.505***	***$7.179***	***$5.348***	***$6.479***	***$8.397***	***$43.908***
Signalling						
Trailable Facing Points Detection (Monitoring)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
West Moreton Minor Signalling Renewals	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]0
Signalling Pole Route Yarongmulu—Laidley	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Level Crossing Signalling Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Location Case Renewal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rangeview SER/PER Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Signalling LED Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Gatton Interlocking Renewal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Relay Interlocking Refurbishments	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	***$3.799***	***$7.010***	***$8.250***	***$6.919***	***$2.965***	***$28.943***
Telecommunications						
Replacement of Weather Stations	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Remote monitoring system rollout	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Telecoms Rectifiers Regional	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Digital Telemetry Rollout	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rangeview Cable Route Upgrade Copper to Fibre	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Nera microwave refresh	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	***$3.302***	***$4.077***	***$0.534***	***$0.160***	-	***$8.073***
Total	**$36.041**	**$30.582**	**$26.914**	**$25.936**	**$25.022**	**$144.495**

Table 12—Proposed capital expenditure by year and project—9.1 mtpa ($2020–21 million)

Project	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Civil						
Timber Bridge Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Formation Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Culvert Replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	*$13.028*	*$12.910*	*$13.374*	*$12.971*	*$14.253*	*$66.536*
Track						
Track Reconditioning	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Resleepering	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rerailing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Level Crossing Reconditioning	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Replace concrete sleepers on tight radius curves	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Level Crossing Transitions	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Greasers replacement / upgrades	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	*$17.842*	*$8.906*	*$8.916*	*$11.061*	*$9.107*	*$55.832*
Signalling						
Trailable Facing Points Detection (Monitoring)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
West Moreton Minor Signalling Renewals	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Signalling Pole Route Yarongmulu—Laidley	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Level Crossing Signalling Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Location Case Renewal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rangeview SER/PER Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Signalling LED Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Gatton Interlocking Renewal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Relay Interlocking Refurbishments	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	*$3.799*	*$7.010*	*$8.250*	*$6.919*	*$2.965*	*$28.943*
Telecommunications						
Replacement of Weather Stations	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Remote monitoring system rollout	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Telecoms Rectifiers Regional	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Digital Telemetry Rollout	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rangeview Cable Route Upgrade Copper to Fibre	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Nera microwave refresh	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	*$3.302*	*$4.077*	*$0.534*	*$0.160*	-	*$8.073*
Total	$37.971	$32.902	$31.075	$28.498	$28.937	$159.384

Timber bridge replacement

Continuation of the timber bridge replacement project is the largest single capital expenditure project proposed for the DAU2 period.

The majority of existing bridges in the West Moreton System are rated to 15.75 tonne axle load (**tal**). These bridges were originally designed for 12 tal (Imperial) or B16 steam locomotives. The bridges from Rosewood to Miles have been assessed with respect to their suitability to the axle configuration of existing traffic and loading of consists. The desktop assessment has shown that, under the existing loadings, these bridges are operating at the limit of their capability. With the current gross tonnages on the West Moreton System, timber bridges are incurring high maintenance costs, increased closure requirements and carry an elevated risk of derailment compared to concrete and steel alternatives.

The timber bridge replacement project is part of an ongoing program to replace timber bridges across West Moreton System. Queensland Rail is proposing to replace timber bridges predominantly with prestressed concrete or steel. This is being undertaken to replace close-to-life-expired bridges with more durable infrastructure, to extend the life of the asset.

Timber bridges are prioritised for replacement based on a risk ranking. The ranking takes into consideration the defects in the bridge, tonnage over the bridge, temporary speed restrictions and priorities of the structures inspectors.

Timber bridge replacement on the West Moreton System is at a 200A standard (20tal), consistent with the West Moreton System Asset Management Plan. This is a key difference in the capital project over the DAU2 period, relative to AU1, where prior to the Australian Government's announcement to proceed with the Inland Rail project in May 2017, bridges were designed to a 300A (30tal) standard.

Maintenance cost savings from the timber bridge replacement program are being reflected in the proposed structures maintenance budget for DAU2, with proposed expenditure on this asset class to be more than 50 per cent lower in real terms from 2015–16 to 2024–25.

Formation repairs and track reconditioning

Queensland Rail is proposing [redacted] ($2020–21) for the 2.1mtpa scenario and [redacted] ($2020–21) for the 9.1mtpa scenario (around [redacted] of proposed capital expenditure proposal) to undertake formation repairs and track reconditioning. These two projects are ongoing and are a function of the original railway construction between 1865 and 1880, which was not designed to be a heavy haul railway.

Treatment of re-sleepering/track lowering (ballast undercutting)

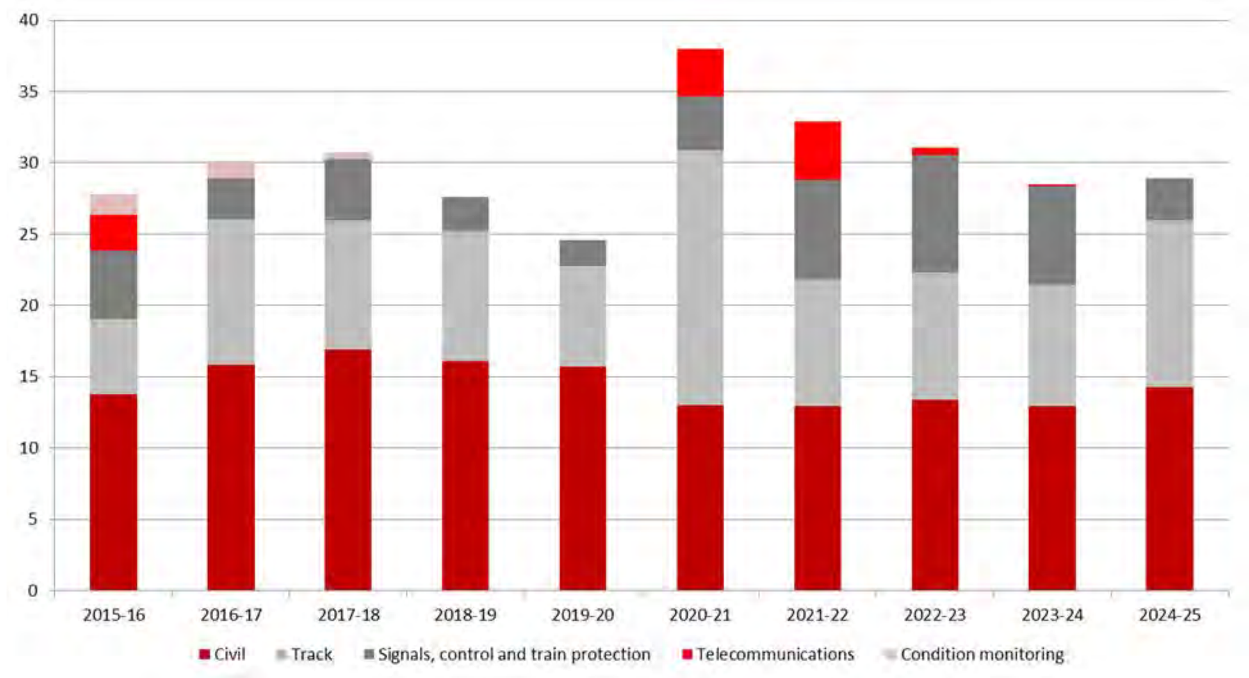
Capital expenditure proposed for both the 2.1 mtpa and 9.1 mtpa scenarios include [redacted] ($2020-21) for resleepering, noting that this expenditure was treated as maintenance in the consideration of AU1 costs. Re-sleepering is proposed for inclusion as capital expenditure for the DAU2 period, consistent with the asset definition set out in Queensland Rail's *Specification—Capitalisation of Expenditure—MD12-376.*

2.7.5 Comparison to capital expenditure in AU1

Proposed capital expenditure of $144.495 million ($2020-21) for the 2.1 mtpa scenario for DAU2 is 3 per cent higher than the capital expenditure allowance for 2015-16 to 2019-20 $140.876 million ($2020-21), noting that this includes $12.248 million for resleepering. Compared to AU1, capital expenditure on structures is proposed to be $14.8 million ($2020-21) lower. Capital expenditure for signals, control and train protection equipment for the DAU2 period is $9.6 million ($2020-21) higher (50 per cent) than for 2015-16 to 2019-20, largely to replace life expired assets.

Proposed capital expenditure of $159.384 million ($2020-21) for the 9.1 mtpa scenario for DAU2 is 13 per cent higher than the capital expenditure allowance included for AU1 of $140.876 million ($2020-21). The comparison of capital expenditure 2015-16 to 2019-20 to the proposed DAU2 capital expenditure is shown in **Figure 7**.

Figure 7:—Proposed capital expenditure AU1 and DAU2, by year and function—9.1 mtpa ($2020-21, million)



2.7.6 Independent peer review

The projects presented in this document have been subject to an internal peer review process.

Queensland Rail also engaged GHD to undertake a review of its proposed capital expenditure for the DAU2 period (refer **Attachment 4**). GHD selected six capital projects for review—timber bridge replacement, track reconditioning, re-sleepering, re-railing and West Moreton Minor Signalling Renewals. These projects represent at least 62 per cent of proposed capital costs over the DAU2 period and a 50:50 mix of throughput-driven and throughput-independent projects.

In respect to scope, GHD concluded that:

> *"Based on the documentation and our site visit, we consider the scopes that Queensland Rail has proposed for the five civil-related projects to be prudent.*
>
> *We consider that there may be justification for more work to be undertaken during the DAU2 period that Queensland Rail proposes to bring the network up to a satisfactory condition; this is particularly the case in relation to work for Track Reconditioning, Formation Repairs and Re-sleepering. Our position has been informed in a substantive way by our site visit, where we observed, among other things, deteriorated formation in certain locations, excessive track vertical movement, mud holes and vegetation in track beds. The section of infrastructure requiring most attention in relation to these issues is the eastern part of the Toowoomba Range (within Rosewood to Jondaryan).*

> *Considering the above, we have not recommended amending the scope of works proposed for the six capital projects. In our view, there is unlikely to be a case to reduce the work scopes."* [16]

In respect to the unit rate of the sampled projects, GHD concluded that:

> "*The assessment of the composition and quantum of the unit rates underlying the five projects is central to our analysis of the efficiency of Queensland Rail's capital expenditure proposal. Our underlying assumption has been that the unit rates that Queensland Rail has achieved over the last three years (where available) result in efficient costs. We consider this an appropriate assumption because our analysis revealed that the costs of consumables (e.g. rail, sleepers and ballast) reflect very competitive prices, based on our internal and external benchmarking, and that labour costs are in keeping with Queensland Rail's relevant wage-related agreements with staff members*."[17]

GHD also noted that:

> "*…Queensland Rail has demonstrated that it has strong buying power in relation to the purchase of rail, sleepers and ballast. When we undertook our benchmarking of unit rates achieved for these three items, we observed that Queensland Rail would often achieve unit rates that were at least 10% lower than indicated by our in-house database and our experience with industry. In this context, we consider it appropriate to acknowledge that Queensland Rail has used its dominant position of a provider of below-rail services in Queensland to seek economies of scale in its purchasing decisions of materials.*"[18]

2.8 Depreciation

Queensland Rail has proposed retaining the asset lives approved by the QCA for AU1 and will apply straight line depreciation based on its assumed asset lives as shown in **Table 13**.

Table 13: West Moreton System asset lives

Asset Lives	Years
Track (inc Turnouts)	35
Roads	38
Fences	20
Signals	20
Bridges	100
Tunnels	100
Culverts	100
Earthworks	100
Other	20
Land acquisition costs	50
Telecommunications	20
Land	0

[16] GHD, Peer review of Queensland Rail's proposed capital expenditure for DAU2 (July 2018), pp 1-2
[17] GHD, Peer review of Queensland Rail's proposed capital expenditure for DAU2 (July 2018), p 2
[18] GHD, Peer review of Queensland Rail's proposed capital expenditure for DAU2 (July 2018), p 2

Consistent with Queensland Rail's previous approach, land is not depreciated.

2.9 Maintenance expenditure

2.9.1 Proposed maintenance expenditure 2.1 mtpa and 9.1 mtpa

Queensland Rail is proposing two potential maintenance cost forecasts for the DAU2 period:

- $101.825 million ($2020–21) to support the movement of 2.1 mtpa—see **Table 14**.
- $140.921 million ($2020–21) to support the movement of 9.1 mtpa—see **Table 15**.

Table 14: West Moreton coal maintenance costs—DAU2 ($2020–21 million)—2.1 mtpa

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Track	$16.426	$16.461	$16.498	$16.536	$16.576	$82.497
Structures	$2.719	$2.517	$2.322	$2.112	$1.884	$11.553
Trackside systems	$1.467	$1.467	$1.467	$1.467	$1.467	$7.337
Facilities/other	$0.088	$0.088	$0.088	$0.088	$0.088	$0.438
Total	**$20.700**	**$20.533**	**$20.374**	**$20.202**	**$20.015**	**$101.825**

Table 15: West Moreton coal maintenance costs—DAU2 ($2020–21 million)—9.1 mtpa

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Track	$23.975	$24.049	$24.126	$24.207	$24.293	$120.649
Structures	$2.953	$2.717	$2.496	$2.286	$2.044	$12.497
Trackside systems	$1.467	$1.467	$1.467	$1.467	$1.467	$7.337
Facilities/other	$0.088	$0.088	$0.088	$0.088	$0.088	$0.438
Total	**$28.483**	**$28.321**	**$28.177**	**$28.048**	**$27.891**	**$140.921**

Attachment 5—*West Moreton System DAU2 Maintenance Costs 2020-21 to 2024-25* provides the full detail for Queensland Rail's maintenance expenditure proposal.

2.9.2 2018-19 West Moreton System maintenance budget—6.25 mtpa

The DAU2 maintenance cost estimates for the 2.1mtpa and 9.1mtpa scenarios are based on Queensland Rail's 2018-19 coal maintenance budget for the West Moreton System. Section 2.9.2 discusses how the 2018-19 maintenance budget has been amended to estimate the 2.1mtpa and 9.1 mtpa maintenance cost forecasts.

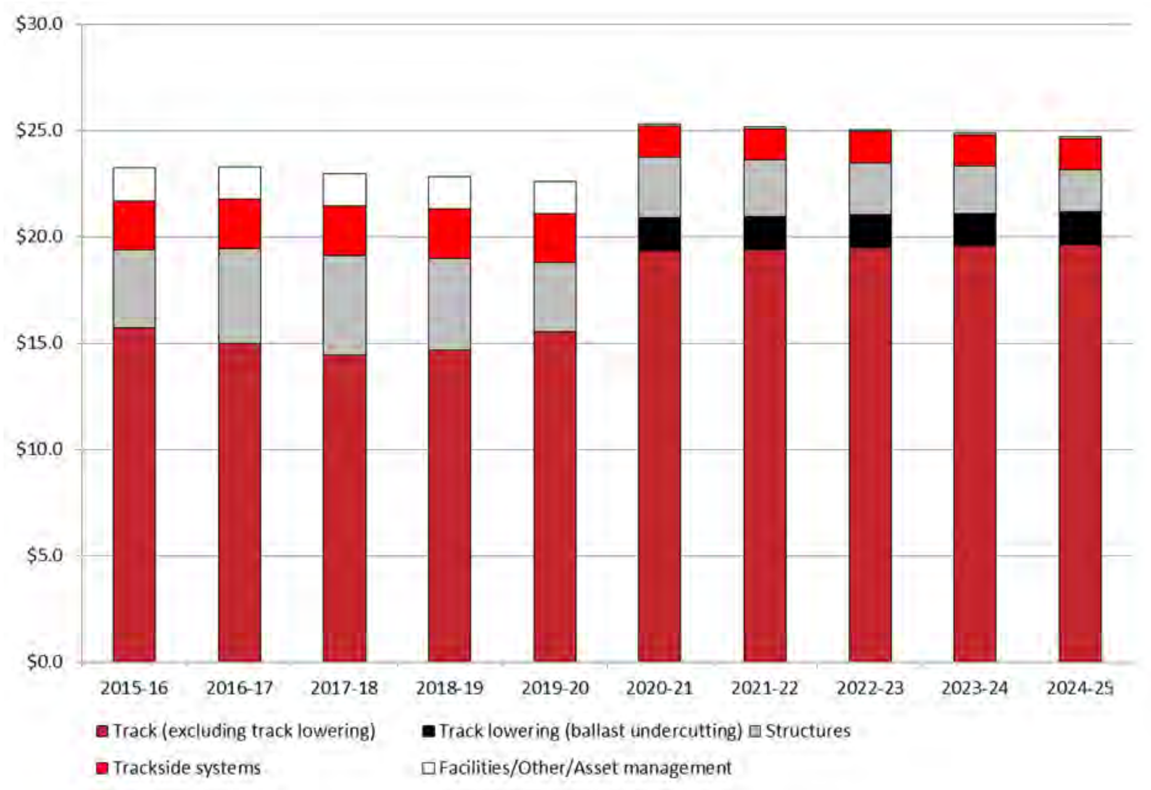
Queensland Rail is proposing to apply the 2018–19 West Moreton System maintenance budget as the representative 'base year' to estimate the efficient costs to support 6.25mtpa of coal haulage.[19] It is assumed that the coal tonnes to be moved in 2018-19 are 6.25mtpa on the Rosewood-Jondaryan corridor and 2.1mtpa on the Jondaryan-Columboola corridor (the 6.25mtpa scenario).

[19] The 2018-19 maintenance estimate also includes maintenance for non-coal traffic (e.g. grain and livestock), plus two return Westlander services per week, which is assumed to remain constant regardless of changes in coal tonnages moved on the West Moreton Network.

The 2018-19 maintenance budget has been amended to reflect the maintenance forecast to continue to provide 6.25mtpa for the period 2020-21 to 2024-25. As shown in **Figure 8**, if the West Moreton System was to continue to haul 6.25mtpa for the DAU2 period, maintenance costs are estimated to be, on average 8.7 per cent higher per annum in real terms than the AU1 maintenance allowance approved by the QCA.[20]

However, if the effect of re-including $1.5 million per annum ($2020-21) in ballast undercutting costs in the DAU2 maintenance allowance is excluded, DAU2 maintenance costs for a 6.25mtpa are forecast to be an average 2 per cent per annum higher over the DAU2 period.

Figure 8: Comparison of West Moreton coal maintenance costs—DAU2 ($2020-21 million)—assuming constant tonnes (6.25 mtpa)



There is also a difference in the allocation of costs between the Rosewood—Jondaryan corridor and Jondaryan—Columboola corridor between AU1 and DAU2 for the 6.25mtpa scenario.

For AU1, total maintenance costs for the West Moreton System were split by each corridor's forecast percentage of gtks operated on the system. For DAU2, with the use of the Enterprise Asset Management System (**EAMS**) and the capacity to more definitely identify maintenance by corridor, the allocation of maintenance costs is proposed to be amended to reflect the location of forecast costs by corridor.

[20] The AU1 maintenance estimates excluding mechanised resleepering in 2015-16 and which have been proposed as capital expenditure for the DAU2 period.

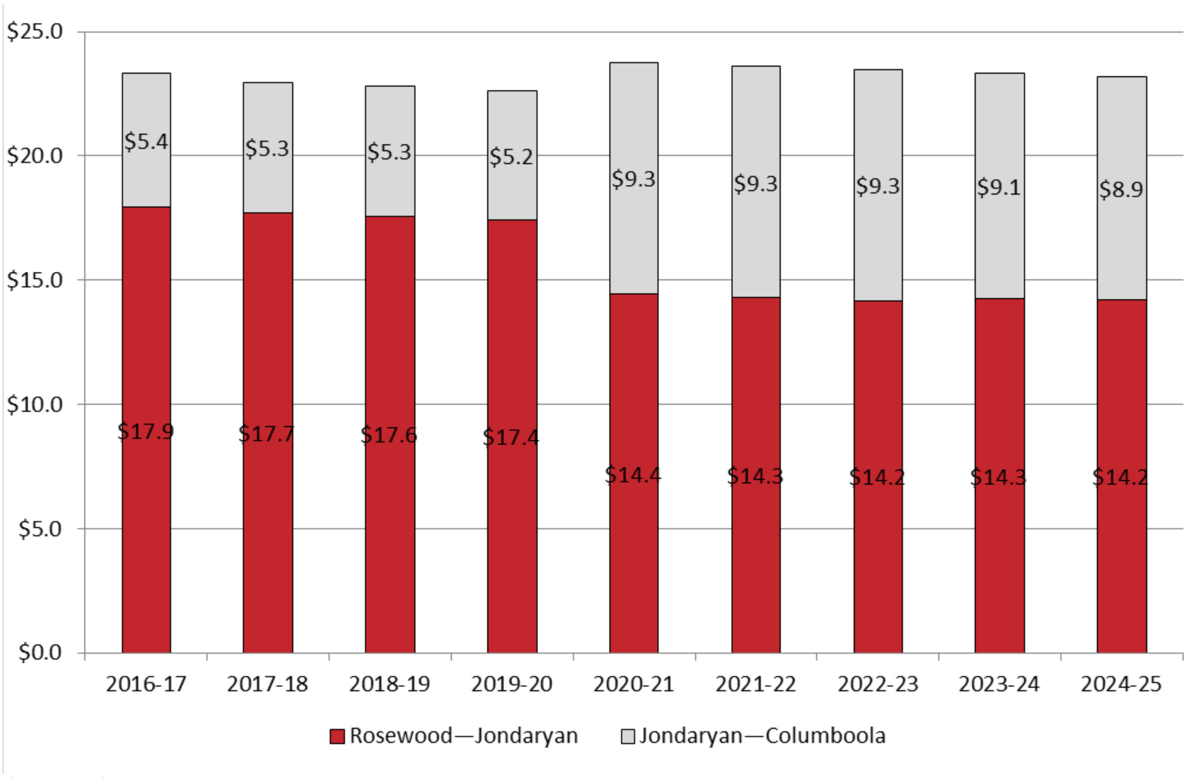
The percentage allocation of costs by corridor for AU1 and DAU2 is shown in **Table 16**, while **Figure 9** shows total maintenance costs split between the two corridors. The difference in cost allocation between the two corridors impacts the maintenance forecast for DAU2, as only the Rosewood—Jondaryan corridor changes with tonnes.

Table 16: West Moreton total coal maintenance, allocation by corridor, AU1 and DAU2 6.25 mtpa

Corridor	AU1—% of gtks	DAU2—Forecast corridor maintenance
Rosewood—Jondaryan	76—79%	61%
Jondaryan—Columboola	21—24%	39%

Note: The variable costs for AU1 maintenance costs are changed for Endorsed Variation Events and Review Events

Figure 9: West Moreton maintenance costs by corridor—AU1 maintenance allowances and proposed DAU2 maintenance allowances ($2020–21 million) (6.25mtpa)



Source: Queensland Rail

Figure 9: West Moreton maintenance costs by corridor—AU1 maintenance allowances and proposed DAU2 maintenance allowance ($2020–21 million) (6.25mtpa)

2.9.3 Tonnage forecast impacts

One of the key issues for estimating maintenance costs for the DAU2 period has been developing a methodology to estimate the impact of two quite different tonnage scenarios operating over the system (i.e. 2.1mtpa and 9.1mtpa).

While Queensland Rail has had some history with the movement of between [redacted] mtpa in 2011-12 and 2012-13 (which is closer to the 9.1 mtpa scenario), there is no comparable history for a 2.1 mtpa scenario.

However, extensive consideration was given to the fixed and variable proportion of maintenance costs on the West Moreton System for the AU1 process.

The QCA estimated the fixed and variable proportions of Queensland Rail's maintenance activities based on its consultant's assessment of tonnage dependent maintenance activities. Queensland Rail has also reviewed the extent to which each of its activities are tonnage or non-tonnage dependent and applied the QCA estimates to forecast the extent to which maintenance activities would need to increase or decrease based on the changed tonnes.

The QCA's fixed costs percentages were applied to the Rosewood—Jondaryan section, using the 6.25mtpa scenario as the base. No change was made to the Jondaryan—Columboola section, which is assumed to carry 2.1 mtpa under both scenarios.

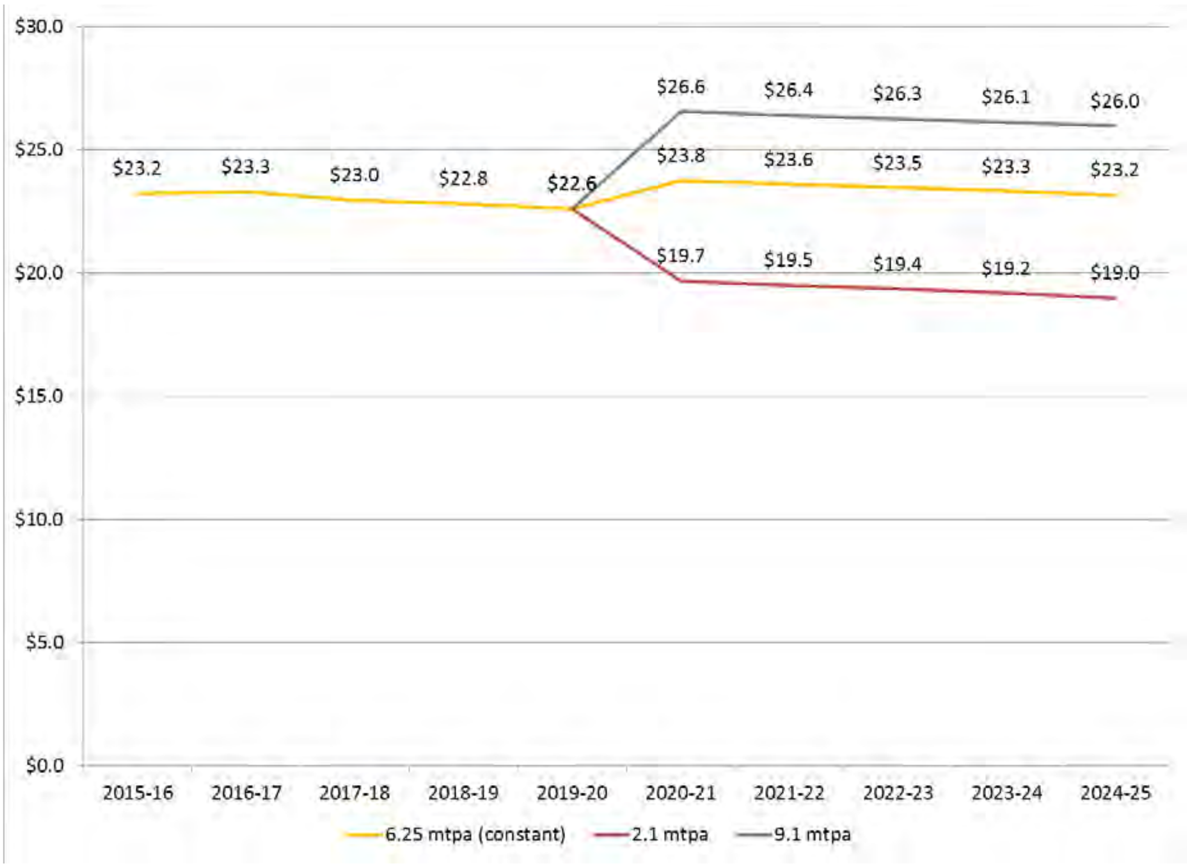
Applying the QCA's fixed cost estimates provides a weighted average fixed to variable split of 54.4 per cent fixed and 45.6 per cent variable for the DAU2 period. The fixed proportion estimated for DAU2 is lower than the QCA's estimate for AU1, with the ratio of 57.3 per cent fixed and 42.7 per cent variable.

Queensland Rail engaged GHD to review the reasonableness of the QCA's fixed and variable splits for individual maintenance activities on the West Moreton System. GHD's 'bottom up' assessment of Queensland Rail's maintenance costs, by activity, generates a 62 per cent fixed/38 per cent variable split.

In the interests of reaching agreement on the methodology for adjusting the 6.25 mtpa scenario to derive the 2.1 mtpa and 9.1 mtpa scenarios, Queensland Rail has adopted the QCA estimates for the tonnage dependent maintenance activities. Given the conclusions of the GHD report, Queensland Rail considers that using the QCA's approach is reasonable for the circumstances.

Figure 10 shows the effect of applying the QCA's fixed allocations to the 6.25mtpa constant tonnes scenario, and makes a comparison to the AU1 QCA allowances.

Figure 10: AU1 maintenance allowance and proposed DAU2 maintenance allowance (excl. ballast undercutting), by tonne scenario ($2020-21 million)



The forecast decline in real costs over the DAU2 period for all scenarios is driven by maintenance cost reductions for timber bridges as bridges are progressively replaced through the capital program.

The 2.1 mtpa scenario is 17 per cent lower over five years than the 6.25 mtpa tonnes scenario, while the 9.1 mtpa scenario shows a 12 per cent increase. To provide a 'like for like' comparison, to AU1, the effect of re-including track lowering (ballast undercutting) in the maintenance allowance has been excluded.

2.9.4 Independent peer review

Queensland Rail engaged GHD to undertake a review of its current expenditure for the West Moreton System (refer **Attachment 6**), which is used as the base for forecasting maintenance for the DAU2 period. GHD reviewed eight of Queensland Rail's major maintenance activities—mechanised resurfacing; top and line spot resurfacing; ballast undercutting (track lowering); rail renewal; rail joint management; sleeper management; maintenance ballasting; and rail stress adjustment. GHD estimated that in 2018-19, these eight activities account for more than 40 per cent of Queensland Rail's total costs on the West Moreton System.

GHD's review of Queensland Rail's maintenance costs concluded that:

> *"Our findings are that, overall, Queensland Rail's maintenance activities and practices reflect prudent and efficient outcomes. Key observations from our site visit are that parts of the network that Queensland Rail had earmarked for maintenance in the near future do indeed require the maintenance work that Queensland Rail plans to undertake for them, hence fulfilling the prudency requirement. Our assessment of, where the data were available, machinery performance, use of shifts and unit rates for raw materials support the position that Queensland Rail is achieving efficient maintenance outcomes for its West Moreton network.*
>
> *In conclusion, we find that Queensland Rail's existing practices for maintaining its railway reflect prudent and efficient outcomes, and that this translates to its cost proposals for the 2.1 Mtpa and 9.1 Mtpa scenarios over the DAU2 period reflecting prudent and efficient outcomes."*[21]

2.10 Operational expenditure

Queensland Rail has proposed operating expenditure of $48.717 million ($2020-21) for the DAU2 period for both the 2.1 mtpa and 9.1 mtpa scenarios (see **Table 17)**. Of this, 39 per cent of the total operating expenditure proposed is for train control.

Table 17: West Moreton proposed DAU2 operating costs—DAU2 ($2020–21 million)—2.1 mtpa and 9.1 mtpa

	2020–21	2021–22	2022–23	2023–24	2024–25	Total DAU2
Train Control	3.832	3.832	3.832	3.832	3.832	19.158
Corporate Overhead	1.451	1.451	1.451	1.451	1.451	7.257
Other	4.460	4.460	4.460	4.460	4.460	22.302
Total	**9.743**	**9.743**	**9.743**	**9.743**	**9.743**	**48.717**

2.10.1 Methodology for development of DAU2 operating expenditure

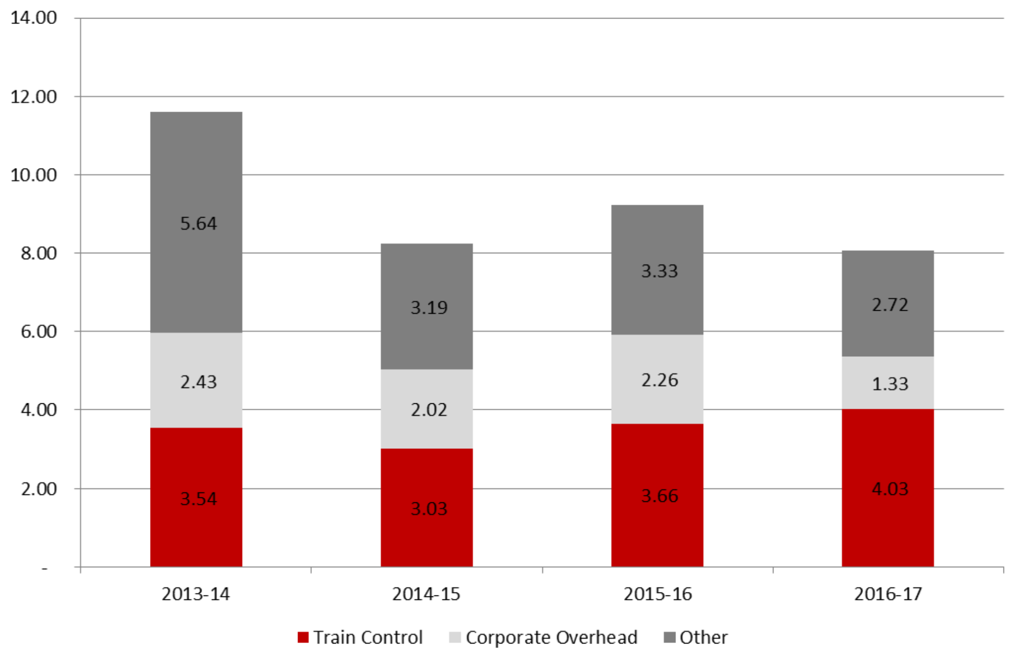
Queensland Rail has proposed the use of its actual operating expenditure allocated to the West Moreton System in the 2016-17 Below Rail Financial Statements as the base for estimated operating costs for the DAU2 period. The exception is for train control costs, which have been estimated by applying a 'bottom up' costing methodology (see discussion below).

The 2016-17 Below Rail Financial Statements were prepared consistent with the QCA approved Queensland Rail Costing Manual 2017.

Queensland Rail considers that 2016-17 represents an efficient base year for the development of operating cost allowances, with operating expenses showing a decrease in costs, with corporate efficiency measures implemented during 2012-13 and 2013-14. **Figure 11** shows Queensland Rail's operating expenses from 2013-14 to 2016-17.

[21] GHD, Peer review of Queensland Rail's proposed maintenance expenditure for DAU2 (July 2018), p.1

Figure 11: Queensland Rail operating expenses 2013–14 to 2016–17 ($ million, nominal)



Source: Queensland Rail Below Rail Financial Statements, 2013–14 to 2016–17
Note: Reported train control costs include operations administration costs (formerly referred to as Corridor Management and Planning & Systems in the 2015 DAU process).

Table 18 shows the cost build up for the proposed DAU2 operating expenditure, including the adjustments made from the 2016-17 Below Rail Financial Statements. The adjustments proposed to the 2016-17 actual operating expenditure are:

- Actual 2016-17 train control costs have not been used as the base for proposing the train control costs for DAU2. The proposed train control costs for DAU2 have been developed using a 'bottom-up' methodology, as set out below.
- Train operations management—operations administration has been included in 'Other expenses' for the presentation of the proposed DAU2 operating expenditure.
- The allocated QCA fee of $7,625 is excluded from other regional costs in 2016-17, as these costs are recovered separately through the QCA levy. (For the Below Rail Financial Statements, QCA fees are allocated based on total gtks across the Queensland Rail network. This is different to the methodology approved by the QCA for the recovery of the QCA Levy from train services based on a 'beneficiary pays' principles).
- $387,625 (75%) is excluded from the telecommunications backbone costs to reflect the notional allocation of telecommunications costs between above and below rail services.

Table 18: Comparison of DAU2 proposed operating expenditure, $2016-17 to Total West Moreton operating expenses 2016-17 Below Rail Financial Statements

	Proposed operating expenditure 2016-17	Costs excluded	Total West Moreton Operating Expenses 2016-17 BRFS
Train Operations Management			
Train Control	3,498,200	75,234	3,573,434
Operations administration	456,225	-	456,225
Sub-total	***3,954,175***	***75,234***	***4,029,409***
Other Expenses			
Business management	601,829	-	601,829
Infrastructure administration	744,705	-	744,705
Other regional (allocated)	687,175	7,629	694,804
Other (unallocated)	165,577	-	165,577
Telecommunications backbone	129,208	387,625	516,833
Sub-total	***2,328,495***	-	***2,723,749***
Corporate Overhead	**1,325,047**	-	**1,325,047**
Total Operating Expenses	**7,607,966**	**470,487**	**8,078,204**
Return on Buildings, Plant, Software & Inventory			
Buildings (excluding land and stations)	3,371,058		
Plant	9,947,843		
Software	688,610		
Current Inventory	2,779,066		
Non-Current Inventory	448,823		
	17,235,399	Asset value as at 30 June 2017	
WACC Estimate	7.47%		
Total Return on Buildings, Plant, Software & Inventory	**1,287,484**		
Grand Total	**8,895,451**		

The 2016-17 operating expenditure has been indexed by actual inflation for 2016-17 and 2017-18 and forecast inflation of 2.5 per cent per annum to derive the $2020-21 proposed DAU2 operating expenditure.

Train control

The proposed DAU2 train control costs are 58 per cent higher than those approved by the QCA for inclusion in reference tariffs for the AU1 period.

Queensland Rail's train control function for the southern part of regional Queensland (Supply Chain South Train Control, located in the Brisbane CBD) is located separately to the train control of the suburban passenger network for SEQ (the Rail Management Centre), which is located at Bowen Hills. The clear separation of the two control centres is longstanding and pre-dated the separation of QR Ltd into Queensland Rail and Aurizon.

Supply Chain South Train Control is responsible for train control for the West Moreton System (west of Rosewood), South West System, Western System, and North Coast Line (South). Train control responsibilities included for the West Moreton System are:

- Train control (two control boards cover the West Moreton System and are operated 24/7, 365 days per year).
- Operational planning, including Daily Train Plans/Master Train Plan and possession planning.
- Network performance monitoring and miscellaneous network safety issues.

QCA's assessment of train control costs for AU1

For AU1, the QCA decided that Queensland Rail's proposed train control costs for the West Moreton System were too high.

However, in forming this view, it appears that the QCA only took into consideration the costs of operating two train control boards for the West Moreton System—with it unclear whether other costs, such as supervision of train controllers or related planning functions were included. Specifically, for AU1 the QCA's consultants B&H Strategic Services Pty Ltd (B&H) appears to have only taken into consideration actual controllers only as the base for making a comparison of Queensland Rail's costs:

> *QCA reported benchmark of 1 train controller per 200,000 train kilometres. Parameter suggests 11 to 12 train controllers (2,309,602/200,000). If each train controller costs $150,000 with on costs, train control should be approximately $1.6 million to $1.8 million*
>
> *Bottom up derivation requires 24/7/365 operation with 2 controllers for each shift requiring 11 controllers (200 shifts per year) plus training, say 14 controllers, costs approx. $2.1 million.*[22]

Queensland Rail notes that while B&H cited other train control benchmarks including ARTC and Westnet there is insufficient information to suggest B&H considered costs beyond the direct costs of operating train control boards.

B&H also questioned the use of Queensland Rail's reported costs as a practical method of establishing a broad budget, and that above rail costs may have been included in the estimate.

> *"The weakness of the approach lies in the accuracy of the recorded costs and we suggest in some instances above rail 'train control' has been included in the recorded and reported costs".*[23]

[22] B&H, Review of the Queensland Rail (QR) West Moreton System Maintenance Costs Capital Costs (Capex), Operations Costs, Depreciated Optimised Replacement Cost (DORC) for the Queensland Competition Authority (May 2014), p 50
[23] B&H, (May 2014), p 53

Queensland Rail notes that the separation of the train control centres and the strict cost allocation for the Below Rail Financial Statements make it extremely unlikely that any above rail train control costs would have been included in Queensland Rail's costs.

B&H recommended reducing Queensland Rail's proposed allowance from $2.8 million ($2012-13) to $2.0 million ($2012-13). However, B&H suggested that Queensland Rail could present a bottom up budget for train control costs, expressed in terms of workload and resources required.[24]

Queensland Rail submitted revised train control costs of $2 million ($2012-13), which reflected the B&H recommendation to the QCA.

Build-up of DAU2 train control costs

For DAU2, Queensland Rail has undertaken a 'bottom-up' assessment of its train control costs, with proposed costs of $3.861 million ($2020-21). The estimated train control resources attributed to the West Moreton System are set out in **Table 19** in $2016-17**.** These costs have been escalated to $2020-21 at 2.5 per cent per annum.

Table 19: West Moreton proposed DAU2 operating costs—DAU2 ($2016-17 million)—2.1 mtpa and 9.1 mtpa

Function	No.	Cost	On-costs	Total West Moreton
Far West Network Control Officer (NCO)	[redacted]	[redacted]	[redacted]	[redacted]
West Network Control Officer (NCO)	[redacted]	[redacted]	[redacted]	[redacted]
Train Control Supervisor	[redacted]	[redacted]	[redacted]	[redacted]
Network Planning and Performance	[redacted]	[redacted]	[redacted]	[redacted]
Consumables	[redacted]	[redacted]	[redacted]	[redacted]
Total				**3,498,200**

Notes:

1. West NCO covers Rosewood to Toowoomba (Willowburn), Far West NCO covers Toowoomba (Willowburn) to Quilpie.
2. Six full time equivalent (FTE) NCOs are required for each control board to run a full shift rotation. This takes into account the operation of the boards 24/7 plus allowing for training and other non-control time.
3. Train Control Supervisors in the Supply Chain South Train Control Centre oversee [redacted] NCOs per shift, including the Far West and West train control board. The equivalent of [redacted] FTE supervisors has been allocated for the West Moreton System.
4. [redacted] FTEs work in Supply Chain South Train Control responsible for Network planning, possession and operational planning (including development of the DTP/MTP), allocation of maintenance locomotives and network performance. One safety co-ordinator is also in this establishment. 40 per cent of the costs of these FTEs are allocated for the West Moreton System.

The 'bottom-up' assessment estimates train control costs of $3.498 million in 2016-17, with this number proposed for DAU2 rather than the $3.573 million for train control reported in the 2016-17 Below Rail Financial Statements.

[24] B&H, (May 2014), p 53

2.10.2 Estimated tonnage impact on operating costs for DAU2

Queensland Rail has proposed the same operating costs for DAU2 under both the 2.1mtpa and 9.1mtpa scenarios. Queensland Rail does not consider that the difference between having one mine or two mines hauling coal in the West Moreton System will materially change the operating costs of providing infrastructure services for the West Moreton System.

While Queensland Rail has applied the methodology used by the QCA for AU1 to allocate operating costs for the West Moreton System on an 82 per cent fixed and 18 per cent variable costs between coal and non-coal traffic, it has not used the variable factor to adjust costs for different tonnage levels. Queensland Rail does not consider that there will be a material change to operating costs at the different tonnes.

However, Queensland Rail considers that there are errors in the B&H approach to estimating the fixed and variable components for AU1. As an example, B&H estimated that 10 per cent of train control costs were fixed. To support this recommendation, B&H noted that:

> *"In Train Control for example, the "boards" used to manage a network can be split or amalgamated depending on the amount of traffic. Since Queensland Rail uses a centralised facility in Brisbane, it should be able to adjust resources as the traffic varies. For example, while the coal operations will remain at constant or increased levels during the middle of the night, the suburban operations will slow down and one could expect that the opportunity for flexible "board" operation would become apparent."*[25]

Queensland Rail considers that it will require two train control boards to be operated, regardless of whether 2.1 mtpa or 9.1 mtpa of coal are transported over the West Moreton System. A key factor in this consideration is the complexity of train control for train services traversing the Toowoomba and Little Liverpool Ranges, as well as managing the interface into the SEQ network at Rosewood, which does not provide the scope to remove a train control board, even in a lower tonne scenario. This is essential for both the efficient running of the network, as well as the safety of the network.

Further, contrary to the view expressed by B&H, Queensland Rail does not have a centralised train control facility that covers the regional and suburban networks. Further, train controllers must be trained to be 'route-specific', so it is not a case of simply handing over train control management to the suburban controllers when the passenger network has less traffic.

Queensland Rail also considers that the fixed percentages allocated to a range of functions were too low and underestimate the costs of providing the service, noting that for many functions there is limited scope to reduce costs due to a reduction in tonnage.

For example, B&H estimated that Queensland Rail's corporate overheads were 80 per cent fixed. Queensland Rail's corporate overheads include the costs of the CEO and Board, Finance and Human Resources. Queensland Rail does not expect that these costs would either increase or decrease from the current costs, due to a change in tonnes on the West Moreton System.

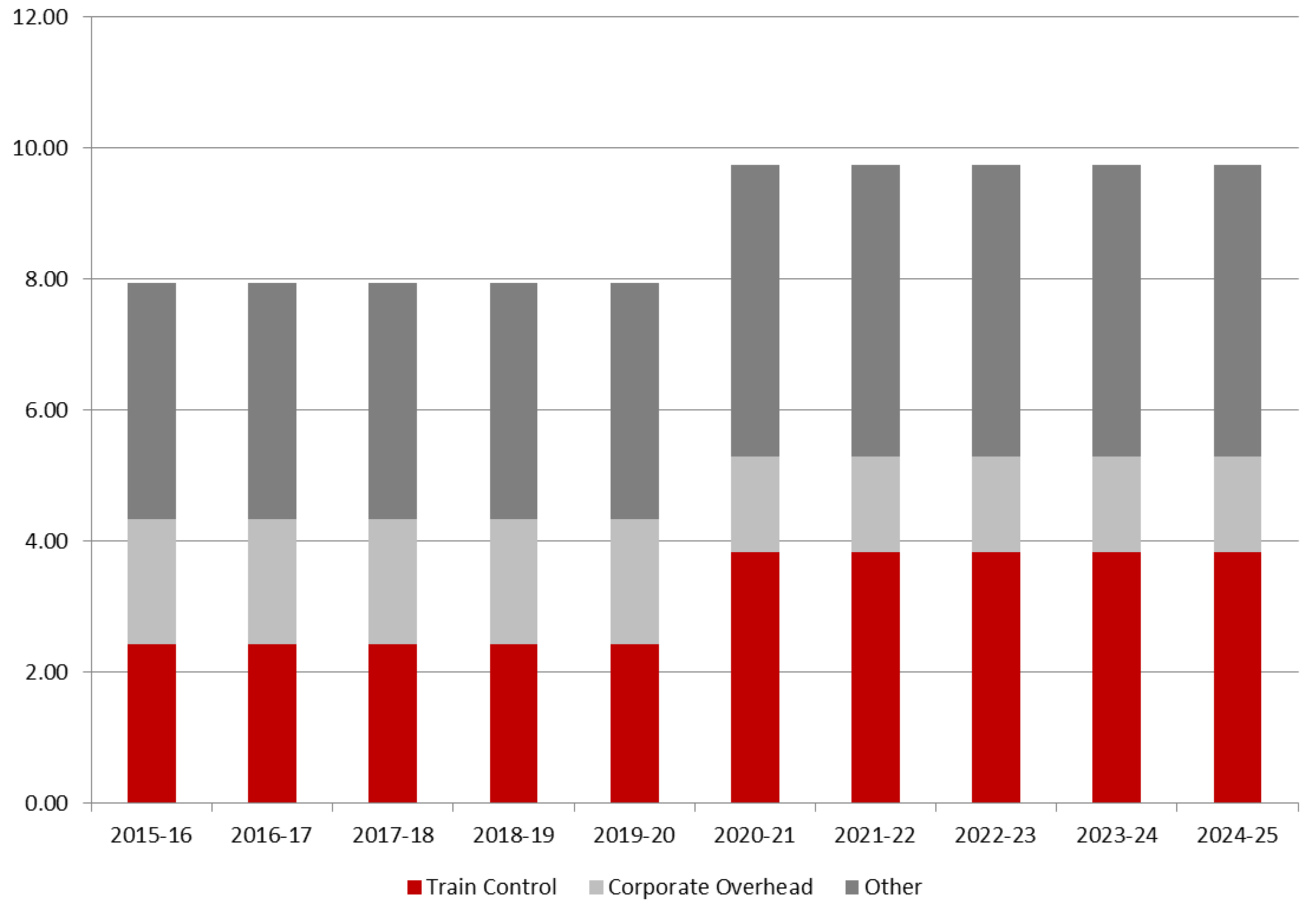
Similarly, business management costs which include budget development and business reporting, billing, development of the Queensland Rail access undertaking and contracting would not change materially for the volume of tonnes operating on the West Moreton System. B&H estimated that only 50 per cent of these costs were fixed. Queensland Rail considers there would be no material increase or decrease in these costs that would arise from an increase or decrease in tonnes.

[25] B&H, Review of Queensland Rail's DAU 2015 (Sept 2015), p 31

2.10.3 Comparison to AU1 operating expenditure allowance

The operating expenditure proposed for DAU2 is 23 per cent higher per annum in real terms than the annual operating expenditure allowance included in AU1 (see **Figure 12**).

Figure 12: West Moreton operating expenditure—AU1 operating expenditure allowance and proposed DAU2 operating expenditure allowance ($2020–21)



Working capital allowance

Queensland Rail has proposed no change to the methodology for the working capital allowance applied for AU1, forecast at 0.3 per cent of the proposed total revenue for the DAU2 period.

2.11 The DAU2 West Moreton coal reference tariff

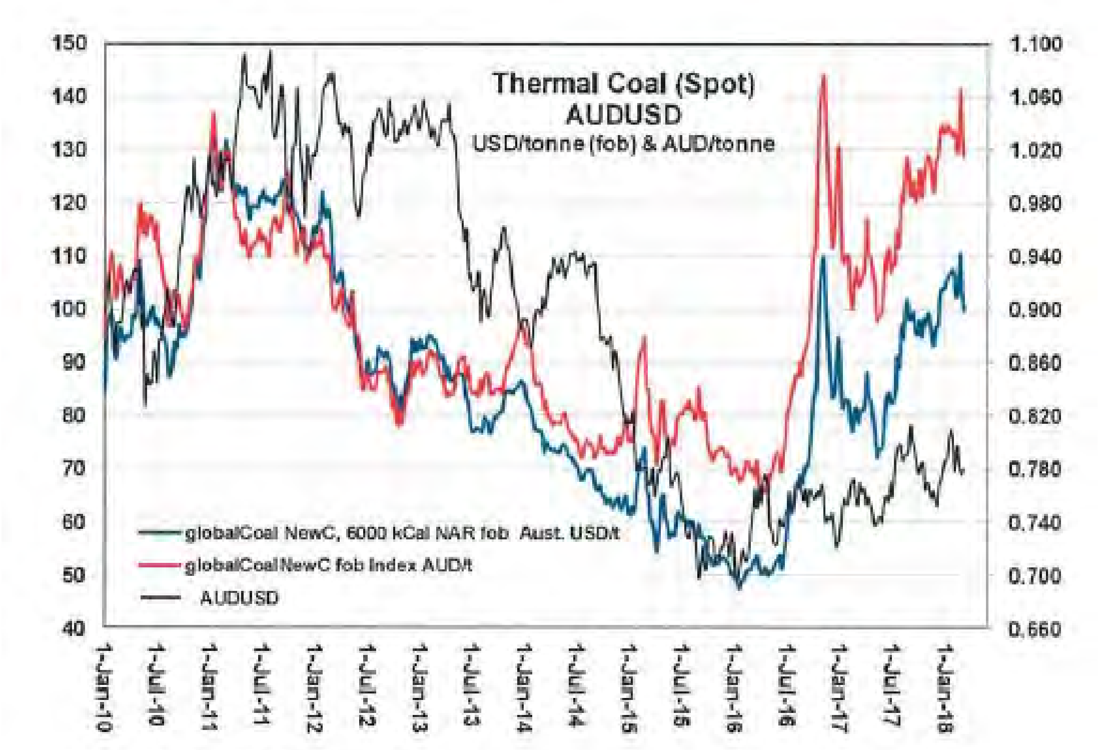
2.11.1 Introduction

Queensland Rail is developing the DAU2 reference tariffs during a time of considerable volume uncertainty (refer to section 2.4 of this explanatory document).

In contrast it is also an environment of high thermal coal spot prices, which encourages coal production. As shown in **Figure 13**, thermal coal spot prices have increased by approximately $70 (AUD) per tonne since the AU1 final decision in 2016. It is expected that the coal price will remain strong over the medium term driven by demand in Asian markets and a shift towards increased use of premium coals including Australian export thermal coals. AU1's West Moreton System reference tariffs were set at the bottom of the international coal pricing market.

[redacted]

Figure 13: Thermal Coal Spot Prices



Source: IHS, XE, Matau Advisory

2.11.2 Development of the reference tariffs

While there is currently considerable volume uncertainty, Queensland Rail believes that uncertainty is likely to decrease as the QCA Final Decision approaches.

Queensland has consulted with West Moreton stakeholders on its approach to the West Moreton coal reference tariffs. During this consultation, Queensland Rail committed to develop a reference tariff at 9.1mtpa, its higher tonnage forecast, and a ceiling tariff at 2.1mtpa, its lower tonnage forecast, for submission to the QCA for approval. This has involved preparing detailed capital, maintenance and operational programs at both forecast levels and seeking external peer review on the capital and maintenance programs from GHD.

Queensland Rail has adopted the QCA's precedent building blocks approach for the development of the reference tariffs, providing regulatory certainty and continuity for industry (see further details below).

The QCA approval of a reference tariff at 9.1mtpa will ensure New Hope and its Board have a clear pricing point at the higher tonnage level expected when New Acland Stage 3 is fully operational.

Queensland Rail does not intend to impose the ceiling tariff calculated for 2.1mtpa. However, the QCA approval of that tariff is important as it will identify the efficient cost of providing the below rail service at this tonnage level.

2.11.3 QCA Approval - 9.1mtpa reference tariffs

Queensland Rail seeks QCA approval for the following:

- West Moreton System coal reference tariff of: **$22.39/'000 gtk** ($2020-21) at 9.1mtpa; and
- Metropolitan System reference tariff of: **$18.13/'000 gtk** ($2020-21) at 9.1 mtpa.

Queensland Rail notes that the draft ceiling tariff at 2.1mtpa is:

- West Moreton System coal reference tariff of: **$52.58/'000 gtk** ($2020-21); and
- Metropolitan System reference tariff of: **$18.13/'000 gtk** ($2020-21).

In developing the above reference tariffs and draft ceiling tariffs, Queensland Rail has used the established QCA model and, except for the review of the Asset Beta, simply updated those inputs.

The key areas of growth in the reference tariffs compared to AU1 are in the following:

- general escalation from the AU1 starting period of $2016-17 to the DAU2 starting period of $2020-21;
- roll forward of the West Moreton System asset value from its opening value in AU1 of approximately $221 million to an opening value of $289 million in AU2 ($2020-21) (i.e. capital expenditure net of depreciation plus appreciation has increased the RAB by $68 million);
- uplift in the proposed WACC; and
- removal of the 87 weekly return train path restriction on coal services through the Metropolitan System.

2.11.4 2.1mtpa – Post lodgement consultation

As part of its consultation, Queensland Rail has agreed with Yancoal to postpone elements of Queensland Rail's DAU2 until post lodgement with the QCA to ensure full consultation with West Moreton stakeholders on these important matters. Matters for consultation include:

- seeking to negotiate a reference tariff for QCA approval with Yancoal for a 2.1mtpa scenario,
- a possible loss capitalisation model at the 2.1mtpa scenario; and
- the possibility of providing reference tariffs for QCA at pricing points between 2.1mtpa and 9.1mtpa.

On this basis, Queensland Rail has agreed with Yancoal not to include a reference tariff in DAU2 for the 2.1mtpa scenario, and to continue consultation post lodgement to seek to negotiate an appropriate reference tariff. Queensland Rail does not intend to charge the 2.1mtpa building block ceiling tariff, but rather intends to negotiate a reference tariff below the ceiling tariff.

Queensland Rail has provided the full 'building block' calculation of the 2.1mtpa ceiling tariff as part of this DAU2 explanatory document. However, Queensland Rail is not seeking approval of a 2.1mtpa ceiling tariff at this stage, and will make a further submission on this after stakeholder consultation (post DAU2 lodgement). However, to ensure transparency and meaningful discussions Queensland Rail has included the draft ceiling tariff at 2.1mtpa, with full capital and maintenance programs accompanied by peer reviews by independent engineering experts GHD. This will assist to facilitate informed discussions. DAU2 does include the reference tariff at 9.1mtpa for QCA approval.

Queensland Rail understands that Yancoal will write to the QCA confirming its support for this approach. This need for additional consultation with West Moreton System stakeholders has arisen out of the unique circumstances around the DAU2 coal reference tariff development. Queensland Rail is considering the following options, subject to the outcome of consultation:

(1) Loss Capitalisation at the lower tonnage forecast:

To the extent that negotiated reference tariffs will not permit Queensland Rail to recover costs of maintaining and operating the network, Queensland Rail will consider, in consultation with industry, an additional mechanism to address that under recovery.

An approach that has been used by ARTC in the Hunter Valley, the ACCC for the NBN Co and Aurizon Network in Central Queensland is a '*loss capitalisation*' (catch-up) model where losses at low tonnages are capitalised and then recouped at higher tonnages.

Consultation with both Yancoal and New Hope indicated that they are willing to explore the concept further. Yancoal, in particular, has requested that Queensland Rail defer submitting a 'loss capitalisation' model to the QCA until further consultation takes place with the mines. Queensland Rail will also not seek approval for the 2.1mtpa ceiling tariff until after consultation, as the ceiling tariff may form part of any loss capitalisation approach.

(2) Setting reference tariffs at each 1mtpa increment between 2.1mtpa and 9mtpa

Queensland Rail will consider options that may result in QCA approved reference tariffs for each 1 mtpa increment between 2.1mtpa and 9.1mtpa. However, time is required to further develop this concept in conjunction with a potential loss capitalisation model and to consult with industry to avoid any unintended outcomes that may discourage growth.

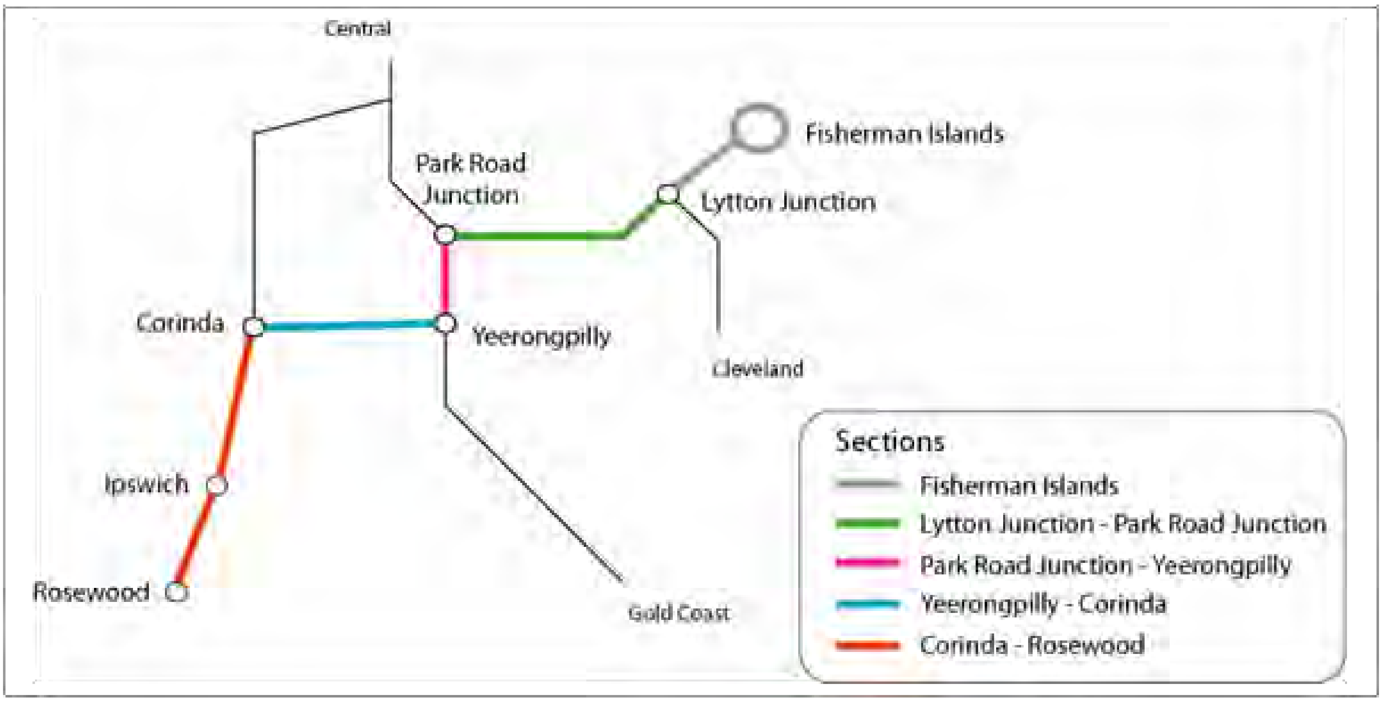
Queensland Rail will continue to work with industry on the access price at 2.1mtpa and the above matters.

3. Metropolitan System Reference Tariffs

3.1 Metropolitan System Characteristics

Coal carrying train services originating in the West Moreton System traverse Queensland Rail's Metropolitan System[26] along approximately 80 route kilometres from Rosewood to the Port of Brisbane (Fisherman Islands). They traverse the Ipswich, Beenleigh, Cleveland suburban lines and then the dedicated dual gauge freight and coal (from Lytton Junction) lines to reach Fisherman Islands. The Metropolitan System has a QCA approved reference tariff for coal carrying train services.

Figure 14: Metropolitan System Coal Route: Rosewood to Fisherman Islands (Port of Brisbane)



3.2 Metropolitan System Reference Tariff — 9.1mtpa

3.2.1 AU1 approach to the Metropolitan reference tariff

Fisherman Islands to Rosewood is dominated by metropolitan passenger services and hence the track quality is higher than that required for coal carrying train services. Assessing a cost for coal carrying train services for this section of track would be a sizeable task likely requiring a valuation, optimisation (in relation to track quality) and allocation (in relation to traffic type).

While previous Depreciated Optimised Replacement Cost (DORC) valuation exercises have been carried out on the Rosewood to Macalister and Macalister to Columboola sections, by both the QCA and QR Network, no such exercise has been attempted for Fisherman Islands to Rosewood. A valuation exercise would require a considerable amount of time and incur significant costs with the likely outcome

[26] The Metropolitan System means that part of the Network bounded to the north by (and including) Nambour station and to the west by (and including) Rosewood and including all branch lines comprised in that part of the Network. Coal trains travel on the System between Rosewood and the Port of Brisbane.

an appraisal appreciably more than that for assets west of Rosewood. Subsequent optimisation and allocation processes would act to reduce the magnitude of the DORC but would be complex and difficult to carry out.

To avoid this complexity, Queensland Rail had previously applied the coal reference tariff derived from Rosewood to Columboola building blocks to the entire route through to Fisherman Islands as this would see an appropriate contribution being made to costs and assets in the Brisbane Metropolitan System. That is, the West Moreton System was considered to be a reliable proxy of the cost for freight services and so was also applied to the Metropolitan System.

The proxy methodology means that the coal contribution to common costs on the Metropolitan System is based on costs assessed on a network where the specific costs that apply to coal services are easier to identify and assess (i.e. the West Moreton System). This is because, among other things, the West Moreton costs reflect coal's share of fixed costs and a share of the wear and tear (i.e. variable costs) that the coal trains originating in the West Moreton System impose on rail infrastructure.

In its 2016 Final Decision on AU1, the QCA decided that the reference tariff developed for the West Moreton System that would have applied from 1 July 2013 should apply to the Metropolitan network as well. From that date:

- CPI **was** to apply to the Metropolitan System reference tariff; and
- a separate Metropolitan System incremental capacity charge was to apply to recover coal-specific investment and a share of relevant freight-specific investment on the network.

The AU1 Metropolitan System reference tariff escalated to $2020-21 is **18.13/'000 gtk** expressed as a one part tariff. No coal-specific capital expenditure is anticipated to be spent for the AU1 period, so there is no incremental capital charge.

3.2.2 DAU2 Coal reference tariff — 9.1mtpa scenario

In its 2016 Final Decision on AU1, the QCA provided guidance as to how post AU1 access undertakings might develop a Metropolitan System reference tariff advising:

> *"The Metropolitan tariff will apply for the term of the undertaking. However, we also seek to give some guidance on the QCA's approach to the Metropolitan tariff more generally. What is said below does not predetermine our decision on any future DAU. Any such DAU will need to be (and will be) considered in accordance with the requirements of the QCA Act at the time it is submitted. However, a relevant matter for the purposes of our Decision is its impact on certainty. We consider that the following comments provide appropriate general guidance in that regard….*
>
> *….We envisage that a proxy methodology will continue to be appropriate, having regard to section 138(2), for deriving the Metropolitan tariff. Further, we acknowledge the broad support for the proxy or extension methodology and we anticipate it will continue to apply. As Queensland Rail said in its March 2016 submission, a proxy 'reflects an efficient and reasonable approach, particularly given the challenges in separately building up the cost structure for the Metropolitan Network'."*[27]

Queensland Rail considers that a continuation of a 'pure' proxy approach is the most appropriate for the Metropolitan System, i.e. the DAU2 West Moreton reference tariff should be extended across the

[27] QCA Decision on Queensland Rail's Draft Access Undertaking, June 2016, pp 173 & 174

Metropolitan System. A pure proxy reference tariff best estimates the changes in the efficient costs of providing the service.

However, Queensland Rail is pragmatically proposing the continuation of the AU1 methodology for the DAU2 Metropolitan System reference tariff at 9.1mtpa (Queensland Rail reserves its rights in relation to future access undertakings). On this basis, Queensland Rail is seeking that the QCA approve a Metropolitan coal reference tariff based upon a continuation of the same methodology as applied in AU1 of:

- **$18.13/'000 gtk** ($2020/21) as a one part tariff; or
- **$1,250.51/rtp** and **$9.07/'000 gtk** ($2020/21) for the two part tariffs to apply to Metropolitan System;

for coal tonnage levels of 9.1mtpa.

In proposing this approach, Queensland Rail notes the size of the gap that will arise between the Metropolitan System reference tariff and the West Moreton System reference tariff, if the QCA approves the reference tariff proposed for 9.1 mtpa.

Queensland Rail is not proposing coal-specific capital expenditure for DAU2 for the Metropolitan System.

3.3 Metropolitan System Reference Tariff — Other tonnages

During Queensland Rail's consultation process on the coal reference tariffs, Yancoal proposed that it is beneficial for all parties if Queensland Rail does not submit coal reference tariffs for lower tonnages at lodgement of the draft access undertaking. This is to allow further consultation with West Moreton stakeholders, and is reflective of the unique difficulties in developing reference tariffs in the DAU2 uncertain environment.

Queensland Rail is committed to meaningful consultation in relation to DAU2's development and agrees with Yancoal's suggestion. On this basis, Queensland Rail has not included Metropolitan System coal reference tariffs below the 9.1mtpa scenario with the lodgement of DAU2. A further submission will be made to the QCA once this consultation has concluded (refer to section 2.11 of this explanatory document for further information regarding this).

4.Standard Access Agreement (SAA)

4.1 Summary of changes to the SAA

The Standard Access Agreement proposed under DAU2 is familiar to current stakeholders and substantially the same as the Standard Access Agreement under the 2016 Access Undertaking. Only a small number of changes are being proposed and many of these arose through agreement during contract negotiations with customers.

The proposed changes to the 2016 SAA are set out in **Table 20**.

Table 20: Proposed Changes to the SAA

Clause	Changes	Rationale
Schedule D - Standard Access Agreement		
1.2, 1.3, 6.7(c), 8.8(b), 18.2(c) and Schedule 3 clauses 2.2 and 5.4(a).	**Deleted reference to good faith.**	The reference to 'good faith' has been deleted as the concept is not defined and is ambiguous and uncertain, particularly in relation to negotiation (as opposed to obligations of performance and enforcement mechanisms). Queensland Rail is required to act reasonably under clause 1.3 and, under clause 8.8(b), must use reasonable endeavours to minimise the impact of proposed amendments as contemplated under that clause. Under clause 18.2(c), Queensland Rail must also act reasonably. The obligation to negotiate in respect of renewals at clause 1.2(b) is retained, to reflect the QCA Act obligation to negotiate for access rights in good faith.
1.3(a)	**Amended clause 1.3(a) by including criteria for Queensland Rail to consider in relation to an amendment proposed by the access holder.**	By specifying the matters relevant to Queensland Rail's consideration of a productivity or efficiency variation, the amendment to clause 1.3(a) promotes certainty.
3	**Restructured for clarity.**	The clause has been restructured with provisions relating to the grant of operational rights and their nature and scope moved to the beginning of clause 3. Clause 3.3 has been amended to clarify drafting regarding its application to Subsequent Operators and simplify the signing process. These amendments reflect those agreed with access holders and Operators who have entered into a tripartite agreement since the AU1 Approval Date.
4.1(c)(i)	**Deleted reference to Subsequent Agreements.** **Amended Nominee Operator to Subsequent Operator**	These amendments have been made to clarify the drafting and refer to the correct defined term. These amendments reflect those agreed with access holders and Operators who have entered into a tripartite agreement since the AU1 Approval Date.
4.6	**Amended so that it is clear that the Operator who is a party to the agreement also provides the representations and warranties.**	Clause 4.6 has been amended to clarify that each party to the agreement (including the Operator) provides the relevant representations and warranties.

Clause	Changes	Rationale
5	**Amended to reflect rail safety legislation changes and clarify that only relevant information is required to be provided.**	Clause 5 has been amended to reflect changes to rail safety legislation and clarify that only relevant information is required to be provided.
7.3 and 8.4	**Deleted clause 7.3(f) and 8.4(d).**	Clauses 7.3(f) and 8.4(d) (requiring parties to notify each other of failures or likely failures to comply with the agreement) have been deleted as they do not reflect customary provisions in commercial contracts and are considered inappropriate. The amendments are reciprocal.
8.12	**Amended to include a control for a risk experienced on the Network Fixed typo in clause 8.12(b).**	Queensland Rail had proposed including an obligation on the Operator to inform Queensland Rail of any potential risks to the Network caused by adverse weather events. This was intended to reflect the obligations contained in operational procedures for an Operator's rail traffic crew to inform Queensland Rail Network Control of, in particular, water or flooding at or in the vicinity of the track. Queensland Rail accepts the feedback provided during consultation that this obligation was too broad and uncertain. Having regard to the fact that access agreements can be long term contracts, Queensland Rail considers it preferable for this obligation to be dealt with in operational documents. Clause 8.12 has been amended to fix a typo.
9.2	**Amended to clarify that changes to the IRMP can be made through the exchange of written notices.**	Clause 9.2 has been amended to clarify that changes to the IRMP can be made through the exchange of written notices by the parties and do not require formal variations to the access agreement. This removes an unnecessary administrative burden, and permits safety issues to be dealt with in an IRMP in an expeditious manner.
9.3	**Amended to reflect new rail safety legislation.**	Clause 9.3 has been amended to reflect the commencement of the *Rail Safety National Law (Queensland)* and the establishment of the Office of the National Rail Safety Regulator as the body responsible for rail safety regulation in Queensland.
9.10	**Amended to reflect changes in safety legislation.**	Clause 9.10 has been amended to reflect the commencement of the *Rail Safety National Law (Queensland)* and the establishment of the Office of the National Rail Safety Regulator as the body responsible for rail safety regulation in Queensland.
13.4	**Amended clause 13.4(a) to include Performance Levels in the liability limitation.**	The limitation of liability under clause 13.4(a) has been amended to include Performance Levels. Under the amended clause, Queensland Rail's liability in connection with failure to meet the Performance Levels is limited in the same way as other matters specified in the clause (such as Network standard or defects). Given the amendments to the Standard Access Agreement to enable more tailored and fit-for-purpose performance levels, performance levels are no longer specified in the Standard Access Agreement upfront but are subject to negotiation between the parties (and thus unknown). In these circumstances it is appropriate to extend the limitation of liability to Performance Levels. Following feedback received during consultation on proposed changes to the SAA, Queensland Rail has included the words 'except as set out in agreed Performance Levels', to clarify that the limitation of liability in clause 13.4 does not exclude any financially based sanctions agreed as part of a performance levels regime. The obligation on parties to monitor, record and assess performance against the Performance Levels has been retained in clause 6.7(f).

Clause	Changes	Rationale
15, 17	**Amended to address incoming ipso facto legislative amendments.**	Clause 15.1 has been included to make clear that clauses 15.2(c), 15.3(c), 15.4(a) and 15.5(a) are subject to relevant legislation and regulations regarding the enforcement of contractual provisions relating to insolvency events. Consequential amendments have been made elsewhere in clause 15 and 17.2.
Former 19.4	**Deleted to remove determination of safety matters by the Rail Safety Regulator.**	Former clause 19.4 has been deleted to reflect the commencement of the *Rail Safety National Law (Queensland)* and the establishment of the Office of the National Rail Safety Regulator as the body responsible for rail safety regulation in Queensland. ONSR has no jurisdiction to resolve disputes.
28	**Amended definitions to reflect changes in rail safety law.**	Certain definitions have been amended to reflect the commencement of the *Rail Safety National Law (Queensland)* and the establishment of the Office of the National Rail Safety Regulator as the body responsible for rail safety regulation in Queensland.
Schedule 1	**Amended in item 11 (Security Amount) to require at least six months' access charges.**	The change has been made to reflect Queensland Rail's risk exposure for the payment of access charges, relinquishment fees or other amounts payable and aligns with Security Amounts approved in other undertakings (e.g. Aurizon Network).
Schedule 3	**Remove references to 'good faith' at clause 2.2 and 5.4(a).**	

5. Changes to Pricing Rules

5.1 Pricing rules under AU1

Queensland Rail has a QCA approved reference tariff for coal services on the West Moreton and Metropolitan Systems. For all other traffics Queensland Rail negotiates access charges with access seekers, within prescribed pricing rules in the access undertaking. In summary the pricing rules set out in AU1, in their order of precedence, are:

- limits on price differentiation, i.e. no discrimination in favour of downstream operators, except to reflect differences in costs or risk of providing access;
- price limits, i.e. access revenue needs to fall within:
    - ceiling limit, which reflects the efficient cost of providing the service; and
    - floor limit, which reflects the incremental cost of providing access;
- network utilisation, where Queensland Rail may charge different rates for train service serving different markets to maximise commercial viability; and
- revenue adequacy, which states that access charges and transport service payments should generate revenue that is at least enough to meet efficient cost of providing access, including a return on investment.

5.2 Summary of proposed changes

Queensland Rail is proposing the following changes to the existing pricing rules:

- amend renewal pricing so that it applies only to coal users and bulk freight, the original intended user groups;
- adopting ARTC approach to limitations of pricing differentiation, which are less restrictive than those currently in AU1; and
- amend the Floor Revenue Limit to take account of TSC Payments.

Each of these changes are discussed in detail below.

5.3 Limits on price differentiation (DAU2 3.3)

5.3.1 Background and arrangements under AU1

The limits on price differentiation are to prevent access providers from giving an access seeker or access holder an unfair competitive advantage over its competitors by providing it with preferential treatment in its access agreement, i.e. when access seekers and access holders are in the same market. As stated in QCA Act clause 168c, an access provider:

> *"must not unfairly differentiate between users of the service in a way that has a material adverse effect on the ability of 1 or more of the users to compete with other users."*

However, Queensland Rail does not compete in the above rail market and therefore is not vertically integrated in a relevant respect, and has no incentive to unfairly differentiate between access seekers and holders in order to favour its own services.

AU1 requires that the access charges set by Queensland Rail for the same commodity in the same geographical area should be the same, except where:

- there are differences in cost or risk to Queensland Rail of providing access; and
- there is insufficient capacity to meet all access seeker requests.

5.3.2 Proposed approach under DAU2

Queensland Rail considers that the drafting of the limits on pricing differentiation in AU1 has become ambiguous, particularly in its lack of recognition of different train types. For example, Queensland Rail cannot charge different train types that move the same commodity in the same geographical region a different access charge as they are considered the same service.

For example, in the North West Minerals Province a number of smaller scale mineral projects are choosing an intermodal logistics solution where products are containerised rather than a traditional bulk logistics solution. Intermodal logistics is more contestable by road freight and in recent years road has been successful in winning concentrate haulage business on the Mount Isa to Townsville transport corridor. Intermodal rail haulage is less efficient than bulk haulage because the net tonne of product transported per gross tonne is less. Under the price differentiation limits in AU1, Queensland Rail is prevented from differentiating train services with the same commodities in the same geographic region other than due to differences in cost or risk over time. Queensland Rail believes that greater economic efficiencies will result where it can price differentiate in a case such as this where there are different train characteristics and efficiencies.

The DAU2 arrangements allow Queensland Rail to differentiate between access seekers who seek a higher quality of service, e.g. higher quality train paths, or certain access conditions unrelated to cost, e.g. departures at a certain time. There is currently no meaningful way for Queensland Rail to identify which access users value these attributes the most, or for access seekers to signal this.

The proposed arrangements also broaden the definition of costs and risks to include the wider implications of providing access, e.g. Queensland Rail will be able to consider the logistical impact on other users and adjust its prices accordingly.

The proposed arrangements allow Queensland Rail to adjust its access charge based on the characteristics of the service provided, and broader costs and risks. It follows that Queensland Rail can provide an improved price signal to access holders and access seekers, thereby promoting allocative efficiency because users who value a higher quality train path or certain departure or arrival times will be allocated those paths.

The proposed new arrangements provide Queensland Rail with a greater ability to differentiate between different users, thereby making Ramsey-type pricing approaches possible. This will:

- encourage uptake of rail services as user groups that are more price sensitive are allocated a lower proportion of fixed cost; and
- help Queensland Rail recover its costs as it can allocate a higher proportion of its fixed cost to user groups that are less price sensitive.

Notably, on much of its network the access revenue Queensland Rail collects from access holders is often significantly below the total efficient cost of providing the service (the price ceiling). For example, Queensland Rail only recovers around 40 per cent of its operating costs on the North Coast Line System. In other words, Queensland Rail's access charges are not directly linked to the cost of providing the services.

Given this, it is difficult to reflect changes in costs and risk in providing access in a methodology for the setting of access charges. Although Queensland Rail can adjust access charges in theory, it is unclear how this would occur in practice. It follows that even in a situation where costs of operating the network are increasing, it may not be possible to pass these costs on to access holders that have renewed their contracts.

Queensland Rail also considers that the AU1 arrangements are overly restrictive, as they do not allow for consideration of other relevant factors, such as the broader commercial and logistic impact of the operator.

In DAU2 Queensland Rail proposes to adopt pricing rules that are currently used in ARTC's interstate rail access undertaking. The ARTC's undertaking, including its pricing rules, have been assessed and approved by the ACCC using an assessment criteria consistent with the QCA's assessment framework.

Adopting ARTC pricing rules allows Queensland Rail to have regard to a number of factors when setting prices, namely characteristics of the service, and commercial and logistical impacts on Queensland Rail's business.

The characteristics of a service include axle load, speed wheel diameter, train length, origin and destination (including the number and length of intermediate stops), departure and arrival times and days of the week.

The commercial effects on Queensland Rail, include:

- the term of the agreement;
- the potential for growth of the business;
- the opportunity cost to Queensland Rail;
- the consumption of Queensland Rail's resources, including capacity;
- the credit risk associated with the business;
- market value of the train path sought;
- the segments of the network access is being sought for; and
- previously negotiated access charges agreed under the framework, where relevant.

The logistical impact on Queensland Rail include:

- the impact on other train services and risk of failure of relevant operator to perform; and
- reduced capacity and system flexibility.

ARTC is also able to consider the capital or other contributions made by an access seeker, and the cost of additional capacity.

When compared to AU1, Queensland Rail's proposed new approach:

- broadens the relevant costs as it includes as relevant opportunity cost to Queensland Rail and costs to other users, e.g. logistical impact;
- specifically includes in the definition of risk the credit risk of the business and risk of operator failure to perform; and
- specifically incorporates other commercial considerations, such as duration of agreement, contributions from the access seeker, and cost of additional capacity.

A number of the factors identified in DAU2 as legitimate reasons for differentiation could be argued to fall under the AU1 allowance of "cost or risk" differences to Queensland Rail. However, Queensland Rail believes that making these explicit would make the process more transparent and clarify the circumstances in which price differentiation is permitted.

5.3.3 Assessment of proposed changes to price differentiation

Queensland Rail engaged HoustonKemp to assess the implications of the proposed changes to price differentiation under DAU2 against the arrangements under AU1 (**refer Attachment 7**).

HoustonKemp assessed the different approaches based on requirements for access undertakings in the QCA Act, which is a foundational reference point for decisions made by the QCA. In summary, this involved assessing whether the different approaches promote:

- the three dimensions of economic efficiency – allocative efficiency, productive efficiency and dynamic efficiency;
- competition in upstream and downstream markets; and
- protects the interest of Queensland Rail, existing access holders, and potential access seekers.

HoustonKemp concluded that the proposed price differentiation arrangements under DAU2 would better promote economic efficiency and the QCA's objectives under the QCA Act when compared with AU1. HoustonKemp's reasoning was that DAU2 arrangements would:

- improve allocative efficiency by providing more refined pricing signals;
- allow for a more efficient recovery of fixed costs and potentially increase network usage;
- allow Queensland Rail more flexibility in negotiations, for example lower access prices can be offered to encourage modal shift from road; and
- allows for Queensland Rail to take account of different Train Service types and the extent to which end-users face different costs because of the differing efficiencies of the train services.

Competition concerns around price differentiation are not relevant to Queensland Rail as the floor and ceiling price controls remain and Queensland Rail does not compete with third parties in the above rail market.

The HoustonKemp report also noted that the ACCC has a similar decision-making criteria in its review of access undertakings, and that the ACCC has approved ARTC's approach to price differentiation as efficiency enhancing.

5.4 Pricing for access rights at renewal

5.4.1 Background

The QCA in its 2016 Final Decision on AU1 determined that coal and bulk freight traffic should have one-off renewal rights where changes to access charges would be limited to changes in risk and costs. The QCA stated in its 2016 Final Decision:

> *"Queensland Rail should give priority to a renewing access holder for coal carrying or other bulk-mineral-carrying train services that satisfy the conditions in the undertaking (i.e. those relating to* contract *period, nature of access rights sought and timeframes for submitting renewal application)." (p.24)*

The purpose of the renewal rights and limitations on changes to renewal prices was to provide coal and bulk freight traffic with more certainty regarding the access price payable. The rationale was that these users incur significant sunk costs at start up, and so certainty in access charges would reduce the risk of having a stranded asset, and so encourage the expansion of their operations.

The QCA also stated in its 2016 Final Decision:

> *"We* also *do not consider it necessary to extend the renewal provisions to cover intermodal services (as requested by Glencore)." (p.23)*

In other words, the intended target of the renewal right and limitations on changes to access charges was for coal and bulk freight traffic only.

Notwithstanding this, Queensland Rail believes that the combination of clauses 2.9.3 (Renewals), 3.3(e) & (f) (Pricing Principles) and 7.1 (Definitions of Renewal, Renewal Access Seeker and Renewal Application) effectively result in granting all traffics seeking to renew access agreements a one-off renewal on the same access charges, provided certain conditions are met e.g. they are for the same origin and destination, there is no increase in product etc.

5.4.2 Proposed changes for DAU2

For DUA2 Queensland Rail proposes the following changes:

- retain one-off renewals, limited to coal and bulk freight;
- where a renewal right has been provided in AU1, DAU2 will not provide a new renewal; and
- renewals are limited to contracts with terms of five to ten years (inclusive) with a maximum renewal term of five years.

Queensland Rail considers that the first two changes would bring into effect the rights originally intended by QCA in its 2016 Final Decision. That is, coal and bulk freight users are provided with access charge certainty, and that this is a one-off right.

The change to term reflects the diversity of contracts that Queensland Rail has in place. [redacted]

Queensland Rail also notes that under ARTC's current indicative access agreement, which has been assessed and approved by the ACCC:

- operators do not have any automatic or enforceable rights of renewal or extension of any Scheduled Train Paths – clause 2.9(e); and
- any terms and conditions of the new agreement, including charges, will be determined in accordance with the access undertaking clause 2.9(d).

In other words, operators on ARTC's interstate network do not have any renewal rights and there are no limitations on what ARTC can charge on renewed contracts, other than the pricing principles in the access undertaking.

Queensland Rail also notes that under ARTC's current indicative access agreement, which has been assessed and approved by the ACCC:

- an operator does not have any automatic or enforceable rights of renewal or extension of any Scheduled Train Paths – clause 2.9(e); and
- any terms and conditions of the new agreement, including charges, will be determined in accordance with the access undertaking clause 2.9(d).

In other words, operators on ARTC's interstate network do not have any renewal rights and there are no limitations on what ARTC can charge on renewed contracts, other than the pricing principles in the access undertaking.

5.4.3 Assessment of proposed changes to renewal rights

Queensland Rail engaged HoustonKemp to assess the implications of the proposed changes to renewal rights and price under DAU2 and against the arrangements under AU1 (**refer Attachment 8**).

HoustonKemp assessed the different approaches based on requirements for access undertakings in the QCA Act, which is a foundational reference point for decisions made by the QCA. In summary, this involved assessing whether the different approaches promote:

- the three dimensions of economic efficiency – allocative efficiency, productive efficiency and dynamic efficiency;
- competition in upstream and downstream markets; and
- protects the interest of Queensland Rail, existing access holders, and potential access seekers.

HoustonKemp concluded that renewal rights under existing AU1 arrangements are broadly defined, and place significant limitations on the access charges for renewed contracts. HoustonKemp identify that this has the potential to lead to:

- increasing the loss Queensland Rail incurs from providing rail services, i.e., allocative inefficiency, because access holders are only likely to renew their contract if they believe that the existing terms and conditions would be better than those available under a renegotiation; and
- impact upstream or downstream competition as renewal rights provide existing access holders with an advantage over new access seekers – this may create additional barriers to entry and capacity may not be allocated to those who value it highest leading to allocative inefficiency.

The HoustonKemp report further concluded that the proposed arrangements under DAU2 better promote economic efficiency and the QCA's objectives under the QCA Act than AU1. The proposed arrangements under DAU2, limit the impact of renewals by making it clear it is a one-off right that only applies to coal and bulk mineral freight. DAU2 also limits the length of the renewal contract. All these changes will improve allocative efficiency as they allow Queensland Rail to recover closer to its efficient costs (limiting the Government subsidy) and limit the additional barriers to entry that renewals can create.

5.5 Floor revenue limit — TSC

As highlighted earlier, AU1's pricing provisions set floor and ceiling revenue limits between which the access charges are required to be set. Queensland Rail can price below floor with QCA agreement. AU1 is silent on the treatment of TSC payments when determining the floor revenue limit.

However, previous access undertakings applying from 2001 to the approval of AU1 have explicitly stated that when determining the floor pricing limit for a combination of train services in a system (as opposed to an individual train service), Government Transport Service Contract (TSC) payments are to be considered. TSC revenue is an important input in calculating the system floor revenue price. For example, '*QR Network's Access Undertaking (2008) June 2010*' (**2008AU**) provides:

> ***"6.2.2 Price Limits for Individual Train Services***
>
> *(d) Price limits will apply in respect to Access Charges to be established for each individual Train Service (referred to as "Individual Train Service") such that, over the Evaluation Period, the relevant Access Charge for the Individual Train Service:*
>
> *(i) will not fall below the level that will recover the expected Incremental Cost of providing Access for the Individual Train Service; and*
>
> *(ii) will not:*
>
> *(A) where the Individual Train Service is the only Train Service using a section of the Rail Infrastructure, exceed the level that will recover the expected Stand Alone Cost of providing Access for the Individual Train Service after giving consideration to the level of contribution provided by Transport Service Payments towards the relevant the Rail Infrastructure; or*
>
> *(B) otherwise, exceed the level that will recover the expected Stand Alone Cost of providing Access for the Individual Train Service."*

Many of Queensland Rail's systems are only financially viable with the presence of TSC revenue, and if this revenue cannot be taken into account, achieving the system floor price would be breached for many parts of the network.

DAU2 clarifies that TSC payments are to be considered in relation to floor price limit determinations.

5.6 Conclusion

In summary, Queensland Rail has made the following changes:

- amend renewal pricing so that it applies only to coal users and bulk freight, the original intended user groups;
- adopt ARTC approach to limitations of pricing differentiation, which are less restrictive than those currently in AU1; and
- amend the Floor Revenue Limit to take account of TSC Payments.

Queensland Rail has proposed the first two changes because it believes that this would remove unnecessary pricing constraints that exist under AU1. HoustonKemp has assessed both proposed changes using an assessment framework that is consistent with QCA's own assessment criteria. HoustonKemp concluded that:

- having more flexibility pricing arrangements would lead to allocative efficiency, because:
  - it reduces Queensland Rail's financial loss from providing below rail services; and
  - help allocate train services to users who value them the most;
- there are no competition concerns as the floor and ceiling price controls remain and Queensland Rail doesn't compete with third parties in the above rail market.

Queensland Rail supports the conclusions reached by HoustonKemp and note that these changes would make DAU2 more consistent with ARTC's arrangement, which have been assessed and approved by the ACCC.

The rationale for the clarifying how TSC payments should be treated for the floor revenue limit is to prevent Queensland Rail from inadvertently breaching its pricing rules. Queensland Rail to consider how much TSC payments should be allocated but AU1 does not provide explicit guidance, given rise to uncertainty.

6. Other Proposed Changes

This section sets out other changes that are proposed.

Table 2: Summary of other changes proposed in DAU2

Clause	Change
Preamble	The preamble has been updated to remove dated information and to be more relevant to the reader. The preamble is not legally binding.
Undertaking term (DAU2 1.1)	The proposed term for DAU2 is five years, which is one year longer than the term under AU1.
Master planning and extension coordination (DAU2 1.5)	DAU2 requires Queensland Rail to prepare a RNMP if requested by industry as opposed to having to prepare one by default. The RNMP will continue to be funded by industry, unless otherwise agreed. DAU2 also removes reference to the North Coast System in recognition that the planning and funding authority for this system is the Department of Transport and Main Roads.
Access application	AU1 has a rigid access application process, which can lead to inefficiencies for simple matters such as access agreement renewals or extensions. Access applications can also be submitted to anyone in Queensland Rail, which has caused delays in processing the applications. DAU2 increases the flexibility of the application process while still protecting the rights of access seekers, e.g. retaining the priority queue provisions. DAU2 has also specified where access application should be submitted.
Preliminary steps (DAU2 2.1.2)	AU1 does not clarify that information exchanged in the preliminary steps, including capacity information, is for information purposes only and is not binding. DAU2 clarifies that neither party will be bound by information provided in the preliminary steps.
Requirement for confidentiality (DAU2 2.2.2)	AU1 allows either party to request a confidentiality agreement. DAU2 clarifies that any confidentiality agreement must permit disclosure to the Queensland Rail Transit Authority, Responsible Ministers, and the QCA.
Access Seekers must satisfy prudential requirements (DAU2 2.8.3)	AU1 provides that an access seeker must not have been in material default of this undertaking or the 2008 undertaking. DAU2 updates this clause to reference DAU2 and AU1 instead.
Operating Requirements Manual (DAU2 4.3)	Operating Requirements Manual (**ORM**) is part of the access undertaking, which means that Queensland Rail will need to submit a draft amending access undertaking to the QCA to make minor changes to the ORM. DAU2 removes ORM from the undertaking and requires Queensland to consult industry when changes to ORM will have a material effect on third parties.
Quarterly report (DAU2 5.1)	Change from requiring Queensland Rail to publish 30 days after end of the quarter in AU1 to the last day of the month after the subject quarter in DAU2. DAU2 has also clarified that the report does not include Citytrain and adds in a threshold before planned possessions are considered to be late for reporting purposes.
Obligation to publish annual report (DAU2 5.2.1)	Change release date of annual performance report from 30 October each year to 31 December to be consistent with when Queensland Rail publishes its below rail financial statements.

Clause	Change
Resolution by QCA (DAU2 6.1.4)	AU1 requires dispute to be referred to the National Rail Safety Regulator but under law does not give the regulator powers to resolve disputes. DAU2 proposes that the QCA refer safety disputes to a suitable safety expert with input from Queensland Rail and the access holder.
Transitional provisions DAU2 6.4)	Update transitional provisions to refer that it refers to the correct undertakings.
Part 7 Definitions and interpretation	Update definitions to reflect DAU's provisions.
Schedule E—Maintaining the Regulatory Asset Base	DAU2 simplifies the approval proves for the acceptance of capital expenditure into the regulatory asset base. It also amends the due date for the submission of the Capital expenditure report to the QCA from 31 October of each year to 31 December of each year.
Schedule F—Network Management Principles	DAU2 has simplified and made it clearer the operation of network management principles (**NMP**), without changing the intent the provisions. DAU2 also required disputes of planned possessions to be made within a certain time period after the access holder has been notified.
Schedule H—Standard Access Agreement	Minor amendments, mostly to reflect feedback industry has provided, changes to safety legislation, and other minor amendments.

6.1 Preamble

Queensland Rail has updated the preamble to focus on DAU2 and be more relevant to its own network. The preamble in AU1 includes outdated information, such as Queensland Rail's separation from Aurizon Network. Queensland Rail notes that the preamble is not legally binding and the update is to help better inform the reader of relevant context.

6.2 DAU2 term (DAU2 1.1)

AU1 applied from 11 October 2016 to 30 June 2020 a period of four years. As AU1 has now been tried and tested, and with DAU2 only making targeted amendments to AU1 on an exception basis rather than a major rewrite, Queensland Rail has proposed a term of 5 years for DAU2.

Queensland Rail believes that reducing the frequency of reviews would also lower the costs to Queensland Rail, industry and the QCA, without comprising any outcomes.

6.3 Master planning and extension coordination (DAU2 1.5)

In AU1 the QCA introduced a process requiring that Queensland Rail prepare a regional network master plan (RNMP) for the:

- West Moreton network
- The Mount Isa Network; and
- The North Coast Network.

The process required Queensland Rail to seek industry agreement and funding to develop a RNMP for each line within 12 months of an access undertaking. If industry could not agree on how to fund the

RNMP, then Queensland Rail was under no obligation to commence the RNMP. Industry chose not to fund the RNMPs during AU1, primarily because the lines had spare capacity, and so there was limited need for master planning and extension coordination.

Queensland Rail believes that AU1's provisions requiring Queensland Rail to develop RNMPs is unnecessary and not fit for purpose. Instead, Queensland Rail is proposing a fit for purpose master planning process for the West Moreton System and the Mount Isa Line System for DAU2, where:

- Queensland Rail will prepare a RNMP upon request from stakeholders;
- RNMPs will continue to be funded by stakeholders;
- Industry and Queensland Rail to agree on a realistic timeframe for development; and
- The North Coast line System is excluded as funding and planning is undertaken by Department of Transport and Main Roads rather than Queensland Rail.

6.4 Access applications (2.1.1)

Queensland Rail has retained the overall access application process, with a minor amendment. AU1 includes a rigid process for access applications, and in particular requires all requests for access rights to be in the form of an access application, including prescribed information set out in Schedule B. This effectively requires an access seeker to follow the same process for a request for renewal or extension of an existing agreement, as for a new application. This can be inefficient and time consuming in simple matters such as renewals and extensions, where often only a small amount of information will vary from the original access agreement.

Conversely, AU1 does not require an access application to be submitted to a nominated person or address, which has caused delays in the processing the access applications delivered to areas of Queensland Rail not responsible for the administration of those applications. While the access application form and Queensland Rail website specify the addresses for lodgement, there have been instances where access applications have been delivered to incorrect areas, resulting in delays and a technical breach of AU1's timeframes for the acknowledgment of an access application.

DAU2 allows access seekers to agree to a different form of access application. This allows for flexibility in addressing the business needs of the access seekers, while ensuring that their rights are protected (for example, to priority in a queue).

DAU2 also requires access applications and responses to Queensland Rail requests for additional information etc. to be either delivered to an email address specified by Queensland Rail on the Queensland Rail website, or in writing to Queensland Rail's postal address. This clause will result in a more efficient access application process.

6.5 Preliminary steps (DAU2 2.1.2)

A prospective access seeker may request initial meetings with Queensland Rail prior to submitting an access application. The initial meetings allow Queensland Rail and the prospective access seeker to discuss the proposed access application and the negotiation process. To facilitate the access application, a prospective access seeker can ask Queensland Rail to provide relevant capacity information. Queensland Rail is also required to make preliminary information (for example, interface requirements, and maximum train lengths etc.) available on its website and to keep this information up to date.

AU1 does not expressly state that preliminary information and capacity information provided is non-binding, and for information purposes only. DAU2 clearly states that neither party will be bound by preliminary information, including capacity information or information provided during initial meetings.

Facilitating preliminary, non-binding discussions is particularly beneficial to new access seekers, particularly end user access seekers.

6.6 Requirement for confidentiality agreement (DAU2 2.2.2)

AU1 allows either Queensland Rail or an access seeker to require the other to enter into a confidentiality agreement.

To accommodate Queensland Rail's structure and reporting obligations, these provisions have been amended to permit Queensland Rail to provide information to the Queensland Rail Transit Authority (**QRTA**), Queensland Rail's Responsible Ministers and TMR and for both parties to provide information to the QCA.

6.7 Access Seekers must satisfy prudential requirements (DAU2 2.8.3)

AU1 requires that access seekers satisfy certain prudential requirements including no material default of the 2008 access undertaking, or AU1. This section has been updated to include a reference to DAU2.

6.8 Operating Requirements Manual (DAU2 4.3)

This Operating Requirements Manual (**ORM**) sets out practices, standards, systems, protocols, requirements, rules, policies and other information in relation to or in connection with Network Control and the access to and use of Queensland Rail's network by operators. It also includes interface management and coordination requirements, safeworking procedures, safety standards (including electrical safety requirements), emergency and investigation procedures, requirements for the management of Network Incidents and environmental requirements.

The nature of ORM means that it will need to be updated when there are relevant legislative changes or when Queensland Rail updates the ORM to keep up with industry best practices, and operational requirements to ensure the efficient and safe management of the network.

Under AU1 Queensland Rail is required to submit a draft amending access undertaking to the QCA for approval for any changes to the ORM as the ORM is part of the AU1, which is a burdensome and time consuming process for both Queensland Rail and Access Holders.

Queensland Rail proposes removing the ORM from DAU2 but including in DAU2 a requirement for Queensland Rail to have an ORM and to consult on changes to the ORM where they will materially affect third parties.

The ORM deals with the operational management of Queensland Rail's network. As Queensland Rail is not competing in the above rail market, Queensland Rail is not incentivised to impose operational requirements designed to hinder third party access, so including the ORM in an access undertaking for QCA oversight is unnecessary.

6.9 Quarterly network train performance report (DAU2 5.1)

The AU1 quarterly performance report includes reporting on matters such as the cause of lateness of non-Citytrain services, train cancellations and network performance. Under AU1:

- quarterly reports to be published by 30 days after the subject quarter; and
- reporting of Planned Possessions that did not start or finish on time includes a Planned Possession that starts one second early or one second late.

Queensland Rail proposes that in DAU2:

- quarterly reports are to be published by the last day of the month after the subject quarter, and where this is a weekend or public holiday the next working day, unless it is agreed with the QCA that such longer period should be allowed. The ability to agree a longer period will make this quarterly report requirement consistent with the annual report;
- add a 30 minute threshold to Planned Possessions reporting so that the reporting is more meaningful. This will make the KPI consistent with other on time reporting in the quarterly report, where thresholds apply; and
- clarifies that the reporting does not include Citytrain, noting that Queensland Rail does not currently include Citytrain under AU1 but the drafting in AU1 is unclear.

Consistent with the 2008AU, Queensland Rail's intention in AU1 was that quarterly reporting requirements were to apply to non-passenger services, and long distance passenger services. This was to ensure statistically relevant data can be extracted by access holders relating to the treatment of their services in comparison to other relevant traffic types, and would exclude Citytrain so that Citytrain does not distort the reported KPIs. DAU2 clarifies this approach.

Queensland Rail Citytrain currently operates over 7800 services weekly across the Metropolitan System. Most of the lines are not utilised by third party services. Including the large volume of Metropolitan System Citytrain services in comparison to third party train services in the quarterly report would mean that the treatment of third party train services in the Metropolitan System would effectively not be reported on, reducing the quality of output and distorting the meaningfulness of the outcomes.

Further, the Metropolitan System includes a number of branch lines that are not utilised by non-passenger services or long distance passenger services (such as the Shorncliffe line). Including data on the use of those branch lines would further skew data output.

The exclusion of Citytrain provides transparency as to how third parties are treated on the Metropolitan System.

Queensland Rail has also clarified that long distance passenger services are included and has applied an on-time threshold of 20 minutes.

Extensive information on Citytrain on-time running and reliability, and safety and security incidents are published on Queensland Rail's website.

6.10 Obligation to publish annual report (DAU2 5.2.1)

AU1 requires that Queensland Rail produce and publish audited Below Rail Financial Statements (**BRFS**) developed in accordance with the Cost Allocation Manual (**Costing Manual**) by 31 December of each year, relevant for the previous financial year of the report (AU1 clause 5.3.1). Maintenance and operating costs are included in the BRFS.

Maintenance and operating costs are also included in the '*Annual Report on the Negotiation Process*' (**annual report)** in accordance with AU1 clauses 5.2.2(i) and 5.2.2(j). However, the annual report is to be produced and published by 30 October each year (clause 5.2.1(a)) rather than 31 December.

Queensland Rail's auditor is the Queensland Audit Office (**QAO**). The QAO first audits Queensland Rail's general financial statements (**Financial Statements**), and then subsequently audits the BRFS using information contained in the Financial Statements.

The QAO cannot commence the audit of Queensland Rail's BRFS until after the Queensland Government departmental financial statements are tabled at the end of September each year. This means that the audit of Queensland Rail's BRFS starts in October of the relevant year so the publication of the BRFS cannot be finalised by 31 October.

This also means that the maintenance costs, operating expenditure, and application of the allocators contained in the Costing Manual will not have been audited by 30 October to align with the publication of the annual report, as required in AU1.

DAU2 proposes to align the publication of the annual report and the BRFS, so that the annual report contains audited financial information that is consistent with the BRFS at publication.

This approach addresses comments made by New Hope in its submission on Queensland Rail's 2016 draft Costing Manual, seeking that maintenance and operating information in the Annual Performance Report be both audited and consistent with the Below Rail financial Statements:

> *"We therefore will have three potentially different sources of cost information for the West Moreton Network, being:*
>
> - *The information contained in the QCA's final decision, and in QR's model, which is the basis of the approved Reference Tariffs.*
> - *The information reported under clause 5.2.2(i).*
> - *The Financial Reports prepared under clause 5.3 (using the Costing Manual).*
>
> *Our key requirement in regard to the overall package of reported information is that these three sources of information should be prepared on consistent basis, or be reconciled with each other…..*
>
> *….This will ensure that a version of the Clause 5.2.2 information regarding maintenance and operating costs is prepared which is based on allocation methodologies consistent with those used to develop reference tariffs."*

Including audited maintenance and operating cost information in the Annual Performance Report will improve the quality of and public confidence in the report, and also ensure consistency with the BRFS, as the underlying information will be subject to the QAO's independent audit process.

DAU2 provides for the due date of the annual report to be 31 December, thereby, aligning with the due date of the BRFS.

6.11 Resolution by QCA (DAU2 6.1.4)

AU1 requires the QCA to refer safety related disputes to the Office of the National Rail Safety Regulator (**ONSR**). However, the Rail Safety National Law does not give the ONSR the power to resolve disputes. DAU2 proposes that the QCA refer safety disputes to a suitable safety expert, selected with input from Queensland Rail and the access holder.

6.12 Transitional provisions (DAU2 6.4)

The introduction of a new access undertaking means that the transitional provisions required updating. DAU2 contains minor amendments to the transitional provisions.

6.13 Part 7 Definitions and interpretation

DAU2 definitions have been updated to reflect DAU2's provisions.

6.14 Schedule E—Maintaining the Regulatory Asset Base

AU1 is the first access undertaking where Queensland Rail has been required to maintain a regulatory asset base for the West Moreton System. Queensland Rail has proposed amendments to Schedule E incorporating lessons from the AU1 process.

DAU2 also amends the due date for the submission of the capital expenditure report to the QCA from 31 October of each year to 31 December of each year. This will align the annual reports. More significantly, the new timeframe will assist in more comprehensive reports to be submitted to the QCA and will result in improved overall efficiencies.

6.15 Schedule F – Network Management Principles (NMP)

The NMP set out Queensland Rail's approach to train planning and network control. DAU2 contains the following changes in the DAU2 NMP from AU1:

- amendment to the process for lodging a dispute for planned possessions; and
- clarification around planned possessions (this change will not alter the operation of the NMP but will clarify existing practice).

6.15.1 Dispute mechanism

AU1's NMP provides that Queensland Rail cannot proceed with the planned possession once a dispute is lodged until the dispute is resolved. A dispute can be lodged right up to the day of the Planned Possession. AU1 provides:

> *"Except in relation to Emergency Possessions and Urgent Possessions, if there is a bona fide dispute between an Access Holder and Queensland Rail in relation to any proposed changes or modifications to the MTP, the proposed change will not take effect until the dispute has been resolved using the dispute resolution provisions of the Undertaking."*

Queensland Rail may have multiple contracts in place with external contractors over several worksites across the network linking into one Planned Possession. Requiring Queensland Rail to stop the work right up until the day of the possession is not reasonable or effective, and in many cases would result in reputational damage and financial compensation to external contractors potentially in the order of millions of dollars.

Queensland Rail considers that the level of prescription in AU1's NMP is reflective of an access undertaking that was developed from regulation for an integrated organisation competing in the above rail market.

No other rail access undertaking in Australia, including Aurizon's access undertaking, has this level of prescription. This level of prescription that could result in major work sites across the network being planned and equipment, material and workforce resources being committed well in advance, but unable to operate on the day of the Planned Possession.

Queensland Rail is incentivised to run an efficient network, and is not incentivised to hinder the operation of third party train services.

This compares with the ARTC interstate access undertaking which provides considerable flexibility:

> ***"9.3 Repairs, Maintenance and Upgrading of the Network***
>
> ***(a)*** *Notwithstanding any other provisions to the contrary in this clause 9, but subject only to clauses 9.3(b), 9.3(c) and 9.4 ARTC may, without notice to the Operator, perform repairs, maintenance or upgrading of the Network, carry out any new work on the Network, or take possession of any part of the Network, at any time.*
>
> ***(b)*** *If repairs, maintenance or upgrading of the Network, the carrying out any new work on the Network, or taking possession of the Network, are reasonably likely to materially affect the Scheduled Train Paths, ARTC will, prior to commencement of the works:*
>
> *(i) take all reasonable steps to minimise any disruption to the Scheduled Train Paths;*
>
> *(ii) notify the Operator of the works as soon as reasonably practicable; and*
>
> *(iii) use its best endeavours to provide an alternative Train Path,*
>
> *but need not obtain the Operator's consent to such repairs, maintenance or upgrading, or possession of the Network.*
>
> ***(c)*** *Possession of the Network means closure of the relevant part of the Network to all traffic for the purpose of effecting repairs, maintenance or upgrading. ARTC will consult with the Operator a reasonable time before taking possession of the Network (except in the case of an emergency) with a view to efficient possession planning and with a view to minimising disruption to Services and ARTC may at its discretion waive the flagfall charge applicable to any Services affected by this clause."*

Queensland Rail is seeking that the QCA reconsider the inclusion of this provision requiring a Planned Possession not to go ahead where a third party access seeker lodges a dispute.

Attachment 1: West Moreton Tonnage Forecasts

[redacted]

[redacted]

[redacted]

[redacted]

Attachment 2: Frontier Economics Independent Expert Report on Asset Beta and Equity Beta

Estimates of asset beta and equity beta for Queensland Rail

REPORT PREPARED FOR QUEENSLAND RAIL

July 2018

Estimates of asset beta and equity beta for Queensland Rail

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Estimates of asset beta and equity beta for Queensland Rail

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1 Executive summary

1 Frontier Economics has been retained by Queensland Rail to provide an estimate of the asset and equity beta parameters for its network; such parameters most notably impact the reference tariff applied to the West Moreton coal network.

1.1 Key findings

2 Our primary conclusions are as follows:

a. The relevant comparators for Queensland Rail's network are likely to differ substantially from those used for Aurizon's Central Queensland Coal Network because of fundamental differences in the nature of risk between the two networks.

b. Regulated energy and water firms should not be used as comparators for the Queensland Rail network as regulation has a minor impact on the relevant asset beta of a regulated firm.

c. The first principles methodology of Incenta (2017), as adopted by the Queensland Competition Authority (QCA) in the 2017 Draft Access Undertaking for Aurizon Network, does not indicate that regulated energy and water businesses are suitable comparators for the Queensland Rail Network.

d. The appropriate asset beta, based on comparators in the ports, railroads, airports and toll roads industries, is determined to be 0.77 when applying a methodology consistent with that accepted by the QCA.

e. Applying a benchmark gearing of 28%, obtained in a manner consistent with the asset beta estimate, yields an equity beta of 0.98 under standard QCA assumptions regarding debt beta and gamma.

1.2 Author of report

3 This report has been authored by Professor Stephen Gray, Professor of Finance at the UQ Business School, University of Queensland and Director of Frontier Economics, a specialist economics and corporate finance consultancy. I have Honours degrees in Commerce and Law from the University of Queensland and a PhD in Financial Economics from Stanford University. I teach graduate level courses with a focus on cost of capital issues, I have published widely in high-level academic journals, and I have more than 20 years' experience advising regulators, government agencies and regulated businesses on cost of capital issues. I have published a number of papers that specifically address beta estimation issues. A copy of my curriculum vitae is attached as an appendix to this report.

4 My opinions set out in this report are based on the specialist knowledge acquired from my training and experience set out above. I have been provided with a copy of the Federal Court's Expert Evidence Practice Note GPN-EXPT, which comprises the guidelines for expert witnesses in the Federal Court of Australia. I have read, understood and complied with the Practice Note and the Harmonised Expert Witness Code of Conduct that is attached to it and agree to be bound by them.

5 I have been assisted in the preparation of this report by Dinesh Kumareswaran, Warwick Davis and James Key from Frontier Economics.

2 Features of Queensland Rail network

6 While the Queensland Rail network may superficially appear to have similarities with the Aurizon Central Queensland Coal Network (Aurizon Network), the two networks have fundamentally different risk profiles. Consequently, the approach and the resulting beta estimate for Aurizon Network is not appropriate for the Queensland Rail Network.

7 In selecting comparators to use in estimating the asset beta of the Queensland Rail network, the relevant risk characteristics are of paramount importance. Our view is that the services provided by Queensland Rail network indicate that, ideally, comparators would have the following characteristics:

- **Be a transport infrastructure operator**: Most of Queensland Rail's network operations are as a below rail infrastructure supplier to above rail shippers and mines.[1]
- **Be used to transport a mix of bulk freight and other kinds of freight**: West Moreton and Mt Isa ship bulk freight with smaller amounts of non-bulk freight. QR also provides passenger services.
- **Have a reasonably small number of larger customers**: Queensland Rail's customers include coal mines, Aurizon and Queensland Government for passenger rail.
- **Be exposed to competition in some or all components of the business**: the Queensland Rail network is subject to significant competition on non-coal traffic from road. Freight transport between cities on the east coast of Queensland, as far north as Cairns, in particular is exposed to competition with both road transport and sea transport.
- **Be exposed to changes in demand from changes in global commodity prices**: Queensland Rail's coal customers are highly exposed to changes in commodity markets given the relatively low value (and consequently low margin) nature of the coal produced in West Moreton, and the relatively high below and above rail costs of transport from this region.

8 While these characteristics should guide the selection and use of comparator entities to estimate key WACC parameters (such as the asset beta and gearing), few comparators, if any, will embody *all* of these ideal characteristics. Therefore, trade-offs between elements of comparability must be made in selecting comparators. Comparators should be selected and afforded weight on the extent to which their

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[1] As previously stated by Frontier, the firm's industry is at least one relevant criteria for analysis, DAU 2017, p92.

asset beta reflects conditions relevant to Queensland Rail in contrast to alternative comparators.

9 In Table 1 below we provide a high level comparison between firms operating in different industry sectors which could potentially be useful comparators for Queensland Rail.

10 This analysis indicates that other railroads, and ports, are likely to be the closest comparators to Queensland Rail, with airports next closest. The pipeline and toll road sectors are somewhat less comparable. The regulated electricity and water sector are least comparable, sharing no key risk-based features with Queensland Rail. A key variable which can differ between comparators is the degree of competition which each faces; in some instances firms have very strong market power (such as the only port in a major city), whereas in some instances competition is more evident (such as major ports in Europe, where there are a number of larger competing ports).

Table 1: Assessment of relevant comparators for Queensland Rail

Queensland Rail attribute	Class 1 Railroads#	Ports	Airports	Pipelines	Tollroads	Electricity / Water
Transport infrastructure operator	✓	✓	✓	✗	✓	✗
Mix of bulk freight / freight	✓	✓	✗	✗	✗	✗
Small number of customers	✓	✓	✗	✓	✗	✗
Exposed to non-trivial competition	Varies	Varies	Varies	Varies	Varies	✗
Exposed to demand change from global markets	✓	✓	✓	✗	✗	✗

Source: Frontier Economics analysis.
Notes: # Revenues more than $USD100 million.

11 The form of regulation can have an effect on the degree of systematic risk, but it is only one of a number of more minor factors.[2] The relevance of particular forms of regulation must be considered on a case by case basis.

2 Frontier does not consider regulation to substantially impact beta estimates, see Aurizon DAU 2017, p. 92.

12 In the 2014 Draft Decision for Queensland Rail, the QCA proposed an equity beta of 0.8, equal to the figure that the QCA had adopted for Aurizon Network, and equal to that proposed by Queensland Rail in its submission. In that decision, the asset beta was set to 0.45 and gearing was set to 55%. At the time of the 2014 Draft Decision, the QCA stated that:

> To date, the QCA has not received submissions to suggest Queensland Rail's business risks are lower than those of Aurizon Network.[3]

13 However, in its 2015 Draft Access Undertaking, Queensland Rail submitted that it was likely to be subject to greater systematic risk than Aurizon Network, noting that the 2014 Draft Decision highlighted several key differences between Queensland Rail and Aurizon Network: Price versus revenue cap regulation, service diversification and sources of revenue. However, Queensland Rail proposed to maintain the same asset beta, equal to that of Aurizon Network and the QCA accepted Queensland Rail's proposal.

14 More recently, the QCA has commissioned Incenta to estimate appropriate asset and equity betas for Aurizon Network. Incenta (2017) has concluded that the beta estimates for Aurizon Network should be based entirely on data from regulated energy and water businesses on the basis that such businesses are most comparable (in terms of systematic risk) to Aurizon Network.[4] It is our view that such businesses would not serve as ideal comparators for Queensland Rail because of the material differences between the risk characteristics of Aurizon Network and Queensland Rail.

2.1 Comparator industries

2.1.1 Class 1 railroads

15 Our view is that the best systematic risk comparators for Queensland Rail are Class 1 railroads.[5] Incenta (2017) did not afford any weight to this industry in estimating the asset beta for Aurizon Network, citing the following:

> Class 1 railroads are expected to have materially higher systematic risk than Aurizon Network. Class 1 railroads are subject to competitive pressure from parallel railroads and alternative transport modes; carry loads that are highly sensitivity to GDP shocks; have relatively higher operating leverage; and their cash flows are neither constrained nor buffered by regulation, which merely monitors the rate of return being earned.[6]

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3 Queensland Rail DAU 2013, p143.

4 Using a 10-year window, taking the average asset beta obtained using of weekly and monthly series. See Incenta (2017), p. 78.

5 Those with revenues greater than $USD100 million annually.

6 Incenta (2017), page 43.

16 However, as noted above, Queensland Rail *is* subject to competitive pressure on a number of freight routes, competing against both road and sea transport. This is not the case for all routes: approximately [redacted] of revenue is attributable to bulk freight, which would arguably not be contestable with road.[7] Coal transported from West Moreton would not be economical to move by truck, and accounts for approximately [redacted] of revenue. Similarly, bulk products on the Mt Isa line are not considered contestable.

17 Some smaller scale projects, such as in the North West Minerals Province, have been contestable and road has been chosen over rail in some cases.[8] While the coal/bulk business may arguably be non-contestable, the non-bulk component would be contestable in many cases. In a recent report, Ranbury Management Group (2015) noted that "Rail's major point of differentiation is price, with rail generally having to significantly undercut road pricing to gain business."[9] Reasons cited for the contestability include the longer transit times, complexity, unreliability and lack of availability of rail.[10]

18 The North Coast Line appears to be subject to competition with road transportation:

> Rail has been losing market share to road freight on this corridor, a situation mirroring that happening along the east coast South–North corridor. Rail is struggling to compete with road freight transport, in an environment of a significant uplift in road vehicle productivity, and massive investment in the highway network between Melbourne and Brisbane, and now planned for Brisbane – Cairns.[11]

19 Moreover, there is considerable uncertainty regarding the sustainability of revenues associated with the coal component; the share of revenue that is contestable by road (or sea) may increase considerably during the forthcoming undertaking period.

20 Also, as noted above, Queensland Rail has a small number of customers.[12] This raises the risk profile as a large reduction in demand could result from the decisions of a single customer. The New Acland Coal mine in particular accounts for a substantial share of revenue; approximately [redacted]

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7 Source: Queensland Rail.

8 Source: Queensland Rail.

9 Ranbury, North Coast Line Capacity Improvement Study — Final Report, February 2015, page 11.

10 Ranbury, North Coast Line Capacity Improvement Study — Final Report, February 2015, page 34.

11 Ranbury, North Coast Line Capacity Improvement Study — Final Report, February 2015, page 10.

12 In contrast to the large number of customers (15) using Aurizon's CQCR.

[redacted]

21 In addition, Queensland Rail *is* materially exposed to national and global shocks: the commodities transported in the West Moreton region are substantially different to those transported by Aurizon: the low margins give rise to a risk that a downturn in commodity prices leads to a reduction in demand of transportation from Queensland Rail, with mine closures plausible (as happened with Wilkie Creek in 2013).

2.1.2 Ports

22 While not considered by Incenta (2107) for Aurizon Network, ports share many similarities with railroad infrastructure such as that forming the asset base of Queensland Rail, and may be informative of Queensland Rail's asset beta.

23 While ports may differ considerably in the product composition, a mix of bulk freight and other freight would be expected for many ports in the sample. Some ports are also materially exposed to global markets through reliance on certain commodities, for example thermal coal either exported or imported.

2.1.3 Airports

24 Airports fall within the sector of transport infrastructure, and so may be informative of the risks faced by other infrastructure operators.

25 While not typically used to transport bulk freight, freight operations may contribute to airport revenue, with air cargo operations accounting for approximately 13% of commercial airline revenue in 2017.

26 The passenger transportation operations side of airports shares some similarities with that of QR, at least the long-distance passenger services are exposed to similar shocks to demand. However QR has a large share of suburban traffic; risks associated with these operations are unlikely to be related to those associated with air passenger services.

27 While some airports may have a large share of revenue accounted for by few airlines, acting as a hub, many airports might have a more diverse source of revenue. Furthermore, the demand for airport services is in most cases derived by consumer demand, with airport fees determined in part by passenger numbers. This is in contrast to the West Moreton coal transport operations of Queensland Rail, which rely on a very small number of mines.

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[13] The Land Court recommended cancelling the expansion plans in 2017, though on appeal the Supreme Court rejected the decision, sending the issue back to the Land Court for further consideration. *New Acland Coal Pty Ltd v Smith & Ors* [2018] QSC 88.

28 The competition faced by airports differs considerably across airports. While some airports may possess a substantial degree of market power, with few competitors located sufficiently close, other airports may be located close to competitors and so face constraints in passenger and freight services.

29 Airports however are exposed to some degree to global markets, in particular the tourism sector, which was impacted during the global financial crisis. The degree of exposure is however uncertain, and may not fully reflect the potential impact of thermal coal demand on Queensland Rail operations.[14]

2.1.4 Pipelines

30 Pipelines in North America are considered as comparators, and share the feature of having a typical low number of customers, though are not typically considered as transportation infrastructure. Incenta (2017) noted that North American pipelines are subject to competitive pressure (though this would differ across pipelines):

> Oil and gas transmission pipelines are subject to competitive pressures from parallel pipelines and alternative transport modes. As such, in general North American pipelines lack market power and their customers are not 'captured' like the customers of Aurizon Network.[15]

31 This aspect is shared with Queensland Rail, with alternative modes of transport applying competitive pressure to some Queensland Rail operations.

32 Relevant to our approach is the exposure to global shocks. As much of the output transported in the pipelines is destined for domestic use, industrial and commercial demand, the exposure is somewhat reduced compared to that of Queensland Rail.

33 Accordingly, while these pipelines may be used to transport products that could be considered commodities, these firms are of limited use to estimating the asset beta of Queensland Rail.

2.1.5 Toll roads

34 Incenta (2017) noted that toll roads are exposed to competitive pressure from alternative routes/transportation modes. The regulation form also aligns more closely with Queensland Rail, compared to Aurizon, since price caps often apply, linked to inflation. While toll roads may be used for freight transportation, the exposure of toll roads to commodity markets is less than that of other infrastructure owners such as Queensland Rail. In addition, the number of customers is typically large and diverse.

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14 Airlines and airports disagreed on the incidence of the impact of the GFC, see "Economic Regulation of Airport Services", Productivity Commission, 2011.

15 Incenta (2017), p. 43.

35 Incenta (2017) concluded that to be sensitive to GDP shocks, bearing full demand risk with CPI rather than cost-based price regulation. Accordingly, Incenta state that the demand of residential and industrial/commercial customers is expected to "display some sensitivity to the economic cycle, since there are often alternatives to toll road services, and there is no regulatory buffer."

36 Toll roads do however relate to the passenger transportation aspect of QR, and as such are afforded some weight.

2.1.6 Regulated energy and water businesses

37 In our view, it is not appropriate to estimate the beta for Queensland Rail solely on data from regulated energy and water network businesses. We note that Queensland Rail differs from a typical energy or water network business on two key dimensions[16]:

a. Nature of customer base – the diverse nature of customer geography and demand mitigates demand risk that applies to energy and water distribution companies; and

b. Elasticity of demand for service – the lack of substitutes for an energy or water distribution company means that they are able to benefit from relatively inelastic demand.

38 As noted in Table 1 above, firms in the regulated energy and water sector are not considered to be informative comparators of Queensland Rail. Failing to reside in the broad industry of transportation infrastructure, such businesses also have very few similarities in terms of determinants of risk exposure.

39 Incenta (2017) observed that:

> Both Aurizon Network and regulated energy and water businesses are monopoly service providers, have a 'captured' customer base with resilient demand for the service, and are subject to cost-based regulation for pre-set periods that cushions cash flows. These factors result in low sensitivity of demand / revenue to GDP shocks.

However, it is important to consider the key aspects resulting in the adoption of such comparators for Aurizon: market power, resilient demand, form of regulation, and low sensitivity of revenue to shocks. These are not applicable to Queensland Rail, and so these regulated energy and water businesses would be expected to have materially lower systematic risk than Queensland Rail.

40 Forming part of the resilient demand of regulated energy and water businesses is the large number of customers: residential, commercial and industrial. Synergies (2017) noted that "electricity and water networks are characterised by large numbers of low volume customers (low customer concentration), with low

16 QCA, UT5 Draft Decision p. 109.

dependence on high volume customers for revenue."[17] This is not in line with Queensland Rail's coal customer base, which has a low number of mines with high demand.

41 Also, the demand risk of Queensland Rail's coal network is more aligned with coal prices as it relies on demand of coal both in Queensland and internationally. Given the recent volatility in the global coal markets, demand for Queensland coal is likely to be more elastic than the demand for energy provided by energy networks.[18] As Queensland Rail has a different risk profile to a typical energy distribution network, this makes companies in this sector poor comparators.

42 In addition to the demand risks referred to in Section 2.1.1 above, Queensland Rail has been subject to a number of substantial reductions in demand for access. The closure of Queensland Nickel in 2016, for example, resulted in a loss of approximately [redacted] in annual revenue.[19]

43 [redacted]

44 To reduce the stranding risk of its assets, Queensland Rail secures take-or-pay contracts, which energy and water networks do not use for residential consumers. This further leads to differences in the way Queensland Rail operates when compared to a typical energy or water distribution network. Rather, the use of these contracts makes the risk of Queensland Rail more similar to transmission pipelines such as natural gas or liquids, which have fewer customers with significant demand.

45 The QCA recognised such differences in their 2013 draft decision:

> However, the QCA notes there are also significant differences between the entities that suggest that Queensland Rail's risks are unlikely to be less than those faced by Aurizon Network. In particular, Queensland Rail:
>
> (a) is more exposed to movements in the economy as it is subject to a price cap. In contrast, Aurizon Network has revenue certainty through its revenue cap
>
> (b) obtains revenues from only two coal mines (Cameby Downs and New Acland) on the western system. In contrast, Aurizon Network's revenue is from around 50 mines and over 15 companies across the CQCR

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17 QCA, UT5 Draft Decision, p. 111.

18 QCA, UT5 Draft Decision, p. 113.

19 Source: Queensland Rail.

20 See http://www.abc.net.au/news/rural/2017-02-23/more-freight-to-hit-north-queensland-roads-glencore/8296554

(c) provides for the transport of relatively low-margin thermal coal, where one mine has recently closed (Wilkie Creek). In contrast, Aurizon Network transports a large proportion of higher-margin coking coal and its coal traffic has not traditionally been related to Australian (or Queensland) economic and stock market cycles.

46 The material differences in risk profiles between Queensland Rail and regulated energy and water leaves little reason to include regulated energy and water in the comparator sample to be used in estimating asset beta.

2.2 Comparison with Aurizon Network

47 The QCA's approach to estimating the beta for Aurizon Network is to place 100% weight on a set of regulated electricity and water businesses. The QCA considered that the primary driver of systematic risk was the form of regulation and noted that Aurizon Network and the regulated electricity and water businesses shared the same form of regulation and were therefore comparable on that basis.

48 In our view, the approach adopted for Aurizon Network should not be adopted for Queensland Rail for two primary reasons:

a. The form of regulation is only one of a number of determinants of systematic risk, and there are material differences between Queensland Rail and Aurizon Network in terms of many of the drivers of systematic risk; and

b. Even if the form of regulation is considered to be the primary driver of systematic risk, Aurizon Network operates under revenue cap regulation whereas Queensland Rail operates under price cap regulation.

49 That is, while the form of regulation differs substantially between Queensland Rail and Aurizon, many other considerations are substantially different, leading to Queensland Rail having a materially higher risk profile than Aurizon. As a consequence, there is no basis for applying the same approach to estimate beta for Queensland Rail and Aurizon Network.

50 The QCA's 2013 Draft Decision for Queensland Rail noted a number of material differences between Queensland Rail and Aurizon Network. However, the 2015 Draft Decision documented a number of similarities between the two networks:[21]

Based on our analysis, we note that Queensland Rail's West Moreton network and Aurizon Network share similar characteristics, namely that they have:

 operations in the Queensland coal chain, although there is some difference in the composition of product

[21] Queensland Rail DAU 2015, p68

- cost-based based regulation that is applied to coal traffic operations
- revenue protection from take-or-pay contract provisions
- cost pass-through provisions within access agreements
- similar institutional arrangements, in that they are both located in the same state and regulated by the same regulator.

While there are some high-level similarities in that both networks are used for transporting coal, our view is that there are a number of material differences that have implications for the degree of systematic risk. The key differences are summarised in Table 2 below.

Table 2: Comparison between Queensland Rail / Aurizon supply of services for bulk freight (coal) and non-coal

Factors affecting position of miners		Queensland Rail	Aurizon
Value and resilience of demand	Coal mine type	Thermal – lower value	Coking / Metallurgical – higher value
Cost	Network state / cost	West Moreton – older, higher cost, not originally designed for coal	CQCN – newer, designed for coal, lower cost
	Above rail cost	Below rail limits above rail efficiency e.g. TAL, length	Not limited to same degree
	Mines within relative cost curves	More marginal	Inframarginal
Diversity of revenue	Other traffic	West Moreton has other traffic types – but this is unprofitable subsidised traffic	Nil
	Mine reliance	1-3 mines – high variance	~60 mines – lower variance
Contracts		Unclear whether take or pay In 2013: While Queensland Rail is protected from under-railings by take-or-pay provisions, those only cover 80% of contracted paths.	Take or pay
Regulation		Price cap – upside and downside on volume risk	Revenue cap
Competition		WM: May be limited for coal traffic Other network: Subject to considerable road-rail competition. Bulk freight	Nil

	favours rail. See Ranbury, p. 104.	

Source: Frontier Economics analysis.

51 In our view, the differences set out in Table 2 have significant implications for systematic risk. Although both networks transport coal, there are many factors which make them dissimilar.

52 Three key differences are:

a. The CQCN services more mature coal mines than Queensland Rail regional system;

b. Smaller amounts of coal are transported using the Queensland Rail regional system than the CQCN;

c. More shippers use the CQCN.

53 We consider that "industry characteristics, customer concentration, and exposure to a particular type of customer also matter for risk."[22] Since Aurizon Network's customers consist of more mature coal mines compared to those serviced by Queensland Rail,[23] this will lead to a different beta.

54 Both Aurizon Network and Frontier have previously considered that "regulation, at most, is just one of the many dimensions that should be considered in determining the appropriate comparator businesses"[24], implying that based on regulation alone Aurizon Network and Queensland Rail are not directly comparable.[25]

55 QCA's consultant Incenta noted that "the underlying economic aspects of Aurizon Network (e.g., certainty of demand and long-term take-or-pay contracts) imply recovery of regulated revenues".[26] However, Queensland Rail does not have this certainty of demand due to the more volatile quantities of coal being mined and transported than compared to Aurizon Network.

56 Since Incenta believe "that regulated energy and water businesses are the best available comparators at this time to estimate Aurizon Network's systematic risk"[27], and Queensland Rail is dissimilar enough to Aurizon, energy networks are not a good comparator for Queensland Rail. These points lead Frontier to believe that, at minimum, other industries should be included to estimate Queensland

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[22] QCA, UT5 Draft Decision, p. 91.

[23] Typically lower value thermal coal.

[24] QCA, UT5 Draft Decision, p. 91.

[25] QCA, UT5 Draft Decision, p. 92.

[26] QCA, UT4 Final Decision p. 248.

[27] QCA, UT5 Draft Decision, p. 110.

Rail's beta, rather than simply adopting the same beta as that which is used for Aurizon Network.

3 Estimation of asset beta

57 As illustrated in Table 1 above, it is our view that the relevant comparator industries include railways, ports, toll roads and airports. We consider that these comparator firms all provide potentially relevant information. It is our view that inclusion of comparators in the (revenue cap) regulated energy and water sector will not improve the accuracy of the asset beta estimate for Queensland Rail because the only reason to include those firms is on the basis of their form of regulation and:

a. Regulation is only one of a number of factors that affect systematic risk; and

b. Because Queensland Rail and Aurizon operate under a different form of regulation, comparators that are appropriate for Aurizon will not be appropriate for Queensland Rail.

58 In contrast to Aurizon, which shares revenue cap regulation with many of these comparators, Queensland Rail is subject to price cap regulation. In the absence of this consideration, regulated energy and water businesses should not be considered informative of the systemic risk to which Queensland Rail is exposed.

59 In this section we outline the method through which we estimate the asset betas of comparator industries, and accordingly the asset and equity betas of Queensland Rail.

3.1 Asset beta estimation method

60 For each potential comparator we obtained from Bloomberg the equity betas for the period May 2008 through to April 2018, and for the period May 2013 through to April 2018; this allows estimation of asset betas over a 5-year and 10-year window. We note that these time periods are consistent with the analysis performed by Incenta (2017).

61 For each window we obtain raw equity betas at both the weekly and monthly frequency, as both of these frequencies are commonly used and have been applied by regulators including QCA.[28]

62 Following the standard QCA approach as adopted by Incenta (2017), we de-lever the raw equity betas using gearing estimated as the average value of net debt over market capitalization over the relevant period. We also follow the standard QCA approach in using a debt beta of 0.12, the QCA's current gamma estimate of 0.46 and the prevailing statutory tax rate for each comparator firm.

28 Incenta (2017), p. 73, and DAU 2017, p. 90.

63 The following expression relates the equity, asset and debt betas (β_e, β_a and β_d respectively), where T is the corporate tax rate (adjusted for imputation by multiplying the statutory tax rate by 1-γ where relevant), D is net debt and E is market capitalization:

$$\beta_e = \beta_a\left(1 + (1 - T)\frac{D}{E}\right) - \beta_d(1 - T)\frac{D}{E}.$$

64 The above Conine formula, generally adopted by the QCA, was used to obtain asset betas for each comparator, for each of the four estimated raw equity betas (two time periods and two data frequencies). Results for each industry are summarized below in Table 3, showing average asset betas for each industry for the four different windows/frequencies. The range and midpoint refers to the industry average, not to individual comparator betas.

65 The comparators used for each industry are presented in Section 72. These comparators expand on those used by Incenta (2017), with additional categories of ports and airports.

66 For the ports industry, the original set of potential comparators contained 78 firms. Due to the large number of comparators, a filtering process was applied to remove those asset betas that would be less informative for purely econometric reasons. This was done on the basis of the standard error of the raw beta estimates (removed if one or more of the equity beta estimates had a standard error greater than 0.3), and the Amihud illiquidity measure (removed if greater than 6×10^{-7}). This leaves 39 comparator firms, suitable for estimation of the asset beta of ports.[29]

29 This filtering process had limited impact on the midpoint asset beta of the ports comparator group; the midpoint of the unfiltered sample was 0.026 points lower than the filtered sample, while having a substantially higher range for the averages of the four windows/frequencies.

Table 3: Calculated asset betas for Queensland Rail comparators

Industry	Count	10 years 2013-05 to 2018-04		5 years 2008-05 to 2018-04		Range low	Range high	Midpoint
		Weekly	Monthly	Weekly	Monthly			
Airports	25	0.73	0.73	0.68	0.76	0.68	0.76	0.72
Gas & liquids pipelines	15	0.81	0.70	0.71	0.48	0.48	0.81	0.64
Class 1 Railways	12	0.89	0.84	0.88	0.96	0.84	0.96	0.90
Ports	39	0.68	0.72	0.72	0.81	0.68	0.81	0.74
Regulated Energy and Water	78	0.41	0.31	0.45	0.34	0.31	0.45	0.38
Toll roads	8	0.49	0.56	0.51	0.54	0.49	0.56	0.53

Source: Frontier Economics analysis of Bloomberg data using QCA de-levering approach and QCA parameter values.

67 As noted above, it is our view that the asset betas of the airports, Class 1 railways, toll roads and ports are the most informative of the conditions and risks faced by Queensland Rail. Comparators in the regulated energy and water industry do not share key characteristics with Queensland Rail; neither do comparators in the pipeline sector. The toll roads and airports sectors both fall in the transport infrastructure industry, with airports in particular exposed to demand changes from global markets. Class 1 railways (annual revenues greater than $USD100 million) and ports are judged to be close comparators to Queensland Rail; they receive the most weight.

Table 4: Weights applied to industry segments

Industry	Weight
Airports	15%
Gas & liquids pipelines	0%
Class 1 railways	40%
Ports	30%
Regulated Energy and Water	0%
Toll roads	15%

Source: Frontier Economics analysis.

68 Applying the weights set out in Table 4 to the midpoint asset beta estimates of each comparator industry yields an asset beta estimate of 0.77.

4 Estimation of equity beta

69 The equity beta is estimated by re-levering the asset beta estimate of 0.77 according to the QCA's Conine approach. As in the de-levering step above, debt beta and gamma are taken to be 0.12 and 0.46 respectively (standard QCA assumptions), and the relevant statutory tax rate is used (30% in the case of Queensland Rail).

70 The net debt/market capitalization ratio used in the Conine formula is taken from the comparators, applying the same weighting as used for the asset beta calculations to the average gearing, across comparators, in each industry. The midpoint of the 5-year and 10-year average figures is used, as set out in Table 5 below.

Table 5: Debt/Equity ratio for comparator industries

Industry	Weight	Midpoint gearing
Airports	15%	0.35
Gas & liquids pipelines	0%	0.61
Class 1 railways	40%	0.26
Ports	30%	0.34
Regulated Energy and Water	0%	0.71
Tollroads	15%	0.85
Weighted average		**0.39**

Source: Frontier Economics analysis of Bloomberg data using QCA de-levering approach and QCA parameter values.

71 Thus, applying the weights as used for the asset beta to industry averages of net debt over market capitalization produces a gearing estimate of 0.39. This corresponds to a gearing ratio (the ratio of net debt to net debt plus market value of equity) of 28 per cent. This is adopted as the benchmark capital structure to be used in obtaining an equity beta of Queensland Rail, and is consistent with the approach taken to obtain the asset beta, specifically the weightings applied to each of the potential comparator industries and the approach of taking the midpoint of estimates from different windows/frequencies.[30] A summary of the relevant parameter estimates is set out in Table 6 below.

30 Frequency is not relevant for gearing as the data is averaged over the time period examined.

Table 6: Queensland Rail indicative cost of capital parameters

Parameter	Value
Asset beta	0.77
Gearing	0.28
Debt beta	0.12
Gamma	0.46
Equity beta	0.98

Source: Frontier Economics analysis of Bloomberg data.

72 We note that a 28% gearing figure is materially below the 55% figure that the QCA has adopted in recent decisions for both Queensland Rail and Aurizon. However, a lower level of gearing is consistent with a higher degree of systematic risk – other things being equal, riskier assets are able to support relatively less debt. Thus, whereas our analysis indicates that a higher asset beta is warranted for Queensland Rail, the impact of that change is mitigated by the lower level of gearing such that the resulting change in equity beta is more limited (from 0.8 to 0.98).

5 Sensitivity analysis

73 The equity beta is estimated by re-levering the asset beta estimate of 0.77 according to the QCA's Conine approach. As in the de-levering step above, debt beta and gamma are taken to be 0.12 and 0.46 respectively (standard QCA assumptions), and the relevant statutory tax rate is used (30% in the case of Queensland Rail).

74 Our beta and gearing estimates are based on the weights assigned to each set of comparators as set out in Table 4 above. Whereas we have explained the rationale for the weights we have selected (being based on the risk characteristics summarised in Table 1), we recognise that a degree of judgment is required. In relation to the application of that judgment, we make the following points:

a. We consider that the relative weights should be based on more than the form of regulation. Regulation is only one of a number of factors that determines a firm's systematic risk.

b. Queensland Rail operates under a different form of regulation than Aurizon Network and regulated electricity and water businesses. It also has a number of other characteristics that make it unlike regulated electricity and water businesses in terms of systematic risk.

c. An asset beta estimate as low as that adopted by the QCA for Aurizon Network can only be maintained if 100% weight is applied to regulated electricity and water businesses. If any material weight is applied to any other group of comparators, the result would be a higher asset beta estimate.

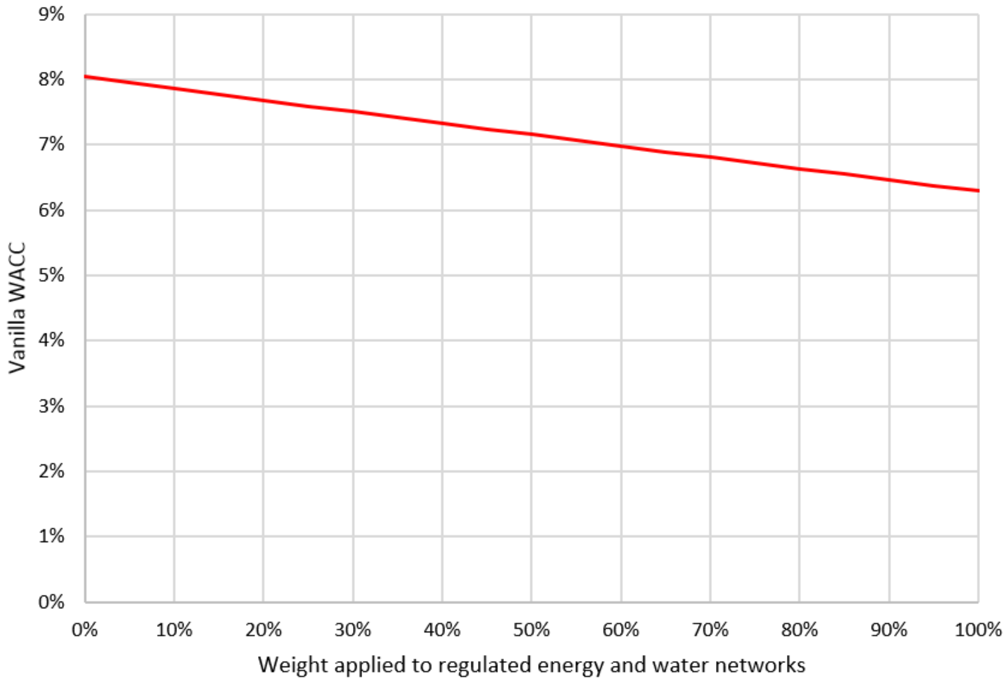
d. Changing the weights in Table 4 to afford more weight to the regulated electricity and water businesses would have two effects that somewhat offset each other:

   i. It would lower the asset beta estimate as more weight is applied to the industry segment that involves the lowest level of systematic risk; and

   ii. It would increase the gearing estimate as more weight is applied to the industry segment that (because of its lower risk) is able to support relatively more debt.

75 The sensitivity of the vanilla WACC estimate to different weights applied to the regulated energy and water sample is summarised in below. In all cases we adopt a return on debt of 4.5%, a risk-free rate of 2.5% and a market risk premium of 7%. The 0% weight corresponds to our recommended estimate, which uses comparators from other industries. The 100% weight applies the QCA's Aurizon Network Draft Decision, with an asset beta of 0.45 and gearing of 55%, based on energy and water network businesses.

Figure 1: Vanilla WACC sensitivity to weight applied to energy and water network comparators.



Source: Frontier Economics analysis. Return on debt set to 4.5%, risk-free rate set to 2.5%, MRP set to 7%.

6 Appendix: Industry samples used in estimation of asset and equity betas

Table 7: Class 1 Railways

Company name	Ticker	Country
Canadian National Railway	CNR CN Equity	Canada
Canadian Pacific Railway Ltd	CP CN Equity	Canada
Asciano Limited	AIO AU Equity	Australia
Aurizon Holdings Ltd	AZJ AU Equity	Australia
Daqin Railway Co Ltd	601006 CH Equity	China
Genessee & Wyoming	GWR US Equity	USA
Container Corporation of India Ltd	CCRI IN Equity	India
Globaltrans Investment PLC	GLTR LI Equity	Russia
CSX Corporation	CSX US Equity	USA
Kansas City Southern	KSU US Equity	USA
Norfolk Southern Corp	NSC US Equity	USA
Union Pacific Railroad	UNP US Equity	USA

Source: Incenta and Frontier Economics.

Table 8: Tollroads

Company name	Ticker	Country
Abertis Infrastructuras	ABE SM Equity	Spain
ASTM SpA	AT IM Equity	Italy
Atlantia SpA	ATL IM Equity	Italy
Getlink (Groupe Eurotunnel)	GET FP Equity	France
Societa Iniziative Autostradali e Servizi	SIS IM Equity	Italy
Transurban Group	TCL AU Equity	Australia
Macquaire Atlas Roads	ALX AU Equity	Australia

Vinci SA	DG FP Equity	France

Source: Incenta and Frontier Economics.

Table 9: Pipelines

Company name	Ticker	Country
Boardwalk Pipeline Partners LP	BWP US Equity	USA
EQT Midstream Partners LP	EQT US Equity	USA
Spectra Energy Corp	SEP US Equity	USA
TC PipeLines LP	TCP US Equity	USA
Williams Partners LP	WPZ US Equity	USA
Kinder Morgan Inc/DE	KMI US Equity	USA
Buckeye Partners LP	BPL US Equity	USA
Enbridge Energy Partners LP	EEP US Equity	USA
Enterprise Products Partners LP	EPD US Equity	USA
Magellan Midstream Partners LP	MMP US Equity	USA
Plains All American Pipeline	PAA US Equity	USA
Sunoco Logistics Partners LP	ETP US Equity	USA
ONEOK Inc	OKE US Equity	USA
Enbridge Inc	ENB CN Equity	Canada
TransCanada Corporation	TRP US Equity	USA

Source: Incenta.

Table 10: Airports

Company name	Ticker	Country
Aerodrom Nikola Tesla Beograd	AERO SG Equity	Serbia
Airport Facilities Co Ltd	8864 JP Equity	Japan
Airports of Thailand	AOT TB Equity	Thailand
Auckland International Airport	AIA NZ Equity	NZ
Beijing Capital International Airport Co Ltd	694 HK Equity	Hong Kong

Copenhagen Airport	KBHL DC Equity	Denmark
Frankfurt Airport Services Worldwide	FRA GR Equity	Germany
GMR Infrastructure Ltd	GMRI IN Equity	India
Grupo Aeropurtuario del Centro Norte SAB de CV	OMAB MM Equity	Mexico
Grupo Aeroportuario del Pacifico SAB de CV	GAPB MM Equity	Mexico
Grupo Aeroportuario del Sureste	ASURB MM Equity	Mexico
Guangzhou Baiyun International Airport Co Ltd	600004 CH Equity	China
HNA Infrastructure Co Ltd	357 HK Equity	Hong Kong
Japan Airport Terminal Co Ltd	9706 JP Equity	Japan
Malaysia Airport Holdings Bhd	MAHB MK Equity	Malaysia
Paris Airport	ADP FP Equity	France
SAVE SpA/Venezia	SAVE IM Equity	Italy
Shenzhen Airport Co Ltd	000089 CH Equity	China
Shanghai International Airport Co Ltd	600009 CH Equity	China
Sydney Airport	SYD AU Equity	Australia
TAV Havalimanlari Holding AS	TAVHL TI Equity	Turkey
Toscana Aeroporti SpA	TYA IM Equity	Italy
Vienna International Airport	FLU AV Equity	Austria
Xiamen International Airport Co Ltd	600897 CH Equity	China
Zurich Airport International	FHZN SE Equity	Switzerland

Source: Frontier Economics.

Table 11: Ports

Company name	Ticker	Country
Adani Ports & Special Economic Zone Ltd	ADSEZ IN Equity	India
China Merchants Port Holdings	144 HK Equity	Hong Kong
COSCO SHIPPING Ports Ltd	1199 HK Equity	Hong Kong
DP World Ltd	DPW DU Equity	Dubai

Hamburger Hafen und Logistik	HHFA GR Equity	Germany
Hutchison Port Holdings Trust	HPHT SP Equity	Singapore
International Container Terminal Services	ICT PM Equity	Philippines
Port of Tauranga Ltd	POT NZ Equity	NZ
Shanghai International Port Gr	600018 CH Equity	China
Shenzhen Chiwan Wharf Holdings Ltd	200022 CH Equity	China
Sociedad Matriz SAAM SA	SMSAAM CI Equity	Chile
Tianjin Port Co Ltd	600717 CH Equity	China
Tianjin Port Development Holdings Ltd	3382 HK Equity	Hong Kong
Wilson Sons Ltd	WSON33 BZ Equity	Brazil
Pakistan International Contain	PICT PA Equity	Pakistan
DP World Ltd	DPW DU Equity	Dubai
Puerto Ventanas SA	VENTANA CI Equity	Chile
Ningbo Zhoushan Port Co Ltd	601018 CH Equity	China
Qingdao Port International Co	6198 HK Equity	Hong Kong
TangShan Port Group Co Ltd	601000 CH Equity	China
Qinhuangdao Port Co Ltd	3369 HK Equity	Hong Kong
Rizhao Port Co Ltd	600017 CH Equity	China
Yingkou Port Liability Co Ltd	600317 CH Equity	China
Beibuwan Port Co Ltd	000582 CH Equity	China
Jinzhou Port Co Ltd	900952 CH Equity	China
Shenzhen Chiwan Wharf Holdings	200022 CH Equity	China
Zhuhai Port Co Ltd	000507 CH Equity	China
Jiangsu Lianyungang Port Co Lt	601008 CH Equity	China
Gemadept Corp	GMD VN Equity	Vietnam
Rinko Corp	9355 JP Equity	Japan
Puertos y Logistica SA	PUERTO CI Equity	Chile

China Container Terminal Corp	2613 TT Equity	Taiwan
Portuaria Cabo Froward SA	FROWARD CI Equity	Chile
Gold Bond Group Ltd/The	GOLD IT Equity	Israel
Nanjing Port Co Ltd	002040 CH Equity	China
Zhuhai Winbase International C	002492 CH Equity	China
Dinh Vu Port Investment & Development	DVP VN Equity	Vietnam
Dong Nai Port JSC	PDN VN Equity	Vietnam
Doan Xa Port JSC	DXP VN Equity	Vietnam

Source: Frontier Economics

Table 12: Regulated Energy and Water

Company name	Ticker	Country
ALLETE Inc	ALE US Equity	USA
Alliant Energy Corp	LNT US Equity	USA
Ameren Corp	AEE US Equity	USA
American Electric Power Co Inc	AEP US Equity	USA
APA Group	APA AU Equity	Australia
Atco Ltd/Canada	ACO/X CN Equity	Canada
Atmos Energy Corp	ATO US Equity	USA
AusNet Services	AST AU Equity	Australia
Avista Corp	AVA US Equity	USA
Black Hills Corp	BKH US Equity	USA
Canadian Utilities Ltd	CU CN Equity	Canada
CenterPoint Energy Inc	CNP US Equity	USA
Centrica	CNA LN Equity	UK
Chesapeake Utilities Corp	CPK US Equity	USA
CMS Energy Corp	CMS US Equity	USA
Consolidated Edison Inc	ED US Equity	USA

Delta Natural Gas Co Inc	DGAS US Equity	USA
Dominion Resources Inc/VA	D US Equity	USA
DTE Energy Co	DTE US Equity	USA
DUET Group	DUE AU Equity	Australia
Duke Energy Corp	DUK US Equity	USA
Edison International	EIX US Equity	USA
El Paso Electric Co	EE US Equity	USA
Emera Inc	EMA CN Equity	Canada
Empire District Electric Co/The	EDE US Equity	USA
Entergy Corp	ETR US Equity	USA
Eversource Energy	ES US Equity	USA
Exelon Corp	EXC US Equity	USA
FirstEnergy Corp	FE US Equity	USA
Fortis Inc/Canada	FTS CN Equity	Canada
Great Plains Energy Inc	GXP US Equity	USA
Hawaiian Electric Industries Inc	HE US Equity	USA
IDACORP Inc	IDA US Equity	USA
MGE Energy Inc	MGEE US Equity	USA
National Fuel Gas Co	NFG US Equity	USA
National Grid PLC	NG/ LN Equity	UK
New Jersey Resources Corp	NJR US Equity	USA
NextEra Energy Inc	NEE US Equity	USA
NiSource Inc	NI US Equity	USA
Northwest Natural Gas Co	NWN US Equity	USA
NorthWestern Corp	NWE US Equity	USA
OGE Energy Corp	OGE US Equity	USA
Otter Tail Corp	OTTR US Equity	USA

PG&E Corp	PCG US Equity	USA
Pinnacle West Capital Corp	PNW US Equity	USA
PNM Resources Inc	PNM US Equity	USA
Portland General Electric Co	POR US Equity	USA
PPL Corp	PPL US Equity	USA
Public Service Enterprise Group	PEG US Equity	USA
SCANA Corp	SCG US Equity	USA
Sempra Energy	SRE US Equity	USA
South Jersey Industries Inc	SJI US Equity	USA
Southwest Gas Corp	SWX US Equity	USA
Spark Infrastructure Group	SKI AU Equity	Australia
Spire Inc	SR US Equity	USA
SSE PLC	SSE LN Equity	UK
Southern Co/The	SO US Equity	USA
TransCanada Corporation	TRP CN Equity	Canada
UGI Corp	UGI US Equity	USA
United Utilities Group PLC	UU/ LN Equity	UK
Unitil Corp	UTL US Equity	USA
Vector Ltd	VCT NZ Equity	NZ
Vectren Corp	VVC US Equity	USA
WEC Energy Group Inc	WEC US Equity	USA
Westar Energy Inc	WR US Equity	USA
WGL Holdings Inc	WGL US Equity	USA
Xcel Energy Inc	XEL US Equity	USA
American States Water Company	AWR US Equity	USA
American Water Works Company	AWK US Equity	USA
Aqua America Inc	WTR US Equity	USA

Artesian Resources Company	ARTNA US Equity	USA
California Water Service Group	CWT US Equity	USA
Connecticut Water Service Inc	CTWS US Equity	USA
Middlesex Water Company	MSEX US Equity	USA
Pennon Group PLC	PNN LN Equity	UK
Severn Trent PLC	SVT LN Equity	UK
SJW Corporation	SJW US Equity	USA
The York Water Company	YORW US Equity	USA

Source: Incenta.

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Attachment 3: West Moreton System DAU2 Capital Expenditure Submission

West Moreton System
DAU2 Capital Expenditure Submission

14 August 2018

Commercial-In-Confidence

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1. Overview

1.1 Context

Queensland Rail's West Moreton System provides rail infrastructure access to two coal mines on the West Moreton System—New Hope Coal's New Acland Stage 2 mine at Jondaryan and Yancoal's Cameby Downs mine that rails from Columboola. These two mines are forecast to produce around 6.25 million tonnes of saleable coal in 2018-19. New Hope Coal's New Acland Stage 2 mine is nearing the end of its life, with it being likely that coal reserves at this mine may be exhausted by mid-2020.

In September 2017, under section 133 of the *Queensland Competition Authority Act 1997* (QCA Act), the Queensland Competition Authority (QCA) requested Queensland Rail to submit a draft access undertaking for the period 1 July 2020 to 30 June 2025 (DAU2), by 31 July 2018. If approved by the QCA, DAU2 will become the Queensland Rail Access Undertaking 2 (AU2).

As part of the development of DAU2 , Queensland Rail has proposed reference tariffs for the West Moreton System based on the 'building blocks' approach. This submission provides information supporting Queensland Rail's proposed capital expenditure for the period.

The DAU2 submission has been developed in the context of considerable uncertainty about the future coal volumes likely to be moved on West Moreton coal system.

In particular, New Hope Coal is yet to receive approval to develop the New Acland Stage 3 mine. New Hope Coal is continuing to progress with its development application, although there is no certainty about the potential outcome of this process. For this reason, two capital expenditure scenarios have been developed and are presented in this submission:

- a 2.1 million tonnes per annum (mtpa) scenario—assuming that only Yancoal's mine at Cameby Downs is producing coal for hauling
- a 9.1 mtpa scenario—assuming the New Acland mine is developed and produces 7 mtpa of coal for railing from Jondaryan, in addition to the 2.1 mtpa from Cameby Downs.

1.2 Proposed DAU2 West Moreton System capital expenditure

Queensland Rail has proposed 25 capital expenditure projects for the West Moreton System over the DAU2 period, with two cost estimates to take account of those projects considered to be tonnage dependent. The two proposed capital expenditure forecast for 2020–21 to 2024–25 (the DAU2 period), both excluding Interest During Construction (IDC) are:

- $144.495 million ($2020–21) to support the movement of 2.1 mtpa
- $159.384 million ($2020–21) to support the movement of 9.1 mtpa.

Table 1 and Table 2 show the proposed DAU2 capital expenditure by corridor and year for the movement of 2.1 mtpa per annum of coal and 9.1 mtpa of coal. These are the total costs for all common network assets, before allocation between coal and non-coal services.[1]

Table 1—Proposed capital expenditure 2.1 mtpa by year and corridor ($2020-21 million), excluding IDC

Corridor	2020-21	2021-22	2022-23	2023-24	2024-25	Total
Rosewood—Jondaryan	$20.878	$20.747	$12.460	$12.265	$7.158	$73.508
Jondaryan—Columboola	$15.163	$9.835	$14.454	$13.670	$17.864	$70.986
Total	**$36.041**	**$30.582**	**$26.914**	**$25.936**	**$25.022**	**$144.495**

Table 2—Proposed capital expenditure 9.1 mtpa by year and corridor ($2020-21 million), excluding IDC

Corridor	2020-21	2021-22	2022-23	2023-24	2024-25	Total
Rosewood—Jondaryan	$22.808	$23.067	$16.621	$17.440	$8.461	$88.397
Jondaryan—Columboola	$15.163	$9.835	$14.454	$11.058	$20.476	$70.986
Total	**$37.971**	**$32.902**	**$31.075**	**$28.498**	**$28.937**	**$159.384**

Queensland Rail has proposed that these capital expenditure projects identified in this submission be included in the capital indicator for DAU2, The efficient actual capital expenditure will be included in the Regulated Asset Base (RAB) on an ex post basis after the QCA has reviewed the projects for prudency of scope, scale and cost.

For the purpose of developing the proposed reference tariffs for DAU2, Queensland Rail has assumed that all of the individual projects (including individual projects that are part of a larger program of works) will be completed within a single year, and as a result forecast expenditure is capitalised in the year it is spent.

1 It should be noted that the Queensland Government's investment to increase the height of tunnels on the Toowoomba range has not been included in this submission, as the beneficiaries of this project will be agricultural transport, not coal transport.

1.3 Capital projects for the DAU2 period

1.3.1 Proposed capital expenditure 2.1 mtpa and 9.1 mtpa

Table 3 sets out the capital projects proposed for the DAU2 period. The capital projects proposed are primarily asset renewal projects. No growth projects are proposed for the DAU2 period for either of the two scenarios.

Table 3—Total proposed DAU2 capital expenditure by project—2.1 mtpa and 9.1 mtpa ($2020-21 million), excluding IDC

Project Name	Tonnage dependent	Regulatory driver	2.1 mtpa	9.1 mtpa
Civil projects				
Timber Bridge Replacement	No	Asset Renewal	[redacted]	[redacted]
Formation Repairs	Yes	Asset Renewal	[redacted]	[redacted]
Culvert Replacement	No	Asset Renewal	[redacted]	[redacted]
Sub-total			***$63.570***	***$66.536***
Track projects				
Track Reconditioning	Yes	Asset Renewal	[redacted]	[redacted]
Re-sleepering	No	Asset Renewal	[redacted]	[redacted]
Re-railing	Yes	Asset Renewal	[redacted]	[redacted]
Level Crossing Reconditioning	No	Asset Renewal	[redacted]	[redacted]
Concrete Sleepers With Gauge Issues On Tight Radius Curves	No	Asset Renewal	[redacted]	[redacted]
Level Crossing Transitions	No	Asset Renewal	[redacted]	[redacted]
Greasers Replacement / Upgrades	No	Asset Renewal	[redacted]	[redacted]
Sub-total			*$43.908*	*$55.832*
Signalling projects				
Trailable Facing Points Detection (Monitoring)	No	Service improvement	[redacted]	[redacted]
West Moreton Minor Signalling Renewals	No	Asset Renewal / Compliance	[redacted]	[redacted]
Signalling Pole Route Yarongmulu — Laidley	No	Asset Renewal	[redacted]	[redacted]
Level Crossing Signalling Upgrade	No	Asset Renewal / Compliance	[redacted]	[redacted]
Location Case Renewal	No	Asset Renewal / Compliance	[redacted]	[redacted]
Rangeview SER/PER Upgrade	No	Asset Renewal	[redacted]	[redacted]
Signalling LED Upgrade	No	Asset Renewal	[redacted]	[redacted]
Gatton Interlocking Renewal	No	Asset Renewal	[redacted]	[redacted]
Relay Interlocking Refurbishments	No	Asset Renewal	[redacted]	[redacted]
Sub-total			***$28.943***	***$28.943***
Telecommunications projects				
Replacement of Weather Stations	No	Asset Renewal	[redacted]	[redacted]
RMS Rollout	No	Asset Renewal / Compliance	[redacted]	[redacted]
Telecoms Rectifiers Regional	No	Asset Renewal / Compliance	[redacted]	[redacted]
Digital Telemetry Rollout	No	Asset Renewal / Compliance	[redacted]	[redacted]
Rangeview Cable Route Upgrade Copper to Fibre	No	Asset Renewal	[redacted]	[redacted]
Nera Microwave Refresh	No	Asset Renewal	[redacted]	[redacted]
Sub-total			***$8.073***	***$8.073***
Grand total			**$144.495**	**$159.384**

Only three of the 25 proposed capital expenditure projects are considered to be tonnage dependent—these projects are for formation repair, track reconditioning and re-railing.

Timber bridge replacement

Continuation of the timber bridge replacement project is the largest single project proposed for the DAU2 period.

The majority of existing bridges in the West Moreton System are rated to 15.75 tal. These bridges were originally designed for 12 tal (Imperial) or dynamic loads imparted by B16 steam locomotives. The bridges from Rosewood to Miles have been assessed with respect to their suitability for the axle configuration and loading of existing traffic. The desktop assessment has shown that, under the existing loadings, these bridges are operating at the limit of their capability. Due to the existing gross tonnages on the West Moreton System, timber bridges are incurring high maintenance costs, increased closure requirements and carry an elevated risk of derailment compared to concrete and steel replacement alternatives.

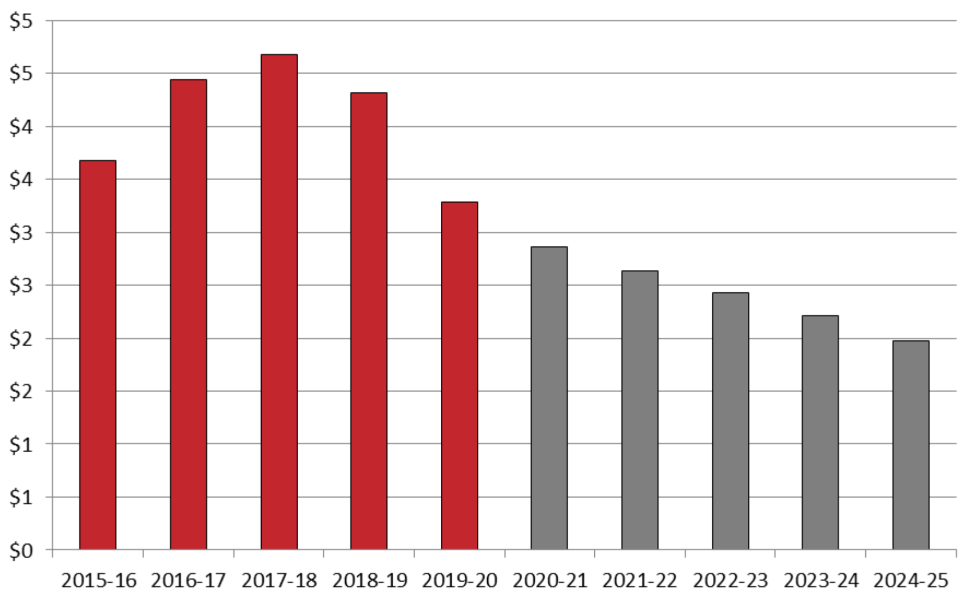
The timber bridge replacement project is part of an ongoing program to replace timber bridges across the West Moreton System. Queensland Rail is replacing timber bridges in the West Moreton System, predominantly with prestressed concrete or steel bridges. This is being undertaken to replace close-to-life-expired bridges with more durable infrastructure.

Timber bridges are prioritised for replacement based on a risk ranking. The ranking takes into inconsideration the defects in the bridge, tonnage over the bridge, temporary speed restrictions and priorities of the structures inspectors.

Timber bridge replacement on the West Moreton System is at a 200A standard (20tal), consistent with the West Moreton System Asset Management Plan. This is a key change in the capital project over the DAU2 period, relative to AU1, where prior to the Australian Government's announcement to proceed with the Inland Rail project in May 2017, bridges were designed to a 300A (30tal) standard.

Maintenance cost savings as a result of the timber bridge replacement program are reflected in the proposed maintenance budget for DAU2, with proposed expenditure to more than halve in real terms from 2015-16 to 2024-25.

Figure 1: Reduction in forecast structure maintenance allowance AU1 to DAU2 constant tonnes 6.25 mtpa ($2020-21 million)



Formation repairs and track reconditioning

Queensland Rail is proposing [redacted] ($2020–21) for the 2.1mtpa scenario and [redacted] ($2020–21) for the 9.1mtpa scenario (around 20 per cent of proposed capital expenditure proposal) to undertake formation repairs and track reconditioning. These two projects are ongoing and are a function of the original railway construction between 1865 and 1880, which was not designed to be a heavy haul railway.

Treatment of re-sleepering/track lowering (ballast undercutting)

Capital expenditure proposed for both the 2.1 mtpa and 9.1 mtpa scenarios include [redacted] ($2020-21) for resleepering, noting that this expenditure was treated as maintenance in the consideration of AU1 costs. Re-sleepering is proposed for inclusion as capital expenditure for the DAU2 period, consistent with the asset definition set out in Queensland Rail's *Specification—Capitalisation of Expenditure—MD12-376.*

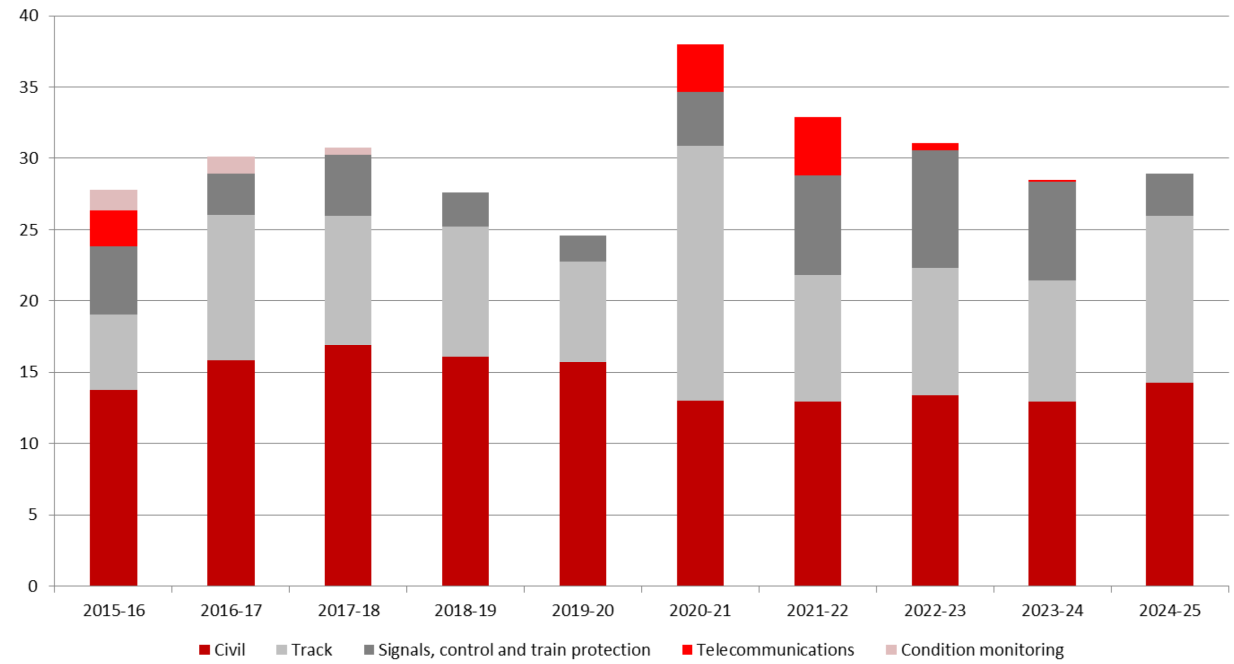
However, for the same reason that re-sleepering is proposed to be treated as capital expenditure, Queensland Rail is also seeking the QCA to reclassify approximately $7.5 million ($2020–21) track lowering costs over the DAU2 period as maintenance.

1.4 Comparison to capital expenditure in AU1

Proposed capital expenditure of $144.495 million ($2020-21) for the 2.1 mtpa scenario for DAU2 is 3 per cent higher than the capital expenditure allowance for 2015-16 to 2019-20 $140.876 million ($2020 21), noting that this includes [redacted] for resleepering. Compared to AU1, capital expenditure on structures is proposed to be $14.8 million ($2020-21) lower. Capital expenditure for signals, control and train protection equipment for the DAU2 period is $9.6 million ($2020 21) higher (50 per cent) than for 2015 16 to 2019 20, largely to replace life expired assets.

Proposed capital expenditure of $159.384 million ($2020-21) for the 9.1 mtpa scenario for DAU2 is 13 per cent higher than the capital expenditure allowance included for AU1 of $140.876 million ($2020-21). The comparison of capital expenditure 2015-16 to 2019-20 to the proposed DAU2 capital expenditure is shown in **Figure 2**.

Figure 2—Proposed capital expenditure AU1 and DAU2, by year and function—9.1 mtpa ($2020–21, million)



2. System description

2.1 Overview of system characteristics and current infrastructure

The West Moreton System is an important link in the supply chains that export coal and agricultural products from areas of south-west Queensland through the Port of Brisbane. The system begins on the western side of Rosewood on the Main Line and runs through Toowoomba to Miles on the Western Line. This section is the predominant coal corridor for the system. The West Moreton System does not include the Glenmorgan Line which runs from Dalby and now stops at Meandarra, the Southern Western Line from Toowoomba to Wyreema and beyond the Ebenezer loading loop, which is part of the Metropolitan System.

Figure 3: West Moreton System characteristics and infrastructure

Route length	321 km narrow gauge
Track length	407 km narrow gauge
Rail size	41, 50, 60 kg/m
Mainline sleepers	Concrete, interspersed steel and timber sleepers, predominantly 1 in 2
Maximum axle load	15.75 tonne axle load (tal)
Max. operating speed	80 km/h
Signalling	RCS and DTC
Reference train length	673.8 metres

2.2 Current traffic types, operators and key customers

The West Moreton network is a multi-use system with coal, freight and passenger trains utilising paths. Coal trains are the dominate traffic from west of Toowoomba and are the predominant driver of the asset strategies for the system. Trains are limited to 15.75tal with a train length of 670m.

As at 30 June 2018, Aurizon is the only freight service operator on the West Moreton System. However, Graincorp has announced that it has contract with Watco from 2019 for the movement of bulk grain in Queensland, including from south west Queensland.

Rail traffic from the South West system joins West Moreton System at Toowoomba. The South West system primarily carries bulk grain.

Queensland Rail is the passenger service operator running the Westlander from Brisbane to Charleville. This is the only passenger services that transits through the West Moreton System.

3. Business environment/key drivers

3.1 History of the West Moreton System and relationship to capital expenditure

The West Moreton System was constructed and opened to traffic in 1865 between Ipswich and Grandchester, with subsequent extensions reaching Toowoomba in 1867. Historically the line catered for passenger, livestock, freight and agricultural products (e.g. grain and cotton).

Coal carrying rail services commenced in 1982 initially from mines located just west of Ipswich. Coal export using the West Moreton System commenced from Jondaryan in 1984, from Macalister in 1994 (closing in 2014) and from Columboola in 2010.

The System's historical origins present continuing challenges for its capital expenditure and ongoing maintenance. The West Moreton System was initially constructed on black soil plains with no engineered formation; resulting in regular failures requiring reconstruction to ensure suitable track geometry is maintained.

Early track standards have resulted in an alignment that is lower than contemporary standards for stand-alone heavy haul railway built specifically for coal carrying services. As a consequence of the network's age and track standard, the section between Rosewood and Miles in particular requires a higher level of intervention than would be required for a modern, stand-alone heavy haul railway in order to safely and reliably deliver contracted tonnages.

The age and condition of the West Moreton System, particularly the relationship between maintenance and the value of assets was considered expensively as part of the QCA's approval of AU1—including approval of the RAB and maintenance cost allowance. While Queensland Rail has been slowly improving the quality of the track through the capital program, the same continue to affect the capital expenditure requirements for DAU2.

3.2 Access holder requirements

The major business for the West Moreton System is the transportation of coal from the Surat Basin to the Port of Brisbane. Typical coal trains are comprised of double header 94.5t locomotives with forty-one 63t (gross) wagons at nominal 15.75 tal.

To ensure the supply chain delivers the product to the Port of Brisbane on time, the above rail operator's services are timetabled to meet the requirements of the SEQ System. Delays in coal carrying train services can result in trains waiting for a new time slot in the SEQ network and delaying delivery of product to the port.

Queensland Rail has a contractual obligation with access holders to minimise below rail transit time. However, access holders also seek:

- a known cap on the number, location and time interval between track possessions
- best possible response times to any network disruption (including force majeure events)
- some spare capacity for peak production rates, or catch up capacity
- coordinated supply chain shutdowns and track possessions.

Queensland Rail aims to meet access holder /operator / supply chain requirements by reasonably limiting the number of speed restrictions and the total number of unavailable days for rail traffic. However, transit times can also be impacted by factors that are not within the control of Queensland Rail.

3.3 Investment drivers and triggers

3.3.1 Inland Rail

The Inland Rail route is divided into 13 projects for delivery with three of these projects in Queensland. The three projects are New South Wales/Queensland Border to Gowrie; Gowrie to Helidon; and Helidon to Calvert.

In view of the Inland Rail Project, The West Moreton System's asset renewal strategy has been revised to modify the loading requirements and design life requirements of new bridges (ie. the loading requirements for new bridges between Rosewood and Jondaryan have been reduced from 300A to 200A. This change will reduce the amount of capital expenditure which is at risk from future projects and changes in the freight market.

The West Moreton System will be affected by the above-mentioned factors in two ways:

- Between Rosewood and Gowrie Inland Rail will directly compete with the existing rail corridor, therefore the design life of renewals should align to the expected remaining life of the line; and
- Between Gowrie and Miles the design life of renewals should take into account the potential for freight customers to cease operations (coal customers) or to change modes (bulk grain).

It should be noted that the design life of structures contributes to, but is independent of the future economic life of the West Moreton System. If Inland Rail is deferred or does not get constructed east of Gowrie, the bridges with the revised design life can be replaced at the end of their useful life.

3.3.2 Strategic Investment by the Queensland Government

Queensland Rail's market share of the agricultural freight task in regional Queensland has declined significantly over the last 10 years. This has placed increased pressure on the regional road network while the regional rail lines continue to be significantly under-utilised. (The exception is the West Moreton System—Miles to the Port of Brisbane, although the higher utilisation of this network is due to coal haulage). The reduction in regional rail freight volumes has also resulted in a significant increase in truck movements through Brisbane to the Port of Brisbane.

In October 2017, the State Government approved Queensland Rail to proceed with a $47.5 million project to complete tunnel clearance works on the Toowoomba and Little Liverpool Ranges as part of the implementation of a rail freight growth strategy. The work is being delivered through a contract with the private sector.

3.4 Traffic assumptions

Rail traffic is limited by the capacity of the Toowoomba Range with a maximum of 113 possible return paths per week. Of these, 14 are preserved for freight and two for passenger rail traffic.

Table 2: West Moreton System traffic assumptions DAU2

Train type	Considerations
Coal	There are up to 97 return paths available for coal to contract. Final approval of New Hope's New Acland Stage 3 development is still to be obtained, and will take total West Moreton railings to approximately 9.1 mtpa. If New Acland Stage 3 development is not approved, total West Moreton railings drop to 2.1 mtpa from mid-2020. If the New Acland Stage 3 mine is developed, this will likely consume the existing paths available for contracting for coal, and additional capacity options will need to be considered.
Non-coal freight	As at 30 June 2018, Aurizon is the only freight service operator on the West Moreton System. [redacted] It is assumed that non-coal freight traffic will remain a or around historic averages over the DAU2 period.
Passenger	The Westlander currently operates twice a week from Brisbane to Charleville and return.

3.5 Capacity constraints

The West Moreton System is constrained by four aspects:

- All timber and steel structures are limited to 15.75tal, noting that a network is only as strong as its 'weakest link'
- Most of the formation material was not engineered and is considered under-strength for 15.75tal;
- Without additional infrastructure investment, the Toowoomba Range capacity is restricted to 113 return paths per week; and
- Passing loops at Fisherman Islands and Kingsthorpe are 690 metres long, which restricts the maximum length of trains on the system (a coal reference train is 673.8 meters long).
- The steep grades of the Toowoomba Range and the Little Liverpool Range cause trains to traverse these sections slowly, which combined with single line workings in both locations causes capacity constraints.

The Toowoomba Range is subject to landslides in extraordinary rain events (>Q100 levels) with major reconstruction repairs to the track being required in recent years. Geotechnical monitoring and assessments have been undertaken and have shown that further investment is required to reduce the risk of further landslides.

Traffic from the West Moreton System must arrive at the entry to the SEQ network at the timetabled time to ensure its path through the network to the Port of Brisbane. Any growth potential on the West Moreton System must consider the capacity and capability of the SEQ System for paths and train length.

3.6 Relationship to West Moreton System Asset Management Plan

Queensland Rail has developed the 2018–19 West Moreton System Asset Management Plan, which provides the strategic framework for planning capital and maintenance activities on a rolling 10-year basis. The capital expenditure projects for the DAU2 period have been developed consistent with the Asset Management Plan.

The West Moreton Asset Management Plan 2018–19 clearly sets out that the axle load (tal) assumptions in the asset strategy for the West Moreton System. In aiming to accommodate potential future increased axle loadings (20tal), all new structures east of Jondaryan will be constructed to 200A loading. All track components are to provide minimum of 20tal capacity.

4. DAU2 proposed capital expenditure

Chapters 5 8 outlines the individual project scopes and estimates that make up the proposed capital program for the West Moreton System for the DAU2 period. The scopes have been developed collaboratively by the Regional West Infrastructure Planning Team and Networks Group Asset Manager's Office.

The vision for the West Moreton System is to provide a safe and reliable network that is trusted by customers and represents sound value for money for Queensland Rail's stakeholders.

Key strategies that are being implemented or introduced by Queensland Rail for its asset management strategies are:

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

4.1 Assumptions

4.1.1 Capital planning assumptions

The following assumptions were made when developing the capital expenditure program:

- 5 x 4 day closures (planned possession); 2 x 3 day closures; 2 x 2 day closures; and 6 x 12 hour closures per year
- 15.75 tonne axle load
- Speed of 60km/hr (loaded train) and speed of 80km/hr for empty trains
- A reference train comprised of 2 x 94.5 tonne locomotives plus 41 coal wagons
- An annual coal tonnage of 2.1 mtpa or 9.1 mtpa, plus non-coal freight moved at historic averages and two return Westlander services per week.

4.1.2 Cost indexation

The \$2017–18 cost estimates have been indexed to \$2020–21 using and CPI of 1.71 per cent for 2017-18 and an assumed rate of 2.5 per cent per annum thereafter. This is based on the inflation trend implied by the Statement on Monetary Policy issued by the Reserve Bank of Australia.[2]

4.1.3 Independent peer review

The projects presented in this document have been subject to independent peer review by GHD. GHD's report has been provided separately to the QCA for its consideration.

2 See RBA, Statement on Monetary Policy—May 2018, Economic Outlook. https://www.rba.gov.au/publications/smp/2018/may/economic-outlook.html

4.2 DAU2 capital expenditure by project and year—2.1 mtpa

Table 3—Proposed capital expenditure by year and project—2.1 mtpa ($2020–21 million)

Project	2020-21	2021-22	2022-23	2023-24	2024-25	Total
Civil						
Timber Bridge Replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Formation Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Culvert Replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	*$12.435*	*$12.317*	*$12.781*	*$12.377*	*$13.660*	*$63.570*
Track						
Track Reconditioning	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Re-sleepering	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Re-railing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Level Crossing Reconditioning	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Concrete Sleepers with gauge issues on tight radius curves	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Level Crossing Transitions	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Greasers replacement / upgrades	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	***$16.505***	***$7.179***	***$5.348***	***$6.479***	***$8.397***	***$43.908***
Signalling						
Trailable Facing Points Detection (Monitoring)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
West Moreton Minor Signalling Renewals	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Signalling Pole Route Yarongmulu—Laidley	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Level Crossing Signalling Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Location Case Renewal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rangeview SER/PER Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Signalling LED Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Gatton Interlocking Renewal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Relay Interlocking Refurbishments	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	***$3.799***	***$7.010***	***$8.250***	***$6.919***	***$2.965***	***$28.943***
Telecommunications						
Replacement of Weather Stations	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Remote monitoring system rollout	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Telecoms Rectifiers Regional	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Digital Telemetry Rollout	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rangeview Cable Route Upgrade Copper to Fibre	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Nera microwave refresh	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	***$3.302***	***$4.077***	***$0.534***	***$0.160***	-	***$8.073***
Total	**$36.041**	**$30.582**	**$26.914**	**$25.936**	**$25.022**	**$144.495**

4.3 DAU2 capital expenditure by project and year—9.1 mtpa

Table 4—Proposed capital expenditure by year and project—9.1 mtpa ($2020–21 million)

Project	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Civil						
Timber Bridge Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Formation Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Culvert Replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	*$13.028*	*$12.910*	*$13.374*	*$12.971*	*$14.253*	*$66.536*
Track						
Track Reconditioning	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Resleepering	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rerailing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Level Crossing Reconditioning	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Replace concrete sleepers on tight radius curves	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Level Crossing Transitions	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Greasers replacement / upgrades	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	*$17.842*	*$8.906*	*$8.916*	*$11.061*	*$9.107*	*$55.832*
Signalling						
Trailable Facing Points Detection (Monitoring)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
West Moreton Minor Signalling Renewals	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Signalling Pole Route Yarongmulu—Laidley	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Level Crossing Signalling Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Location Case Renewal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rangeview SER/PER Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Signalling LED Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Gatton Interlocking Renewal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Relay Interlocking Refurbishments	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	*$3.799*	*$7.010*	*$8.250*	*$6.919*	*$2.965*	*$28.943*
Telecommunications						
Replacement of Weather Stations	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Remote monitoring system rollout	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Telecoms Rectifiers Regional	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Digital Telemetry Rollout	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rangeview Cable Route Upgrade Copper to Fibre	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Nera microwave refresh	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sub-total	*$3.302*	*$4.077*	*$0.534*	*$0.160*	-	*$8.073*
Total	$37.971	$32.902	$31.075	$28.498	$28.937	$159.384

5. Civil projects

5.1 Timber bridge replacement

5.1.1 DAU2 proposed costs and scope

Table 5: Proposed DAU2 timber bridge replacement costs by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 6: Proposed DAU2 timber bridge replacement scope, by corridor (metres)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	213	152	0	91	0	457
Jondaryan—Columboola	0	57	224	120	259	661
Total	**213**	**209**	**224**	**211**	**259**	**1,118**

5.1.2 Project description

Summary	
Background	Timber bridge replacement is part of an ongoing program to replace timber bridges across the West Moreton System. Timber bridges are prioritised for replacement based on a risk ranking. The ranking takes into consideration the defects in the bridge, tonnage over the bridge, temporary speed restrictions and priorities of the structures inspectors. Timber bridge replacement on the West Moreton is at a 200A standard (20tal), consistent with the West Moreton System Asset Management Plan.
Project scope	Replace timber bridges, between Rosewood and Columboola, with prestressed concrete or steel bridges. Reinstatement of associated trackwork is included and is minimised by ensuring bridges are designed on the current alignment where practicable. The DAU2 estimates are based on contracted rates and have been estimated using an average cost of [redacted] ($2020-21) for a concrete ballast deck structure.
Project benefits	Project benefits include: • Reduction in maintenance costs associated with component degradation/replacement and detailed inspections as shown within the structures maintenance costs proposed for DAU2. • Reduction in exposure to old technology and labour intensive practices. • Reduction in exposure to defect and work related speed restrictions on bridges and their approaches. • Reduction in exposure to the expected scarcity of skilled workers and the supply of timber components in the long term.
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System. However, Queensland Rail notes the works that comprise this project are being undertaken in response to the traffic volume proposed by coal carrying customers. The project would otherwise not be required to be delivered within the DAU2 period.
Delivery provider	An external contractor under the management of Queensland Rail will be engaged to complete this project excluding track work, which will be undertaken by Queensland Rail.
Consideration of alternative options	All bridge replacements are put out to tender without specifying a replacement structure type. This allows industry to drive reductions in prices through innovation and packaging multiple sites.

5.2 Formation repairs

5.2.1 DAU2 proposed costs and scope

Table 7: Proposed DAU2 formation repairs, by corridor—2.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 8: Proposed DAU2 formation repairs by corridor—9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

Table 9: Proposed DAU2 formation repairs, scope by corridor—2.1 mtpa (kms)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	0.8	0.8	0.8	0.8	0.8	4.0
Jondaryan—Columboola	4.3	4.3	4.3	4.3	4.3	21.5
Total	5.1	5.1	5.1	5.1	5.1	25.5

Table 10: Proposed DAU2 formation repairs, scope by corridor—9.1 mtpa (kms)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood— Jondaryan	1.6	1.6	1.6	1.6	1.6	8.0
Jondaryan— Columboola	4.3	4.3	4.3	4.3	4.3	21.5
Total	5.9	5.9	5.9	5.9	5.9	29.5

5.2.2 Project description

Summary	
Background	Formation repairs are part of a continuing program to manage formation issues on the West Moreton System. Issues with formation on the West Moreton System are longstanding and are the result of the original railway construction between 1865 and 1880. In 2013, WorleyParsons noted that the result is that the formation is sub-standard even for a semi-heavy haul operation, and the track at present requires regular resurfacing (in the order of once every three to four months). The improvement from resurfacing in top and line soon deteriorates. Areas where there is major weakness in the foundation the sleepers start pumping and the black soil mud soon permeates the track structure.[3] Formation strengthening was recommended by the Transportation and Technology Centre Inc (TTCI) in 2010 following its review of the West Moreton System with concerns about derailment and increasing speed restrictions.[4] Formation repairs have occurred during the AU1 period and will continue for DUA2.
Project scope	Repair of formation failure, mud holes and ballast pockets throughout the West Moreton System. An average provision of 5.1 km per year has been provided for the 2.1 mtpa scenario and 5.9 km per year in the 9.1 mtpa scenario. Estimated costs per km are based on the delivery costs by corridor achieved during 2015-16 to 2016-17 are: • Rosewood—Jondaryan:[redacted] ($2020-21) • Jondaryan—Columboola: [redacted] ($2020-21) The formation repairs program is expected to continue past 2024-25.
Project benefits	Project benefits include: • Reduced ballast contamination reducing the risk of speed restrictions and derailments • Reduced top and line deterioration reducing the risk of speed restrictions and derailments
Tonnage dependent?	Yes
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System. However, Queensland Rail notes the works are being undertaken in response to the traffic volume proposed by coal carrying customers. The project would otherwise not be required to be delivered within the DAU2 period.
Delivery provider	Queensland Rail will remove and replace rail assets. Formation rehabilitation will be undertaken by an external contractor.
Consideration of alternative options	Depending on the soil strengths at each location different options are considered. This includes varying depths of new formation material and the use of geogrids and geotextiles.

3 Queensland Rail has previously provided the QCA with a copy of the report— Worley Parsons, AU1 West Moreton Reference Tariff Submission Review (2013)

4 Queensland Rail has previously provided the QCA with a copy of the report—TTCI Evaluation of Queensland Rail West Moreton Coal Corridor (2010)

5.3 Culvert replacement

5.3.1 DAU2 proposed costs and scope

Table 11: Proposed DAU2 culvert replacement costs by corridor—2.1 mpta and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

Table 12: Proposed DAU2 culvert replacement, scope by corridor (number of culverts)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	6	8	3	1	0	18
Jondaryan—Columboola	2	0	5	7	7	21
Total	**8**	**8**	**8**	**8**	**7**	**39**

5.3.2 Project description

Summary	
Background	Replacement of life expired assets
Project scope	Queensland Rail proposes to replace 39 life expired culverts between Rosewood and Columboola over the DAU2 period. Culverts have been identified as requiring replacement as part of regular network inspection. These structures are at risk of failure under operations or washout in the event of a high rainfall event. Failure of these structures would significantly impact throughput.
Project benefits	Project benefits include: • Improved safety and reliability of the network by reducing risk of derailments and network outages due to culvert collapse • Reduced risk of flood damage to adjacent properties due to blocked or restricted culverts; and, • Reduced risk of service delays caused by speed restrictions posed due to culverts failing prior to renewal
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System. However, Queensland Rail notes the works are being undertaken in response to the traffic volume proposed by coal carrying customers. The project would otherwise not be required to be delivered within the DAU2 period.
Delivery provider	Culvert replacement will be undertaken by Queensland Rail with support from external subcontractors as appropriate.
Consideration of alternative options	Replacement of life expired culverts will be in line with Queensland Rail's Network Track and Civil Asset Strategy policy which is for culvert design to be as simple and standardised as possible. The two preferred culvert designs for Queensland Rail are: • Concrete Box Culverts which should be designed in accordance with AS1597.1:2010 and AS1567.2:2013. • Concrete Reinforced Pipes which should be designed in accordance with AS3725:2007 and manufactured in accordance with AS4508:2007.[5]

5 Queensland Rail, Network Track and Civil Asset Strategy (2017), p 61

6. Track projects

6.1 Track reconditioning

6.1.1 DAU2 proposed costs and scope

Table 13: Proposed DAU2 track reconditioning by corridor—2.1 mtpa ($'000 2020–21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 14: Proposed DAU2 track reconditioning by corridor—9.1 mtpa ($'000 2020–21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 15: Proposed DAU2 track reconditioning scope by corridor—2.1 mtpa (kms)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	2.45	0.00	0.00	0.00	0.00	2.45
Jondaryan—Columboola	0.00	2.23	1.04	1.96	1.00	6.23
Total	**2.45**	**2.23**	**1.04**	**1.96**	**1.00**	**8.68**

Table 16: Proposed DAU2 track reconditioning scope by corridor—9.1 mtpa (kms)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	2.92	0.76	2.14	2.90	0.00	8.72
Jondaryan—Columboola	0.00	2.23	1.04	0.00	2.96	6.23
Total	**2.92**	**2.99**	**3.18**	**2.90**	**2.96**	**14.95**

6.1.2 Project description

Summary	
Background	Track reconditioning work in the West Moreton System involves reconstructing the formation and track. The scope of works includes: • track deconstruction • formation reconstruction from the subgrade • replacement of fastenings, rail (41 kg/m to 50 kg/m) and sleepers • welding and stressing • tamping and resurfacing • quality components (NDT of welds, formation compactness etc.) • follow-up inspections, as needed.
Project scope	The project scope includes undertaking track reconditioning for: the remaining interspersed timber and steel track on the Mainline between Helidon to Toowoomba, selected portions of the track on the Mainline Up Road between Rosewood and Helidon selected portions west of Jondaryan are to be re-laid with 50kg/m rail on medium depth concrete sleepers and 250mm of fresh ballast. It will include track being installed to a designed and monumented alignment at a stress free neutral temperature of 38 degrees Celsius. Track reconditioning is considered to be tonnage dependent, with 8.68 km of reconditioning planned for the 2.1 mtpa scenario and 14.95 km of reconditioning planned for the 9.1 mtpa scenario. Estimates have been developed using a rate of [redacted]/km ($2020-21). These sites prioritised for relay, target areas where a high maintenance requirement is being experienced, including resurfacing, rail defect propagation and high wear. A provision has been made for formation lowering and capping where required. High shoulders and cesses are to be graded throughout to ensure sufficient drainage of the formation. This work program is expected to continue beyond 2024–25.
Project benefits	Project benefits include: • Improvements in the reliability of heavily used sections, reducing derailment likelihood • Improvements in track geometry, stability and a reduction in significant creep limiting pull aparts and buckles • Reduction in the occurrence of rail defects, traffic interruptions, broken rail derailments • Reduction in future maintenance requirements such as rail repairs and rail joint maintenance, saving labour and improving trackside safety
Tonnage dependent?	Yes
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System. However, Queensland Rail notes the works are being undertaken in response to the traffic volume proposed by coal carrying customers. The project would otherwise not be required to be delivered within the DAU2 period.
Delivery provider	Queensland Rail will perform the majority of the work associated with this project with limited use of external contractors for earthworks and cranage hire.
Consideration of alternative options	The use of steel sleepers has been considered, however given the proposal is to remove all sleepers, ballast and rail, the use of concrete sleepers is prefer as the most reliable and cost effective option.

6.2 Re-sleepering

6.2.1 DAU2 proposed costs and scope

Table 17: Proposed DAU2 re-sleepering by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 18: Proposed DAU2 re-sleepering scope by corridor (number of sleepers)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	2,600	0	0	0	11,000	**13,600**
Jondaryan—Columboola	38,500	0	0	0	0	**38,500**
Total	**41,100**	**0**	**0**	**0**	**11,000**	**52,100**

6.2.2 Project description

<table>
<tr><th colspan="2">Summary</th></tr>
<tr><td>Background</td><td>Re-sleepering comprises the replacement of defective timber sleepers in a pattern or at random using specialised, internal, resleepering teams and machines to achieve high production rates. The teams typically include resurfacing support, ensuring the integrity of the top and line is maintained.

Network requirements for re-sleepering in each corridor are forecasted for a 10 year period using a robust 'one pass maintenance' cyclic renewal program. This program is based on residual ineffective sleepers (at the time of the last renewal cycle) and/or the most current sleeper testing results (typically undertaken using the proprietary ZetaTech system on five yearly intervals). The forecast includes a degradation rate of 5 per cent per year of the total timber sleeper population.

Mechanised re-sleepering is proposed for inclusion as capital expenditure for the DAU2 period, consistent with the asset definition set out in Queensland Rail Specification—Capitalisation of Expenditure—MD12-376.[6]

Large scale re-sleepering replaces old sleepers with new—and avoids increasing costs of sleeper management and other related costs if sleepers are not routinely replaced.

The table below sets out the asset definition used to distinguish between resleepering as operating and capital expenditure. Queensland Rail's DAU2 submission has been developed consistent with this definition, i.e. sleeper replacement for lengths longer than 500 meters.

Queensland Rail guidelines for capitalisation of track specific costs as operating expenditure[7]

<table>
<tr><th>Asset condition</th><th>Expenditure Type</th><th>Area</th><th>Rail</th><th>Ballast</th><th>Sleepers</th></tr>
<tr><td rowspan="5">Not expired / Expired / Damaged</td><td>Like replacement</td><td>Regional</td><td>< 2000 meters</td><td>< 2000 meters</td><td>< 1 in 4 (25%) or less than 500 meters</td></tr>
<tr><td>Improvement</td><td>Regional</td><td>< 2000 meters</td><td>N/A</td><td>< 1 in 4 (25%) or less than 500 meters</td></tr>
<tr><td>Single rail</td><td>Statewide</td><td>Any length</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Undercutting (track height adjustment only)</td><td>Statewide</td><td>N/A</td><td>Any length</td><td>N/A</td></tr>
<tr><td>Resurfacing(top up)</td><td>Statewide</td><td>N/A</td><td>Any length</td><td>N/A</td></tr>
</table></td></tr>
<tr><td>Project scope</td><td>Queensland Rail plans to replace 52,100 sleepers over the DAU2 period.

Re-sleepering costs have been estimated at [redacted] ($2020–21).</td></tr>
<tr><td>Project benefits</td><td>Project benefits include:

Reduction of maintenance costs associated with individual sleeper failure

Reduction in top and line defects and thus the related risk of derailments

Improvement to the safety and reliability of the network</td></tr>
<tr><td>Tonnage dependent?</td><td>No</td></tr>
<tr><td>Regulatory driver</td><td>Asset renewal</td></tr>
<tr><td>Project beneficiaries</td><td>This project benefits all traffic on the West Moreton System and is part of the scheduled renewal program.</td></tr>
<tr><td>Delivery provider</td><td>Queensland Rail will perform the majority of the work associated with this project.</td></tr>
<tr><td>Consideration of alternative options</td><td>Re-sleepering is a routine capital renewal function of operating a railway. No alternative options have been considered.</td></tr>
</table>

6 Queensland Rail Specification—Capitalisation of Expenditure—MD12-376, 59

7 Queensland Rail Specification—Capitalisation of Expenditure—MD12-376, p 20

6.3 Re-railing

6.3.1 DAU2 proposed costs and scope

Table 19: Proposed DAU2 re-railing by corridor—2.1 mtpa ($'000, 2020–21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 20: Proposed DAU2 re-railing by corridor—9.1 mtpa ($'000, 2020–21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 21: Proposed DAU2 re-railing scope by corridor—2.1 mtpa (meters)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	4,106	4,002	4,000	3,809	5,320	21,237
Jondaryan—Columboola	0	0	0	0	0	0
Total	**4,106**	**4,002**	**4,000**	**3,809**	**5,320**	**21,237**

Table 22: Proposed DAU2 re-railing scope by corridor (meters)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	6,106	6,002	6,000	5,809	7,320	31,237
Jondaryan—Columboola	0	0	0	0	0	0
Total	**6,106**	**6,002**	**6,000**	**5,809**	**7,320**	**31,237**

6.3.2 Project description

Summary	
Project scope	The re-railing project proposes to replace an average of 1.4 km/year under the 2.1 mtpa scenario and 2.1 km/year under the 9.1 mtpa scenario. The project includes a combination of: • Replacement of life expired 41kg/m rail in Rosewood—Jondaryan corridor. Some 41kg/m rail is showing increased susceptibility to rail wear and defect discovery rate. The 41kg/m rail will be replaced with 50kg/m rail. • Replacement of life expired 50kg/m rail at a rate of 2km/year in locations where rail wear will result in gauge related defects, and in these instances both the high leg and low leg rails will be replaced. As part of the re-railing operation, track is to be installed on a monumented designed alignment with rail at a stress free neutral temperature of 38 degrees. Estimates are based on a rate of [redacted] ($2020-21).
Project benefits	Project benefits include: • Reduces the likelihood of broken rail derailments • Reduces exposure to service defects which require shutdowns to remove defective rail and expensive welding in, and match grinding of, the inserted closure rails • Improves the safety and reliability of the track.
Tonnage dependent?	Yes
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System. However, Queensland Rail notes the works that comprise this project are being undertaken in response to the traffic volume proposed by coal carrying customers. The project would otherwise not be required to be delivered within the DAU2 period.
Delivery provider	Queensland Rail will perform the majority of the work associated with this project with limited use of external contractors for earthworks and cranage hire.
Consideration of alternative options	Re-railing is a routine capital renewal function of operating a railway. No alternative options have been considered.

6.4 Level crossing reconditioning

6.4.1 DAU2 proposed costs

Table 23: Proposed DAU2 level crossing reconditioning by corridor—2.1 mpta and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

6.4.2 Project description

Summary	
Project scope	Reconditioning of level crossings within the West Moreton System with an aim to increase the useful life of the asset. Works will typically seek to either prevent the occurrence of defects or address specific defects in the formation, ballast and rail componentry (pads, biscuits, spacers etc.).
Project benefits	Project benefits include: • Reduced likelihood of broken rail derailments • Reduced exposure to service defects which require shutdowns to remove defective rail and expensive welding in, and match grinding of, the inserted closure rails • Improves the safety and reliability of the track
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System and is part of the scheduled renewal program.
Delivery provider	Queensland Rail will perform the majority of the work associated with this project with limited use of external contractors for earthworks and cranage hire.
Consideration of alternative options	This is a routine capital renewal project. No other alternative options have been considered.

6.5 Replacement of concrete sleepers on tight radius curves

6.5.1 DAU2 proposed costs

Table 24: Proposed DAU2 replacement of concrete sleepers with gauge issues on tight radius curves by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

6.5.2 Project description

Summary	
Background	Concrete sleepers in the Toowoomba and Little Liverpool ranges are deteriorating at a rate faster than the expected 50 year life for concrete sleepers due to the high track forces in tight radius curves. Note that these curves are not those that are part of the check-rail capital works program for AU1.
Project scope	It is proposed to replace out of tolerance concrete sleepers causing gauge defects on tight radius curves where rail wear is high. Sleepers will be replaced with full depth concrete sleepers.
Project benefits	Project benefits include: • Reduction in gauge-related defects thereby reducing maintenance expenditure and the risk of derailments • Improved network reliability
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	The works that comprise this project will be undertaken in response to the traffic volume proposed by coal carrying customers on the West Moreton System. The project would otherwise not be required to be delivered within DAU2 period.
Delivery provider	Queensland Rail crews will perform the work associated with this project.
Consideration of alternative options	The 'do noting' option is not an option given the risk associated with gauge defects and the additional maintenance from the deteriorating sleepers determined to be inconsistent with Queensland Rails reliability strategic network objectives. Also considered was the replacement of rail—deemed to be an inefficient use of material—and the use of spacers to bring the rail back into gauge—which proved to be unfeasible.

6.6 Level crossing transitions

6.6.1 DAU2 proposed costs

Table 25: Proposed DAU2 level crossing transitions, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

6.6.2 Project description

Summary	
Project scope	The improved track structure at level crossings consists of 50kg/m rail on concrete sleepers. An increase in junction weld failures has been experienced where this improved structure has been implemented in areas of 41kg/m rail on timber sleepers. To reduce the frequency of this failure it is proposed to extend the concrete sleepers and 50kg/m for a minimum of 20 sleepers past the level crossings.
Project benefits	Project benefits include: • Reduced likelihood of broken rail derailments • Reduced exposure to service defects which require shutdowns to remove defective rail and expensive welding in and match grinding of the inserted closure rails • Improves the safety and reliability of the track
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	The works that comprise this project will be undertaken in response to the traffic volume proposed by coal carrying customers on the West Moreton System. The project would otherwise not be required to be delivered within DAU2 period.
Delivery provider	Queensland Rail crews will perform the work associated with this project.
Consideration of alternative options	This is a routine capital renewal project. No alternative options have been considered.

6.7 Greasers replacements / upgrades

6.7.1 DAU2 proposed costs

Table 26: Proposed DAU2 greasers replacement, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

6.7.2 Project description

Summary	
Project scope	Existing rail lubrication devices are expected to become life expired within the DAU2 period, in addition to this the availability of componentry for maintenance is likely to become restricted as new products are introduced and support for existing systems is phased out. As a result, a replacement program is proposed, allowing for the introduction of new, potentially more efficient, technology. The opportunity also exists to rationalise the locations of the existing devices to be able to provide a more cost effective coverage of applicable locations.
Project benefits	Project benefits include: • Reduced exposure to obsolete and unsupported technology • Reduction in maintenance expenditure associated with maintenance of life expired assets • Reduction in the operational expenditure as a result of a more efficient lubrication network (materials, labour)
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System and is part of the scheduled renewal program.
Delivery provider	Project will be delivered by external suppliers with support from Queensland Rail personnel where required.
Consideration of alternative options	This is a routine capital renewal project. The 'do nothing' option will result in an undesirable exposure to life expired assets and the resultant increased maintenance expenditure.

7. Signalling projects

7.1 Trailable facing points detection (monitoring)

7.1.1 DAU2 proposed costs

Table 27: Proposed DAU2 trailable facing points detection (monitoring), by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

7.1.2 Project description

Summary	
Project scope	The project will install monitoring/detection system for trailable points in Direct Train Control (DTC) Territory west of Toowoomba. The system will detect the position of the turnout for a facing move—which is the high risk movement. The system will detect and send notification to maintenance staff allowing them to respond and repair before fault potentially becomes a delay to train operations.
Project benefits	Project benefits include: • Reduce reactive maintenance • Gain in reliability • Reduced system down time
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System.
Delivery provider	Work for this project will be undertaken by Queensland Rail, supplemented by external contractors if required.
Consideration of alternative options	Technology options will be considered in the project. Construction options will be considered in the project.

7.2 West Moreton minor signalling renewals

7.2.1 DAU2 proposed costs

Table 28: Proposed DAU2 West Moreton minor signalling renewals, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

7.2.2 Project description

Summary	
Project scope	The purpose of this project is to renew prioritised life-expired signalling infrastructure on the West Moreton System—specifically solar track circuits; model 10 boom mechanisms; and alternators. A number of location cases are known to contain asbestos components. To remove the risks associated with asbestos, these location cases have been identified for renewal. These renewals are required to reduce system downtime and reactive maintenance, remove risks associated with asbestos, and to ultimately improve overall system reliability. This is a continuation of is an existing program commenced in the AU1 period.
Project benefits	Renewal of these assets is required to reduce signalling system downtime and reactive maintenance, remove risks associated with asbestos, and to ultimately maintain overall system reliability. Project benefits include: • Reliability and maintainability of signalling infrastructure on the West Moreton System • Increased safety of equipment by removing asbestos • A reduction in maintenance interventions and impacts to On Time Running
Tonnage dependent?	No
Regulatory driver	Asset renewal/compliance
Project beneficiaries	This project benefits all traffic on the West Moreton System.
Delivery provider	Work for this project will be undertaken by Queensland Rail, supplemented by external contractors if required.
Consideration of alternative options	Technology options will be considered in the project. Construction options will be considered in the project.

7.3 Signalling pole route Yarongmulu—Laidley

7.3.1 DAU2 proposed costs

Table 29: Proposed DAU2 Signalling pole route Yarongmulu—Laidley, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

7.3.2 Project description

Summary	
Project scope	Signalling Pole Route Upgrade Yarongmulu to Laidley includes the replacement of sections of deteriorated aerial pole route carrying life-expired signalling multicore circuits with re-enterable cable route, cable and pits from Yarongmulu North 77.030—77.900km (0.870km); and Laidley 79.780—80.800km (1.020km) This is a continuation of is an existing program commenced in the AU1 period.
Project benefits	Project benefits include: • Upgrade to modern equipment • Reduce reactive maintenance • Gain in reliability • Enables maintainability due to lack of spare parts for existing equipment • Reduced system down time
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System.
Delivery provider	Work for this project will be undertaken by Queensland Rail, supplemented by external contractors if required.
Consideration of alternative options	This is a routine capital renewal project. No alternative options have been considered.

7.4 Level crossing signalling upgrade

7.4.1 DAU2 proposed costs

Table 30: Proposed DAU2 level crossing signalling upgrade, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

7.4.2 Project description

Summary	
Project scope	The project will deliver level crossing upgrades at 18 sites. Upgrades range from: • complete replacement of hut and associated equipment—seven sites • Replacement of obsolete QR Flasher Modules and upgrade of flashing lights to LED—eight sites • Removal level crossings—3 sites.
Project benefits	Project benefits include: • Upgrade to modern equipment • Reduce reactive maintenance • Gain in reliability • Enables maintainability due to lack of spare parts for existing equipment • Reduced system down time
Tonnage dependent?	No
Regulatory driver	Asset renewal/compliance
Project beneficiaries	This project benefits all traffic on the West Moreton System.
Delivery provider	Work for this project will be undertaken by Queensland Rail, supplemented by external contractors if required.
Consideration of alternative options	• Replacement of Flasher Module required as unit is obsolete hence no other option considered • Complete replacement of 7 sites considered necessary as numerous compliance issues as well as general age and reliability - therefore no other option considered

7.5 Location case renewal

7.5.1 DAU2 proposed costs

Table 31: Proposed DAU2 location case renewal, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

7.5.2 Project description

Summary	
Project scope	This project will replace life expired signalling location boxes in the West Moreton System. These locations have been damaged and are no longer structurally sound. The project will replace the locations with new modern more reliable equipment. Additional safety barriers will be installed around locations to prevent further incidents.
Project benefits	Project benefits include: • Repair damaged equipment • Gain in reliability
Tonnage dependent?	No
Regulatory driver	Asset renewal/compliance
Project beneficiaries	This project benefits all traffic on the West Moreton System.
Delivery provider	Work for this project will be undertaken by Queensland Rail, supplemented by external contractors if required.
Consideration of alternative options	• Technology options will be considered in the project. • Construction options will be considered in the project.

7.6 Rangeview Signalling Equipment Room / Power Equipment Room upgrade

7.6.1 DAU2 proposed costs

Table 32: Proposed DAU2 Rangeview SER/PER upgrade, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

7.6.2 Project description

Summary	
Project scope	This project will replace the existing wooden station building containing vital signalling equipment with a new Signalling Equipment Room (SER)and Power Equipment Room (PER). A new alternator will also be installed with the PER. The replacement building and equipment will be more reliable, have improved access and increased levels of safety for maintenance staff. Some location work including electrical compliance issues is assumed in the scope.
Project benefits	Project benefits include: • Reduce reactive maintenance • Gain in reliability • Reduced system down time • Improvement for safety • Modern building
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System.
Delivery provider	Work for this project will be undertaken by Queensland Rail, supplemented by external contractors if required.
Consideration of alternative options	'Do nothing' is not an option as building is likely to be condemned and requires replacement.

7.7 Signalling LED upgrade

7.7.1 DAU2 proposed costs

Table 33Proposed DAU2 signalling LED upgrade, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

7.7.2 Project description

Summary	
Project scope	Incandescent lamps are obsolete and have a number of inherent failure modes that the LED signal module system has designed out. The train driver—signal interface relies on the signal aspect indicating a clear and unambiguous indication. LEDs have far greater intensity than incandescent signals and have a greater life expectancy therefore improving signal sighting and driver response. This project will replace 34 incandescent signals with LED signals. Project work includes installing LEDs, necessary location changes including relays changes but does not include any cable upgrades.
Project benefits	Project benefits include: • Reduce reactive maintenance • Gain in reliability • Reduced system down time • Improvement for safety—driver visibility and LED alarms
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System.
Delivery provider	Work for this project will be undertaken by Queensland Rail, supplemented by external contractors if required.
Consideration of alternative options	This is a routine capital renewal project. No alternative options have been considered.

7.8 Gatton interlocking renewal

7.8.1 DAU2 proposed costs

Table 34: Proposed DAU2 Gatton interlocking renewal, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

7.8.2 Project description

Summary	
Project scope	This project renews life expired Westrace Mk1 interlocking at Gatton.
Project benefits	Renewing life-expired network equipment and assets will provide the following benefits: • maintain network performance and integrity; • enhance reliability; and • enhance capacity for future upgrades • maintain reliability of the signalling system, thereby supporting safe and reliable operations; and • reduction in unplanned maintenance interventions and service disruptions due to equipment failure.
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System.
Delivery provider	Work for this project will be undertaken by Queensland Rail, supplemented by external contractors if required.
Consideration of alternative options	Technology options will be considered in the project. Construction options will be considered in the project.

7.9 Relay interlocking refurbishments

7.9.1 DAU2 proposed costs

Table 35: Proposed DAU2 relay interlocking refurbishments, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-–21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

7.9.2 Project description

Summary	
Project scope	This project will refurbish the 12 relay based signal interlockings in the West Moreton System, including: • replacement of the relays of 12 interlockings. • replacement of relay bases where condition is not suitable for reuse. • recovery and refurbishment of the removed relays.
Project benefits	Renewing life-expired network equipment and assets will provide the following benefits: • maintain network performance and integrity; • enhance reliability; and • enhance capacity for future upgrades • maintain reliability of the signalling system, thereby supporting safe and reliable operations; and • reduction in unplanned maintenance interventions and service disruptions due to equipment failure.
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System.
Delivery provider	Work for this project will be undertaken by Queensland Rail, supplemented by external contractors if required.
Consideration of alternative options	Technology options will be considered in the project. Construction options will be considered in the project.

8. Telecommunications projects

8.1 Replacement of weather stations

8.1.1 DAU2 proposed costs

Table 36: Proposed DAU2 replacement of weather stations, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

8.1.2 Project description

Summary	
Project scope	There are seven weather monitoring stations within the West Moreton network that are monitored via the existing Remote Monitoring System (RMS-V1). This system (RMS-V1) is outdated technology, no longer available and the system is inflexible to improvement or expansion. Another project is currently underway to type approve a new version of this system (RMS-V2) that can be supported into the future. This project is to rollout the new Remote Monitoring System (RMS-V2) at sites within the West Moreton network that are currently monitored by the existing Remote Monitoring System, as follows. Weather stations: • Yarongmalu (ML 76.250km) • Forest Hill—Laidley (ML 85.050km) • Spring Bluff (145.740km) • Holmes (ML 139.420km) • Murphy's Creek (ML 139.420km) • Oakey (WL 30.645km) • Macalister (WL 117.750km).
Project benefits	Project benefits include: • Maintain train operations safety • Early warning of track and environment condition.
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton System.
Delivery provider	Work for this project will be undertaken by Queensland Rail, supplemented by external contractors if required.
Consideration of alternative options	This is a routine capital renewal project. Off the shelf options were considered however nothing meets Queensland Rail's requirements, hence this is being developed internally. Hardware systems are off the shelf.

8.2 Remote monitoring system (RMS) rollout

8.2.1 DAU2 proposed costs

Table 37: Proposed DAU2 RMS rollout, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

8.2.2 Project description

Summary	
Project scope	There are currently 18 level crossings within the West Moreton system that are monitored via the existing Remote Monitoring System (RMS-V1). This current system (RMS-V1) is outdated technology, no longer available and the system is inflexible to improvement or expansion. Another project is currently underway to type approve a new version of this system (RMS-V2) that can be supported into the future. This project is to rollout the new Remote Monitoring System (RMS-V2) at sites within the West Moreton system that are currently monitored by the existing Remote Monitoring System, as follows. Level crossings: • Station Rd, Calvert (ML 64.232km) • Gaul St, Gatton (ML 96.122km) • Old Toowoomba Rd, Gatton (ML 98.360km) • Jones St, Toowoomba (ML 159.212km) • Bacon Factory Entrance, Willowburn (WL 4.293km) • Junction Rd, Gowrie (WL 11.620km) • Kingsthorpe (WL 20.051km) • Clark St, Oakey (WL 29.743km) • Cooyar Rd, Oakey (WL 30.915km) • Sabine Rd, Jondaryan (WL 44.570km) • Irvingdale St, Bowenville (WL 57.150km) • Cunningham St, Dalby (WL 83.480km) • Condamine St, Dalby (WL 83.740km) • Nicholson St, Dalby (WL 84.160km) • Jandowae Rd, Dalby (WL 85.805km) • Wambo St, Chinchilla (WL 163.180km) • Warrego Hwy, Rywung (WL 179.385km) • Warrego Hwy, Columboola (WL 194.670km)
Project benefits	Project benefits include: • Maintain train operations safety • Early identification and intervention of operational and mechanical errors so that risk of road and rail accidents can be reduced • Early warning of track and environment condition
Tonnage dependent?	No
Regulatory driver	Asset renewal/compliance
Project beneficiaries	This project benefits all traffic on the West Moreton System.
Delivery provider	Work for this project will be undertaken by Queensland Rail, supplemented by external contractors if required.
Consideration of alternative options	This is a routine capital renewal project. Off the shelf options were considered however nothing meets Queensland Rail's requirements, hence this is being developed internally. Hardware systems are off the shelf.

8.3 Telecommunications rectifiers

8.3.1 DAU2 proposed costs

Table 38: Proposed DAU2 telecommunications rectifiers, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: totals may not add due to rounding

8.3.2 Project description

Summary	
Project scope	This project will replace life expired telecommunications rectifier and battery equipment at 18 telecommunications sites support signalling telemetry and train control radio systems. • Grandchester • Yarongmulu • Laidley • Forest Hill • Gatton • Grantham • Helidon • Stringybark • Lockyer • Murphy's Creek • Holmes • Ballard East • Spring Bluff • Bowenville • Mt Mowbullan • Chinchilla • Rywung • Miles
Project benefits	End of life assets will be replaced, thereby reducing the risk of failure in the case of power outage.
Tonnage dependent?	No
Regulatory driver	Asset renewal/compliance
Project beneficiaries	This project benefits all traffic on the West Moreton System.
Delivery provider	Work for this project will be undertaken by Queensland Rail.
Consideration of alternative options	This is a routine capital renewal project.

8.4 Digital Telemetry Rollout

8.4.1 DAU2 proposed costs

Table 39: Proposed DAU2 digital telemetry rollout, by corridor—2.1 and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

8.4.2 Project description

Summary	
Project scope	The Universal Traffic Control (UTC) system is used to manage train movements within Queensland Rail's remote controlled signalling territory. For the West Moreton network, UTC is used from Rosewood to Willowburn. The existing telemetry used to provide communications between the UTC system and the signalling system is based on a life-expired analogue based system that requires an upgrade. Queensland Rail is progressing with a project to support a migration to a new telemetry system. This will include development of the core UTC system to support the new telemetry system, as well as trials to prove the system. This project will replace end of life Siemens S2 SOF and Scanner hardware with a digital telemetry product operating over Ethernet/IP at 13 sites Grandchester to Toowoomba: • Grandchester • Yarongmulu • Laidley • Forest Hill • Gatton • Grantham • Lockyer • Murphy's Creek • Holmes • Spring Bluff • Rangeview • Toowoomba • Willowburn
Project benefits	Project benefits include: • Maintain reliable operations in the remote controlled signaling territory within the West Moreton network. • The project will replace end of life equipment no longer supported by the manufacturer
Tonnage dependent?	No
Regulatory driver	Asset renewal/compliance
Project beneficiaries	This project benefits all traffic on the West Moreton network.
Delivery provider	Work for this project will be undertaken by Queensland Rail, supplemented by external contractors if required.
Consideration of alternative options	This is a routine capital renewal project.

8.5 Rangeview cable route upgrade copper to fibre

8.5.1 DAU2 proposed costs

Table 40: Proposed DAU2 Rangeview cable route upgrade copper to fibre, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

8.5.2 Project description

Summary	
Project scope	This project will renew 5km of direct buried copper communications cable from Toowoomba CER to Rangeview SER, supporting signalling telemetry. The cable will be replaced with new cable route supporting copper and optical fibre services.
Project benefits	The project will reduce the risk of failure due to life expired copper cable.
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton network.
Delivery provider	Work for this project will be undertaken by Queensland Rail.
Consideration of alternative options	Radio option is not feasible due to obstructed line if sight. Construction options will be considered in the project.

8.6 Nera microwave refresh

8.6.1 DAU2 proposed costs

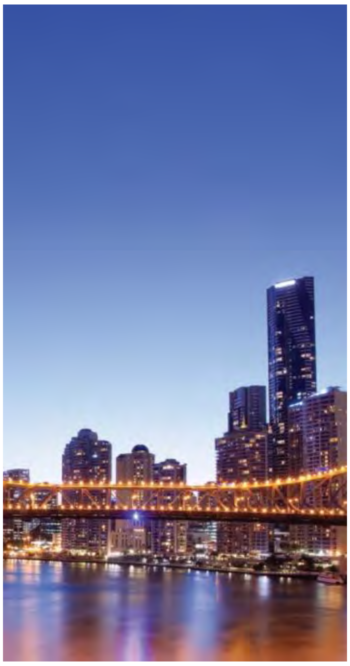
Table 41: Proposed DAU2 Nera microwave, by corridor—2.1 mtpa and 9.1 mtpa ($'000, 2020-21)

Corridor	2020–21	2021–22	2022–23	2023–24	2024–25	Total
Rosewood—Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jondaryan—Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

8.6.2 Project description

Summary	
Project scope	This project will replace end of support Nera microwave indoor equipment at five sites supporting signalling telemetry and train control radio. • Helidon • Stringybark • Murphy's Creek • Toowoomba Reservoir • Toowoomba.
Project benefits	The existing equipment is no longer supported by the manufacturer and will be replaced.
Tonnage dependent?	No
Regulatory driver	Asset renewal
Project beneficiaries	This project benefits all traffic on the West Moreton network.
Delivery provider	Work for this project will be undertaken by Queensland Rail.
Consideration of alternative options	This is a routine capital renewal project. This is a replacement of the indoor equipment only. The outdoor equipment is still supported by the manufacturer.

Attachment 4: GHD Peer Review of West Moreton System DAU2 Capital Expenditure 2020-21 to 2024-25



Peer review of Queensland Rail's proposed capital expenditure for DAU2

Queensland Rail

13 July 2018

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Executive summary

Queensland Rail has engaged GHD (we/us) to assess the prudency and efficiency of proposed capital works for the West Moreton system from 2020-21 (FY2021) to FY2025, captured in Queensland Rail's Draft Access Undertaking 2 (DAU2) proposal to the Queensland Competition Authority (QCA). The DAU2 proposal requires forecast of capital costs for the following scenarios:

- 2.1 million tonnes per annum (mtpa) scenario, where only Yancoal's mine at Cameby Downs (Columboola) operates
- 9.1 mtpa scenario, where Yancoal's mine and New Hope's expansion at the New Acland mine (Jondaryan) comes online.

Queensland Rail's proposal for these two scenarios involves 25 capital projects. In agreement with Queensland Rail, we adopted a sampling approach for our assessment. The principles that we adopted for selecting the sample capital projects are as follows:

- At least 60% of total capital-expenditure costs are covered.
- All projects that increase in value because of the throughput increase from 2.1 mtpa to 9.1 mtpa are included in the sample.
- The project sample should, where practicable, attempt to cover the four broad categories of: civil projects; track improvement projects; signalling projects; and telecommunications projects.
- Some of the selected capital projects should have a relationship with Queensland Rail's proposed maintenance-expenditure plans (e.g. if a timber bridge upgrade program is completed during DAU2, then we would expect a reduction in maintenance costs of 'repairs timber bridges' (B06)).

Based on these principles, and in agreement with Queensland Rail, we selected the following six capital projects, which represent at least 62% of proposed capital costs over the DAU2 period and a 50/50 mix of throughput-driven and throughput-independent projects:

- Formation Repairs
- Track Reconditioning
- Re-railing
- Timber Bridge Upgrades
- Re-sleepering
- West Moreton Minor Signalling Renewals.

Scope

We have reviewed Queensland Rail's notifications register and 2016-17 asset management plan (AMP), which are Queensland Rail's key documents for shaping its planned capital works for DAU2. We also undertook a site visit (5-6 June 2018) of the West Moreton system to familiarise ourselves with the main issues affecting Queensland Rail's track infrastructure. Based on the documentation and our site visit, we consider the scopes that Queensland Rail has proposed for the five civil-related projects to be prudent.

We consider that there may be justification for more work to be undertaken during the DAU2 period that Queensland Rail proposes to bring the network up to a satisfactory condition[1]; this is particularly the case in relation to work for Track Reconditioning, Formation Repairs and Re-sleepering. Our position has been informed in a substantive way by our site visit, where we observed, among other things, deteriorated formation in certain locations, excessive track vertical movement, mud holes and vegetation in track beds. The section of infrastructure requiring most attention in relation to these issues is the eastern part of the Toowoomba Range (within Rosewood to Jondaryan).

Considering the above, we have not recommended amending the scope of works proposed for the six capital projects. In our view, there is unlikely to be a case to reduce the work scopes.

Unit rate

We have reviewed the unit rates proposed for five of the six sampled capital projects[2]. The assessment of the composition and quantum of the unit rates underlying the five projects is central to our analysis of the efficiency of Queensland Rail's capital expenditure proposal. Our underlying assumption has been that the unit rates that Queensland Rail has achieved over the last three years (where available) result in efficient costs. We consider this an appropriate assumption because our analysis revealed that the costs of consumables (e.g. rail, sleepers and ballast) reflect very competitive prices, based on our internal and external benchmarking, and that labour costs are in keeping with Queensland Rail's relevant wage-related agreements with staff members.

In each of the sections where we review the first five capital projects, we evaluate the proposed unit job cost largely against the historical unit rate achieved by Queensland Rail in West Moreton network. Then we evaluate the price of the key components of each historical project category against the industry normal practice and our in-house rates. We consider the unit rates proposed for all the five sampled capital projects to be efficient. (We also consider the proposed total expenditure for West Moreton Minor Signal Renewals as efficient.)

Other key observation

We note that Queensland Rail has demonstrated that it has strong buying power in relation to the purchase of rail, sleepers and ballast. When we undertook our benchmarking of unit rates achieved for these three items, we observed that Queensland Rail would often achieve unit rates that were at least [redacted] lower than indicated by our in-house database and our experience with industry. In this context, we consider it appropriate to acknowledge that Queensland Rail has used its dominant position of a provider of below-rail services in Queensland to seek economies of scale in its purchasing decisions of materials.

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[1] A network that meets the service standards (e.g. average sectional running times) that have been agreed to with access holders via the signed access agreements.

[2] We could not review the unit rates for the West Moreton Minor Signalling Renewals project because the cost of works is not based on a product of scope and unit rate, but rather than overall cost figure for several minor projects.

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This report has been prepared by GHD for Queensland Rail and may only be used and relied on by Queensland Rail for the purpose agreed between GHD and the Queensland Rail as set out in section 2 of this report.

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The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared. The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

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This report, which is a peer review of Queensland Rail's proposed costs for the DAU2 period, has been prepared in the context that Queensland Rail's submission is being provided as a response to an economic-regulation process.

1. Introduction

Queensland Rail has engaged GHD (we/us) to undertake a peer review of its proposed capital expenditure for the DAU2 period, covering FY2020-21 (FY2021) to FY2025. This peer review includes:

- Identifying efficient costs for the forecast capital tasks, noting the throughput scenarios to be considered are for 2.1 million tonnes per annum (mtpa) and 9.1 mtpa
- Undertaking a comparative analysis, where relevant, of the proposed cost forecast with a suitable rail system and/or corridor to demonstrate that costs are appropriate

Our peer review acknowledges that Queensland Rail's proposed capital expenditure for the DAU2 period will be subject to review and adjustment by the Queensland Competition Authority (QCA) and its consultants in the QCA's draft decision on the DAU2. Hence, our assessment has been undertaken in the context of an economic-regulation expenditure review.

1. 1 Queensland Rail's proposal

Queensland Rail has proposed to undertake 25 capital projects over DAU2 (see Table 1).

The projects are categorised as: (a) civil projects; (b) track improvement projects; (c) signalling projects; and (d) telecommunication projects. Of the 25 projects, only three of the projects are dependent on the throughput scenario selection. These are Formation Repairs, Track Reconditioning, and Re-railing.

Table 1: Queensland Rail's proposed capital projects for DAU2

Section in Queensland Rail's submission	Project Name	Dependent on forecast throughput?	Qld Rail Regulatory Driver
4.1	Timber Bridge Upgrades	No	Asset Renewal
4.2	Formation Repairs	Yes	Asset Renewal
4.3	Culvert Replacement	No	Asset Renewal
5.1	Track Reconditioning	Yes	Asset Renewal
5.2	Re-sleepering	No	Asset Renewal
5.3	Re-railing	Yes	Asset Renewal
5.4	Level Crossing Reconditioning	No	Asset Renewal
5.5	Concrete Sleepers With Gauge Issues On Tight Radius Curves	No	Asset Renewal
5.6	Level Crossing Transitions	No	Asset Renewal
5.7	Greasers Replacement / Upgrades	No	Asset Renewal
6.1	Trailable Facing Points Detection (Monitoring)	No	Service Improvement
6.2	West Moreton Minor Signalling Renewals	No	Asset Renewal / Compliance
6.3	Signalling Pole Route Yarongmulu - Laidley	No	Asset Renewal

Section in Queensland Rail's submission	Project Name	Dependent on forecast throughput?	Qld Rail Regulatory Driver
6.4	Level Crossing Signalling Upgrade	No	Asset Renewal / Compliance
6.5	Location Case Renewal	No	Asset Renewal / Compliance
6.6	Rangeview SER/PER Upgrade	No	Asset Renewal
6.7	Signalling LED Upgrade	No	Asset Renewal
6.8	Gatton Interlocking Renewal	No	Asset Renewal
6.9	Relay Interlocking Refurbishments - WM	No	Asset Renewal
7.1	Replacement of Weather Stations	No	Asset Renewal
7.2	RMS Rollout - West Moreton	No	Asset Renewal / Compliance
7.3	Telecoms Rectifiers Regional	No	Asset Renewal / Compliance
7.4	Digital Telemetry Rollout - West Moreton	No	Asset Renewal / Compliance
7.5	Rangeview Cable Route Upgrade Copper to Fibre	No	Asset Renewal
7.6	Nera Microwave Refresh	No	Asset Renewal

A summary of Queensland Rail's proposed capital expenditure, for each throughput scenario, is presented in Table 2.

Table 2: Queensland Rail's proposed capital expenditure ($M, $FY2018) over DAU2

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
2.1 mtpa	33.7	28.6	25.2	24.3	23.4	**135.2**
9.1 mtpa	35.5	30.8	29.1	26.7	27.1	**149.2**

Under the 2.1 mtpa scenario, total proposed expenditure is $135.2 million ($FY2018) over DAU2. In comparison, proposed expenditure is $149.2 million under the 9.1 mtpa scenario.

1. 2 Structure of our report

We have investigated Queensland Rail proposed capital expenditure for DAU2 for the sample of expenditure items to assess whether it is prudent and efficient. Our report is structured as follows:

- Approach for assessing prudency and efficiency (Chapter 2)
- Sampling approach (Chapter 3)
- Analysis for each sampled project (Chapters 4 to 9)

2. Approach for assessing prudency and efficiency

Our overarching approach for assessing prudency and efficiency recognises that Queensland Rail's expenditure proposal covers:

- A scenario in which only the Yancoal's Cameby Downs mine (at Columboola) operates
- A scenario in which the Yancoal mine and New Hope's New Acland Expansion (at Jondaryan) proceeds.

Therefore, our analysis considers Queensland Rail's proposed expenditure by dividing the capital activities according to the following sections:

- Rosewood to Jondaryan (R2J)
- Jondaryan to Columboola (J2C).

2. 1 Prudency

Prudency relates to whether a capital project is *needed*. What needs to be established is whether a project is required for Queensland Rail to deliver the below-rail declared service and what regulatory driver or drivers support that expenditure. Regulatory drivers include, for example:

- Meeting growth (typically driving capex in infrastructure expansion)
- Service improvement (usually requiring explicit or tacit customer approval and willingness to pay for such improvement, through an access agreement or system operating parameters that the entity has published)
- Renewal, replacement and refurbishment of assets to maintain foreseeably required capacity and conformance with performance standards in customers' access agreements
- Compliance with applicable legislation (e.g. for rail, Transport (Rail Safety) Act 2010 (Qld) (TRSA Act) and Transport (Rail Safety) Regulation 2010 (Qld) (TRSA Regulation), the Professional Engineers Act 2002 (Qld) and mandatory standards and operating licences)

Our assessment considers whether Queensland Rail's DAU2 proposal provides a clear link between the nominated capital project, the provision of the below-rail service and the relevant regulatory driver (also see Table 1).

2. 2 Efficiency

An efficient expenditure is one that is the most cost effective for delivering the required standard of service. This could relate to the option selected to meet the service requirement, the unit costs being used, the amount of materials and/or labour forecast to be used.

To assess whether a proposed capital expenditure is efficient, we would seek to consider whether the costs are:

- in keeping with the appropriate scope for the required task
- the least costs (taking into account asset lifecycle cost)
- in keeping with market rates

- comparable with industry benchmarks (taking into account locational and operating factors that may impact on costs)
- in keeping with those costs that an operator would have incurred, if it were subject to competitive pressures to retain market share. We note that this is a subjective assessment that requires engineering and commercial judgement.

Table 3 summarises what our prudency and efficiency tests cover, to the extent that the relevant data were available and could be reviewed in the required timeframes for the engagement with Queensland Rail.

Table 3: Summary of prudency and efficiency tests

Prudency		Efficiency	
Is the capital project needed?	Is the scope of works (e.g. distance of Re-railing) appropriate?	Do the cost rates for machines, equipment, labour and consumables reflect competitive outcomes?	Are machines, equipment and labour being used in an efficient manner?

2. 3 Capex-classification rules

In classifying its activities as capital expenditure or maintenance expenditure, Queensland Rail has regard to its *Capitalisation of expenditure* specification. An overview of the classification rules for property, plant and equipment expenditure is set out in Figure 1:

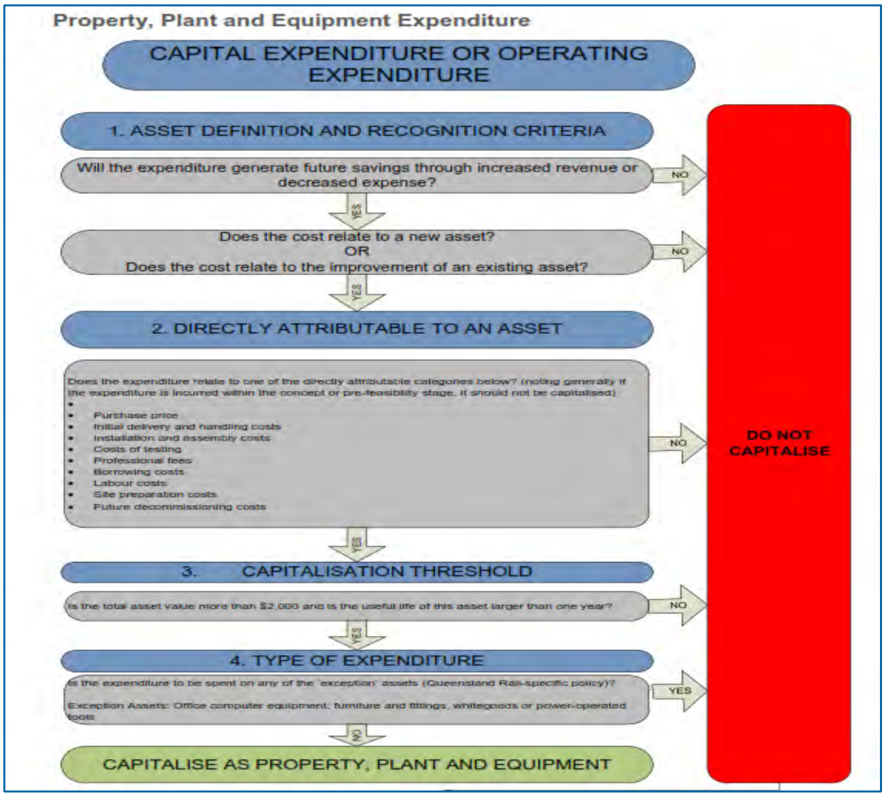

Figure 1: Queensland Rail's approach for classifying property, plant and equipment as capex/opex

Capital expenditure and operating expenditure (which includes maintenance expenditure) generate increased revenue for Queensland Rail under the DAU2 framework for the West Moreton tariff pricing. It is necessary therefore to test whether the expenditure relates to a new asset or to improving an existing asset.

Section 2.2.3.6 of the *Capitalisation of expenditure* specification outlines what Queensland Rail considers the term 'improve' to cover:

> *…expenditure on assets must be capitalised (i.e. added to the carrying amount of the asset) when it improves the condition of the asset beyond its originally assessed standard of performance or capacity. This can occur through:*
>
> - *An increase in the service potential provided by the asset; or*
> - *Increasing the useful life of the asset.*[3]

Hence, Queensland Rail's distinction between capital and operating expenditure in terms of expenditure in existing assets is predicated on whether the expenditure results in an increase in service standards and/or an increase in useful life.

Track rules

Section 2.2.3.3 of the specification sets out railway-track-specific rules for Queensland Rail:[4]

> *Where a section of track is replaced, the following rules apply:*
>
> - *Where an entire section of track is replaced, including all its components, the old track is disposed of and the replacement costs, including demolition costs, are to be capitalised.*
> - *Where only the dual rail lines are replaced, the replacement costs, including demolition costs are to be capitalised where the track is at least 110 metres in length. Any replacement costs of track shorter than 110 metres must be expensed as incurred and the existing track is not disposed of.*
> - *Where only a single rail line is replaced due to wear and tear, the entire costs of replacement are expensed as incurred. Where only the sleepers are upgraded resulting in increased track capacity, the sleepers are to be capitalised where the expenditure is part of a larger capital replacement program.*
> - *The existing sleepers must be disposed of and the demolition costs are to be capitalised. Upgrade includes replacing timber with steel or concrete, or replacing steel with concrete. There are no minimum track length requirements under these circumstances.*
> - *Where only the ballast is replaced or replenished, these costs are to be expensed as incurred.*

These rules were accounted for during our peer review.

3. Sampling approach

We have adopted a sampling approach to undertake a targeted and detailed review of some capital projects, rather than a preliminary review of all capital projects. The premise for undertaking this approach is to provide Queensland Rail firm and substantiated, rather than indicative, findings for the peer-review process.

[3] Page 20 of Queensland Rail's *Classification of expenditure* specification.

[4] Pages 16-17 of Queensland Rail's *Classification of expenditure* specification.

3. 1 Principles for selecting sample

The principles adopted for selecting the sample capital projects are as follows:

- At least 60% of total capital-expenditure costs are covered
- All capital projects that increase in value because of the throughput increase from 2.1 mtpa to 9.1 mtpa are included in the sample
- The capital project sample should, where practicable, attempt to cover the four broad categories of: civil projects; track improvement projects; signalling projects; and telecommunications projects
- Some of the selected capital projects should have a relationship with Queensland Rail's proposed maintenance-expenditure plans (e.g. if a timber bridge upgrade program is completed during DAU2, then we would expect a reduction in maintenance costs of 'repairs timber bridges' (B06)).

3. 2 Sample selected

Based on the principles above, and in agreement with Queensland Rail, we have selected six capital projects to review in this task (see Table 4). The sample covers at least 62% of DAU2 capital expenditure and reflects a 50/50 mix of throughput-driven and throughput-independent projects.

Table 4: GHD's capital-project sample

Section in Queensland Rail's submission	Project Name	Costs change when throughput increases from 2.1 mtpa to 9.1 mtpa
4.2	Formation Repairs	Yes
5.1	Track Reconditioning	Yes
5.3	Re-railing	Yes
4.1	Timber Bridge Upgrades	No
5.2	Re-sleepering	No
6.2	West Moreton Minor Signalling Renewals	No

Our detailed assessment of each of the six projects is provided in the following sections. For each of the projects, we set out the following:

- Recommendation, so that the reader is aware of our summary findings
- Project description, including setting out why the project is needed for the safe and reliable operation of the West Moreton below-rail infrastructure to meet contracted positions
- Queensland Rail's proposal, in terms of total costs and proposed scopes of work (e.g. km per annum of Formation Repairs)
- Prudency, in terms of whether the scopes reflect prudent expenditure
- Efficiency, in terms of whether the unit rates and total costs reflect efficient expenditure
- Key references for our analysis.

4. Formation Repairs

4. 1 Recommendation

We consider the proposed scopes for Queensland Rail's Formation Repairs program (5.1 km per annum for the 2.1 mtpa scenario, and 5.9 km per annum for the 9.1 mtpa scenario) over DAU2 to be prudent.

We consider that the unit rates adopted for the Formation Repairs program ([redacted] for the Rosewood to Jondaryan section, [redacted] for the Jondaryan to Columboola section) are efficient, and we have confidence in Queensland Rail's derivation of these rates. Our review was based on Queensland Rail's actual cost data over FY2016 to FY2018.

4. 2 Project description

Formation Repairs address failures in the track structure due to poor and/or below the minimum engineering standards (e.g. the Queensland Rail Civil Engineering Track Standards[5]). Poor formation condition, such as shown in Figure 2, causes uneven movement of the train which leads to increased deterioration of track and locomotive components over time, culminating in an increased probability of derailment. Formation repair scope of works includes the repair of formation deterioration and failure, mud holes and ballast pockets. Queensland Rail assesses and tracks network formation condition via a formation notification register (preventative). The repairs are then targeted towards segments of track which present as a high priority notification.

The repair scope of works typically involves preparation works of the track panel for removal, extraction of the track panel or long weld section to expose the ballast and formation, followed by excavation of the formation through to 600 – 700 mm below the ballast, reaching the subgrade level. The subgrade is prepared and engineered fill layers are placed, followed by placement and compaction of a capping layer and then ballasting. The track panel is then reinstated and connected by welding or jointing, and stressed accordingly. The track is then tamped and aligned.

[5] Queensland Rail Civil Engineering Track Standard MD-10-575, version 3.2, dated 11 November 1994

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Figure 2: Areas in the West Moreton system needing Formation Repairs

During our site visit we observed that there are locations along the network where formation needs to be repaired or strengthened as per the example shown in Figure 2.

4. 3 Queensland Rail's proposal

Queensland Rail's expenditure proposal for the Formation Repairs program is articulated in Table 5.

Table 5: Queensland Rail's proposed expenditure for Formation Repairs ($000s, $FY2018)

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
2.1 mtpa	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
R2J	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
J2C	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
9.1 mtpa	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
R2J	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
J2C	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Under the 2.1 mtpa scenario, proposed expenditure is [redacted]. If throughput increases to 9.1 mtpa, proposed annual expenditure lifts by [redacted]. We note that Queensland Rail's expenditure proposal is based on the following unit rates:

- [redacted] (rounded) for the R2J section
- [redacted] (rounded) for the J2C section.

We used the proposed unit rate to derive the proposed distance of work by section, as set out in Table 6. The majority of works will be performed in the J2C section, while the scope of work in the R2J section is dependent on the tonnage being transported.

Table 6: Queensland Rail's proposed distances for Formation Repairs (km)

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
2.1 mtpa	**5.1**	**5.1**	**5.1**	**5.1**	**5.1**	**25.5**
R2J	0.8	0.8	0.8	0.8	0.8	4.0
J2C	4.3	4.3	4.3	4.3	4.3	21.5
9.1 mtpa	**5.9**	**5.9**	**5.9**	**5.9**	**5.9**	**29.5**
R2J	1.6	1.6	1.6	1.6	1.6	8.0
J2C	4.3	4.3	4.3	4.3	4.3	21.5

In the next subsection, we assess whether Queensland Rail's proposed scopes of work for the 2.1 mtpa scenario (5.1 km per year) and 9.1 mtpa scenario (5.9 km per year) reflect prudent decision making.

4. 4 Prudency

Our prudency review is based on information from notifications (or defects) data and on the condition of the formation observed during our site visit. Our review also accounted for factors such as the presence of expansive soils and the standard of construction of the railway (particularly with regards to compaction of material).

We investigated the notifications data for formation repairs as of February 2018. Out of the 87 line items, only one of these was prioritised as high (having a score of 3), four are moderate (having a score of 4), twenty three were classed as low (having a score of 5) and 56 are classified as very low (having a score of 6). This indicates that the formation repair work on the West Moreton network is suitably monitored and the formation is adequately maintained.

We understand that Queensland Rail's approach for scoping the works over the DAU2 period is similar to that for the AU1 period. Since the notifications data indicate that historical scopes of work demonstrate that the West Moreton network's formation is being suitably monitored, and the formation that has had work completed is being adequately maintained, we consider that Queensland Rail's proposed scopes for the DAU2 period, for both scenarios, are likely to yield similar outcomes.

4. 5 Efficiency

Queensland Rail has proposed the following unit rates for Formation Repairs work in the Rosewood-to-Jondaryan section and the Jondaryan-to-Columboola section separately:

- [redacted] (rounded) for the R2J section
- [redacted] (rounded) for the J2C section.

Our top-down review of costs, based on historical job costs reported for FY2016-FY2018 provided by Queensland Rail's contact officer[6], has resulted in the following average unit rates (real $FY2018 terms):

- [redacted] for the Rosewood-to-Jondaryan section
- [redacted] for the Jondaryan-to-Columboola section.

This provides us evidence of how the unit rates for the proposed costs are calculated. We therefore recommend using the unit rates that Queensland Rail has proposed for Formation Repairs work over DAU2 period.

To supplement our top-down analysis, we reviewed the cost components that contribute to the build-up of yearly annual costs (analysis undertaken in nominal terms):

- Out of 36 cost components in the formation-repairs capital project, the four components that contributed most to total costs over the FY2016 to FY2018 period are: hire charges for plant and machinery [redacted]; internal labour [redacted]; ballast [redacted]; and miscellaneous permanent-way components (9%).
- We did not review the hire charges for plant and machinery (e.g. excavators, sucker trucks, impact wrenchers, and lighting towers) or permanent-way components (e.g. insulated pads, geogrids, fishbolts and screw dogs) because of the diverse nature of elements within these cost components. Analysing such data would not yield meaningful unit-rate results that we could reliably use for this peer review.
- We reviewed the unit rates for internal labour and ballast from FY2016 to FY2018:
  - Hourly labour rates were between [redacted] (Formation-repairs infrastructure worker) to [redacted] (Track maintenance supervisor).[7] We consider these rates reasonable based on our in house data for labour rates.
  - The current contract prices indicate the unit rate for ballast is between [redacted] This is consistent with the actuals data after converting the unit from per cubic metre to per tonne. We consider these rates to be reasonable.

Overall, the data on the cost components have not triggered the need for us to revisit our top-down analysis for formation repairs. In summary, we recommend the use of:

- [redacted] (rounded) for the R2J section
- [redacted] (rounded) for the J2C section.

We understand that Queensland Rail has elected to use [redacted] for the R2J section and [redacted] for the J2C section, which are lower rates than our recommended numbers.

4. 6 References

In undertaking our peer review of the costs of Formation Repairs project over DAU2, we reviewed the following documents:

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[6] *2018 05 29 B.04613 Formation* spreadsheet, sent on 4 June 2018.

[7] The data show a maximum labour rate of $150/hr once for one hour of work. We consider this immaterial and have excluded it from the range.

- AU2 West Moreton Tariff Reset Capital Submission – July 2018
- Queensland Rail's Network Asset Management Plan – 2017/18
- Queensland Rail's Capitalisation of expenditure – June 2017
- AU1 West Moreton Reference Tariff Submission Review – September 2013
- West Moreton Reference Tariff 2015 DAU Appendix 3 – May 2015
- West Moreton System Information Pack – October 2016
- Queensland Rail's Western System Coal Tariffs – June 2014
- Queensland Rail documentation and tables – Assorted dates
- B&H Review of Queensland Rail West Moreton System for QCA – May 2014

5. Track Reconditioning

5. 1 Recommendation

We do not recommend any changes to Queensland Rail's proposed scope of works or costs for Track Reconditioning. We consider the scope being budgeted in the DAU2 proposal to be prudent. In addition, we consider the proposed unit rate of [redacted] ($FY2018), based on our analysis of Queensland Rail's historical data, to reflect efficient costs.

5. 2 Project description

Track reconditioning work in the West Moreton network involves reconstructing the formation and track. The scope of works involves:

- track deconstruction,
- formation reconstruction from the subgrade,
- replacement of fastenings, rail (41 kg/m to 50 kg/m) and sleepers,
- welding and stressing,
- tamping and resurfacing,
- quality components (NDT of welds, formation compactness etc.), and
- follow-up inspections as needed.

If Track Reconditioning is not undertaken when required, the risks of failure increase. Figure 3 shows an area scheduled for Track Reconditioning work in the near future. There are historical issues with track buckling on tight curves sections in hot summer months. These issues need to be addressed to reduce the risk of derailments, through increasing track structure strength.

Figure 3: Poor track conditions in parts of the West Moreton system

The subsection below outlines Queensland Rail's cost proposal for Track Reconditioning over the DAU2 period.

5. 3 Queensland Rail's proposal

Queensland Rail's cost proposal is set out in Table 7.

Table 7: Queensland Rail's proposed expenditure for Track Reconditioning ($000s, $FY2018)

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
2.1 mtpa	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
R2J	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
J2C	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
9.1 mtpa	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
R2J	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
J2C	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Under the 2.1 mtpa scenario, DAU2 expenditure is [redacted]. If throughput increases to 9.1 mtpa, expenditure lifts [redacted]. We note that Queensland Rail's cost proposal is based on a unit rate of [redacted] of track-reconditioning works. The scopes (kilometres of Track Reconditioning) to which Queensland Rail's cost proposal relates are set out in Table 8.

Table 8: Queensland Rail's proposed distances for Track Reconditioning (km)

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
2.1 mtpa	**2.45**	**2.23**	**1.04**	**1.96**	**1.00**	**8.68**
R2J	2.45	0.00	0.00	0.00	0.00	2.45
J2C	0.00	2.23	1.04	1.96	1.00	6.23
9.1 mtpa	**2.92**	**2.99**	**3.18**	**2.90**	**2.96**	**14.95**
R2J	2.92	0.76	2.14	2.90	0.00	8.72
J2C	0.00	2.23	1.04	0.00	2.96	6.23

5. 4 Prudency

Areas of Track Reconditioning are selected, in part, by defect notices that are reported in Queensland Rail's Enterprise Asset Management System (EAMS). The information in the defect notices is entered and complemented by engineering inspections, where Queensland Rail's staff review and confirm that rail, sleepers and ballast are in need of renewal. Locations for Track Reconditioning are then prioritised based on the condition and level of throughput over the rail (e.g. the main line is likely to get higher priority than a passing loop). Hence, a combination of defect information and engineering judgement informs Queensland Rail's plans for Track Reconditioning.

From our review of the EAMS data and observations during our site visit we consider that Queensland Rail's approaches for selecting the proposed scopes for the 2.1 mtpa and 9.1 mtpa scenario are appropriate. Hence, we consider Queensland Rail's proposed scopes to be prudent.

5. 5 Efficiency

Queensland Rail has proposed a unit rate of [redacted] ($FY2018) for Track Reconditioning. We undertook a top-down review of expenditure (analysis undertaken in real $FY2018 terms) as follows:

- Queensland Rail provided us with historical data (nominal terms) from FY2016 to FY2018. [8] All past Track Reconditioning jobs were undertaken on the Rosewood to Jondaryan section. We converted the historical data into real $FY2018 terms, calculated an average cost of the jobs completed in each year, and derived a total simple-average rate of [redacted] over the three-year period.[9]
- As Track Reconditioning is an activity that is performed regularly by Queensland Rail and, in our view, is quasi-maintenance in nature, we consider that Queensland Rail has the experience to estimate costs accurately. At the same time, we note that the Department of Transport and Main Road's (DTMR's) *Project Cost Estimating Manual* provides for a [redacted] contingency range for Development Phase Stage 2 design estimates (i.e. tenders based on final designs, construction specifications and project documentation).[10]
- Track Reconditioning is undertaken regularly by Queensland Rail and there is a robust understanding of the scope and costs of work. However, we consider a 10% increase on historic rates, taking into account in particular cost increases in materials (especially steel for rail) is reasonable. This would make an appropriate unit rate for the DAU2 period to be [redacted].

The [redacted] figure is consistent with Queensland Rail's proposal of [redacted]; hence, we consider Queensland Rail's proposed rate of [redacted] to be appropriate and efficient.

To test the veracity of our top-down analysis, we reviewed the cost components that contribute to the build-up of yearly annual costs (analysis for which was undertaken in nominal terms):

- Out of the 40 cost components in the track-reconditioning project, the five components that contribute most to total costs over the FY2016 to FY2018 period are: rail [redacted]; hire charges for plant and machinery [redacted] labour [redacted]: sleepers [redacted]; and ballast [redacted].
- As the track-reconditioning process covers numerous types of plant and machinery (e.g. wagon hire, lighting towers, bobcats), we did not seek to validate the reasonableness of the unit rates of 'hire charges for plant and machinery'.
- We assessed the unit rates for rail, labour, sleepers and ballast in FY2018:
  - Rates for 50-kg 110-metre standard-carbon (SC) and head-hardened (HH) rail were within [redacted] to [redacted] in FY2018. We note that this is less than the June 2018 contract prices of [redacted] (SS) to [redacted] (HH).[11] Thus, we do not consider the rates excessive.
  - Hourly labour rates were between [redacted] (support staff) to [redacted] (track maintenance supervisor). We consider these reasonable and in line with our in-house labour costs data.

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[8] *2018 05 31 B.4471 & B.5171 Reconditioning* spreadsheet.

[9] In the data spreadsheet provided, a few FY2018 jobs were excluded from the sample as Queensland Rail marked them as 'not complete' or 'cost yet to settle'. We have also excluded four Oakey-Jondaryan Relay jobs as there was no length of completion recorded.

[10] See pages 45 and 130 of https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Project-cost-estimating-manual.aspx

[11] E-mail from Queensland Rail on 31 May 2018.

- Sleeper unit rates were [redacted] (CS CL1 CNT PAN 1067 25T) to [redacted] (ASS CS 47/50 LP CNT FAST 3W 20T). We do not consider these rates excessive given that they are in keeping with our in-house cost data.
- The current contract prices indicate the cost of ballast should be [redacted]. This is consistent with the actuals data after converting the unit from per cubic metre to per tonne. We consider these rates reasonable.

Queensland Rail also provided evidence that 41-kg 110-metre SC[12] rail [redacted] was more costly than 50-kg rail, assuaging our concern that the 2.1 mtpa scenario would require Queensland Rail to demonstrate that reverting to 41-kg rail was an inappropriate and less cost-effective option than persisting with the move to 50-kg rail.

The data on the cost components has not triggered the need for us to revisit our top-down analysis for Track Reconditioning. Accordingly, we consider a unit rate of [redacted] ($FY2018) to be appropriate and efficient.

5. 6 References

We relied on the following information, provided by Queensland Rail, during our peer review:

- 2018 05 31 B.4471 _B.5171 Reconditioning

[12] HH 41-kg rail is not available.

6. Re-railing

6. 1 Recommendation

We consider the proposed scopes for the Re-railing program (i.e. metres per annum of Re-railing) to be prudent. We also consider the proposed unit rate for Re-railing program (i.e. [redacted]) to be efficient. This is based on us assessing the unit rate that Queensland Rail achieved in West Moreton network during FY2016-FY2018, and considering a reasonable adjustment. We discuss our review in detail in the following sub-sections.

6. 2 Project description

Re-railing constitutes the replacement of worn and defective rail in the West Moreton system. This activity is required to reduce the likelihood of delays and/or derailments caused by the defective rail. This activity also reduces instances of track requiring closing off for maintenance. Thus, Re-railing contributes to the safe and reliable operation of the network. Figure 4 shows an example of rail showing early signs of wear, as evidenced by the flattening of the running edge.

Figure 4: Worn rail in the West Moreton system

The network contains a mix of 41 kg/m and 50 kg/m rail, with 41 kg/m being historical and 50 kg/m used as the replacement that increases stability to the track structure. A discussion of this mix for the Rosewood-to-Toowoomba, Toowoomba-to-Jondaryan and Jondaryan-to-Columboola sections is provided below.

Rosewood to Toowoomba

The Rosewood-to-Toowoomba section, identified as the Main Line, is duplicated between Rosewood and Helidon with only Grandchester to Yarongmulu over the Little Liverpool Range being single track. The down track section is predominantly 50 kg/m rail with concrete sleepers as it mainly carries the loaded traffic, and therefore is prioritised for upgrade. The up track is typically 41 kg/m rail with 1-in-2 interspersed steel and timber sleepers.

The Helidon to Toowoomba section is single track, with steep climbs up the Toowoomba Range, with five passing loops. It is predominantly 50 kg/m standard carbon rail or 50 kg/m head hardened rail; however, there are curved sections of 41 kg/m rail on the Toowoomba Range.

All concrete-sleepered track rails in the Rosewood-to-Toowoomba section are continuously welded. Non-concrete-sleepered track is in 110 m lengths (or 220 m lengths), except in check rail curves, where the rail is in 28 m lengths. The lower range loops are 41 kg/m rail and upper range loops are 50 kg/m rail.

Toowoomba to Jondaryan

The Western Line is predominantly tangent track with less than 9 km of curves. Toowoomba to Kingsthorpe is predominantly 50 kg/m Continuously Welded Rail (CWR) with small sections of 41 kg/m CWR. Kingsthorpe to Oakey is predominantly 41 kg/m Continuously Welded Rail (CWR). Oakey to Jondaryan is 50 kg/m rails on concrete sleepers.

Jondaryan to Columboola

Jondaryan to Columboola is predominantly 41 kg/m rail in either 110 m or 220 m lengths, with interspersed one in two steel and timber sleepers. The majority of the Jondaryan-to-Miles section is straight track with tight curves.

6. 3 Queensland Rail’s proposal

Table 9: Queensland Rail's proposed expenditure for Re-railing ($000s, $FY2018)

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
2.1 mtpa	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
R2J	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
J2C	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
9.1 mtpa	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
R2J	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
J2C	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Under the 2.1 mtpa scenario, DAU2 expenditure is [redacted]. If throughput increases to 9.1 mtpa, expenditure lifts by [redacted]. We note that Queensland Rail’s expenditure proposal is based on a unit rate of [redacted] of Re-railing works. Queensland Rail’s proposed scopes, in metres per annum, for Re-railing are set out in Table 10. We note that Re-railing is not planned to occur on the track west of Jondaryan, in either the 2.1 mtpa or 9.1 mtpa scenarios.

Table 10: Queensland Rail's proposed distances for Re-railing (metres)

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
2.1 mtpa	**4,106**	**4,002**	**4,000**	**3,809**	**5,320**	**21,237**
R2J	4,106	4,002	4,000	3,809	5,320	21,237
J2C	-	-	-	-	-	-

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
9.1 mtpa	**6,106**	**6,002**	**6,000**	**5,809**	**7,320**	**31,237**
R2J	6,106	6,002	6,000	5,809	7,320	31,237
J2C	-	-	-	-	-	-

Approximately 21.2 km of Re-railing is scheduled to occur in the 2.1 mtpa scenario over the five-year AU period, while the figure is 31.2 km for the 9.1 mtpa scenario. In the next subsection, we consider whether Queensland Rail's proposal reflects prudent decision making.

6. 4 Prudency

To determine the prudency of Queensland Rail's Re-railing process, we reviewed historical EAMS data. We understand from the data that no Re-railing was conducted in the FY2016 period, but that Re-railing of 4.6 km in the FY2017 period and 8.5 km in the FY2018 period (to date) has been performed. Over the three years, Queensland Rail has averaged about 4 km each year. Hence, there is a degree of confidence that Queensland Rail can attain the proposed scopes in the 2.1 mtpa scenario. As Queensland Rail has been able to attain more than 7.32 km of Re-railing work (9.1 mtpa scenario peak in FY2025) in the current financial year, we consider it likely that Queensland Rail will have the resourcing in place to meet scope requirements under the 9.1 mtpa scenario.

During our site visit, we did not observe anything to suggested Queensland Rail's proposed scopes for the 2.1 mtpa or 9.1 mtpa scenario are excessive. Hence, we consider the scopes to be prudent.

Capitalisation of expenditure

Queensland Rail's *Capitalisation of expenditure* documentation provides that Re-railing in excess of 110 metres per job is classified as capital expenditure. We note that the minimum-distance Re-railing job that Queensland Rail is performing during the DAU2 period is 269 metres (see Figure 5).

FY	Corridor	Floc	Start km	End km	Length (km)
2021	Rosewood - Jondaryan	QR01-N-WM-C179-MNL	115.919	117.5	1.581
2021	Rosewood - Jondaryan	QR01-N-WM-C255-MNL	16.705	17.819	1.114
2021	Rosewood - Jondaryan	QR01-N-WM-C255-MNL	18.217	18.486	0.269
2021	Rosewood - Jondaryan	QR01-N-WM-C255-MNL	18.814	19.14	0.326
2021	Rosewood - Jondaryan	QR01-N-WM-C255-MNL	19.16	19.976	0.816
2022	Rosewood - Jondaryan	QR01-N-WM-C255-MNL	19.998	24	4.002
2023	Rosewood - Jondaryan	QR01-N-WM-C255-MNL	24	28	4
2024	Rosewood - Jondaryan	QR01-N-WM-C255-MNL	28	29.73	1.73
2024	Rosewood - Jondaryan	QR01-N-WM-C179-MNL	108.58	110.659	2.079
2025	Rosewood - Jondaryan	QR01-N-WM-C179-MNL	106.6	108	1.4
2025	Rosewood - Jondaryan	QR01-N-WM-C179-MNL	100.08	104	3.92

Figure 5: Queensland Rail's proposed Re-railing jobs over DAU2

Given the above information, we consider that Queensland Rail's proposal for Re-railing jobs represents capital works, not maintenance.

6. 5 Efficiency

We note that Queensland Rail has proposed a unit rate of [redacted] ($FY2018) for Re-railing during the DAU2 period. Our top-down review of costs (analysis undertaken in real $FY2018 terms) revealed the following:[13]

- Queensland Rail's historical data (nominal terms) covers FY2016 to FY2018. The data cover 13 completed Re-railing projects[14], involving 16.675 km of Re-railing over the three years.
- We first converted Queensland Rail's nominal-cost data into real $FY2018 terms. We then derived a weighted-average unit rate, based on distance, of [redacted].
- We understand that Queensland Rail considered that unit rates achieved in FY2018 would be lower than usual due to some of the Re-rerailing occurring within a 10-day track closure triggered by the Commonwealth Games.

Consistent with our approach for estimating a contingency allowance for Track Reconditioning, we consider a [redacted] increase to accommodate:

(a) the higher-than-usual efficiency that is not expected to take place during DAU2 period, and

(b) increases in material and labour costs,

to be appropriate to levy on the average rate. This lifts the unit rate from [redacted] to [redacted].[15]

On factor (b), we note that since steel prices have increased by approximately [redacted] between April 2017 and April 2018[16]. This supports our analysis that a Re-railing rate [redacted] higher than the historic rate can be deemed to be efficient.

To supplement our top-down analysis, we reviewed the cost components that contribute to the build-up of yearly annual costs (analysis undertaken in nominal terms) as follows:

Out of the 35 cost components in the Re-railing project, the two components that contributed most to total costs over the FY2016 to FY2018 period are: rail [redacted]); and internal labour ([redacted]).

We assessed the unit rates for rail and labour as follows:

- Rates for 50 kg 110 metre SC and HH rail were within [redacted] to [redacted]. This is consistent with our analysis for rail costs (including for 41 kg 110 metre SC rail) in the track-reconditioning capital project, hence we consider the rates reasonable.
- Rates for 27.5 metre SC and HH rail were within the range of [redacted] to [redacted]. We consider this range to be reasonable and in keeping with our in-house cost data. However, we note that Queensland Rail's Capitalisation of Expenditure specification indicates that for capital works, the rail replacements will utilise long welded rail (LWR) (rail exceeding 110 metres). Queensland Rail has explained to us that during capital work in practice, 27.5 metre rail is used together with the 110 metre rail to meet various total length requirement. The 27.5 metre rails are also welded to longer rails when 110 metre rails are under-supplied. We suggest that Queensland Rail include this explanation in its DAU2 submission.

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[13] *2018 05 28 B.04291 Rerailing Actual* spreadsheet.

[14] We note that all these projects were undertaken on the Rosewood-to-Jondaryan section only. Therefore we can only estimate a rate to be applied to both sections for the DAU2 period.

[15] See pages 45 and 130 of https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Project-cost-estimating-manual.aspx

[16] https://gensteel.com/steel-building-prices/forecast

- Hourly labour rates were within [redacted] (Re-railing infrastructure worker) to [redacted] (track maintenance supervisor). We consider these rates reasonable as they are in keeping with our internal database of labour rates.

In conclusion, data on the cost components have not triggered the need for us to revisit our top-down analysis. Hence, we consider that [redacted] metre ($FY2018) reflects an efficient unit rate for Re-railing.

6. 6 References

We relied on the following information from Queensland Rail during our peer review of the Re-railing project:

- 2018 05 29 NDT Defects wrt Re-railing (*Excel* workbook)
- 2018 05 29 Broken Rail Defects wrt Re-railing (*Excel* workbook)
- 2018 05 28 B.04291 Rerailing Actuals (*Excel* workbook).

7. Timber Bridge Upgrades

7. 1 Recommendation

We consider the proposed scopes for the Timber Bridge Upgrade program (i.e. metres per annum of replacement) to be prudent. We have also assessed the unit rate of [redacted] ($FY2018) as efficient, based on our benchmarking of costs with ARTC's Inland Rail project and Queensland Rail's timber bridge replacements along the North Coast line. Accordingly, we consider Queensland Rail's proposed expenditure for timber bridge upgrade to be prudent and efficient.

7. 2 Project description

Queensland Rail is in the process of replacing its timber bridges in the West Moreton system, predominantly with prestressed concrete or steel. This is being undertaken to replace close-to-life-expired bridges with more durable infrastructure, to extend the life of the asset and better manage customers' requirements to avoid track speed restrictions (TSRs).

An example of a timber-bridge structure in the West Moreton system that is currently being replaced is depicted in Figure 6 below.

Figure 6: Timber-bridge structure in West Moreton system – failed girder (bearer)

Figure 7 shows a timber-bridge structure that has succumbed to poor conditions, as evidenced by the hollowed (rotten) nature of the timber cross beam (headstock) to the right hand side of the figure.

Figure 7: Timber-bridge structure in West Moreton system – support beams in poor condition

If the bridges are not replaced (or maintained) at the appropriate time, the risk of failure increases, which will undermine the safety of trains using the network.

Note that a key difference in the capital project over the DAU2 period, relative to the DAU1 process, is that Queensland Rail is seeking to reduce the loading requirements of bridges, namely by reducing the TAL requirements from 30 TAL to 20 TAL. This reflects Queensland Rail's view that the Inland Rail project requires Queensland Rail to be more conservative in its long-term expectations about whether throughput needs of the system will necessitate 30 TAL investments.

7. 3 Queensland Rail's proposal

Queensland Rail has proposed the following costs for Timber Bridge Upgrades (see Table 11).

Table 11: Queensland Rail's proposed expenditure for Timber Bridge Upgrades ($000s, $FY2018)

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
2.1 / 9.1 mtpa	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
R2J	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
J2C	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

In total, Queensland Rail proposes to spend [redacted] over DAU, comprising [redacted] in the R2J corridor and [redacted] in the J2C corridor.

The scopes that accompany Queensland Rail's cost proposal are set out in Table 12. The total distance to be covered over DAU2 is 1,117 metres, with 457 metres for the R2J section and 661 metres for the J2C section.

Table 12: Queensland Rail's proposed scopes for Timber Bridge Upgrades (metres)

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
2.1 / 9.1 mtpa	**213**	**209**	**224**	**211**	**259**	**1,117**
R2J	213	152	0	91	0	457
J2C	0	57	224	120	259	661

In the next subsection, we discuss our approach to assessing whether Queensland Rail's proposed Timber Bridge Upgrade program reflects prudent decision making.

7. 4 Prudency

In our opinion, the Timber Bridge Upgrade program is required because opting to maintain nearly life-expired bridges is more costly, in the long term, than replacing the structure with prestressed concrete and steel. Choosing to maintain rather than to replace the timber bridges would bring the following issues:

- It would impose frequent TSRs on train services
- Problem of retaining specialist tradesmen
- It requires detailed inspection
- Repair expense would be incurred every year.

Hence, we consider Queensland Rail's rationale for replacing timber bridges during the DAU2 period to be appropriate.

Queensland Rail has a large number of outstanding notifications on timber bridges, with girder wear and splitting being a major problem. In the FY2018 period, there were 75 new notifications and, in the FY2017 period, there were 176 new notifications for bridges. Although the vast majority of defects are low priority, the number of defects demonstrates the poor condition of the bridges. The number of notifications on a bridge and the tonnage over it are being used by Queensland Rail to determine which bridges need to be upgraded first. We undertook a site visit to verify whether Queensland Rail's approach of selecting the bridges for replacement was consistent with the asset condition of the bridges that we observed.

During our site visit, there was nothing to indicate that the selection of timber bridges to be replaced during the DAU2 period reflected inappropriate decision making by Queensland Rail. The bridges we observed were of relatively poor quality and, from our perspective, replacement over the DAU2 period is sensible and more appropriate than persisting with maintaining them. An overview of the bridges that Queensland Rail proposes to replace is set out in Figure 8 below.

FY	Corridor	Functional Loc.	Lin.Ref.Pattern	Start Point	Description	BRIDGE LENGTH (m)	Sum of Total
2020/21	Rosewood - Jondaryan	BRL_01140	C179	88.45	ML U/BRIDGE 88.460 DN RD	30.5	[redacted]
		BRL_01141	C179	88.45	ML U/BRIDGE 88.460 UP RD	30.5	[redacted]
		BRL_01147	C179	106.02	ML U/BRIDGE 106.060 UP RD	79.3	[redacted]
		BRL_01148	C179	106.02	ML U/BRIDGE 106.060 DN RD	72.8	[redacted]
2020/21 Total							[redacted]
2021/22	Rosewood - Jondaryan	BRL_01105	C179	56.59	ML U/BRIDGE 56.600 DN RD	28	[redacted]
		BRL_01106	C179	56.59	ML U/BRIDGE 56.600 UP RD	28.7	[redacted]
		BRL_01109	C179	57.83	ML U/BRIDGE 57.840 DN RD	29	[redacted]
		BRL_01110	C179	57.83	ML U/BRIDGE 57.840 UP RD	29.9	[redacted]
		BRL_01115	C179	59.22	ML U/BRIDGE 59.230 UP RD	18.3	[redacted]
		BRL_01116					[redacted]
	Jondaryan - Macalister	BRL_02386	C257	106.24	WL U/BRIDGE 106.250	20.8	[redacted]
	Macalister - Columboola	BRL_02408	C258	161.458	WL U/BRIDGE 161.460	4.6	[redacted]
		BRL_02415	C258	168.71	WL U/BRIDGE 168.720	13.5	[redacted]
		BRL_02422	C258	186.618	WL U/BRIDGE 186.620	4.5	[redacted]
		BRL_02423	C258	189.42	WL U/BRIDGE 189.430	13.8	[redacted]
2021/22 Total							[redacted]
2022/23	Jondaryan - Macalister	BRL_02387	C257	106.48	WL U/BRIDGE 106.520 JIMBOUR CRK	86	[redacted]
	Macalister - Columboola	BRL_02390	C258	114.64	WL U/BRIDGE 114.690 BROADMEAD	91.9	[redacted]
		BRL_02395	C258	128.72	WL U/BRIDGE 128.740	46	[redacted]
2022/23 Total							[redacted]
2023/24	Rosewood - Jondaryan	BRL_01111	C179	58.16	ML U/BRIDGE 58.170 DN RD	21.9	[redacted]
		BRL_01112	C179	58.16	ML U/BRIDGE 58.170 UP RD	21.9	[redacted]
		BRL_01113	C179	58.93	ML U/BRIDGE 58.940 DN RD	23.7	[redacted]
		BRL_01114	C179	58.93	ML U/BRIDGE 58.940 UP RD	23.7	[redacted]
	Jondaryan - Macalister	BRL_02383	C257	87.17	WL U/BRIDGE 87.200	67.5	[redacted]
	Macalister - Columboola	BRL_02402	C258	144.77	WL U/BRIDGE 144.780	26.3	[redacted]
		BRL_02421	C258	186.09	WL U/BRIDGE 186.100	26.3	[redacted]
2023/24 Total							[redacted]
2024/25	Macalister - Columboola	BRL_02399	C258	139.66	WL U/BRIDGE 139.690	54.9	[redacted]
		BRL_02406	C258	155.42	WL U/BRIDGE 155.430	20.8	[redacted]
		BRL_02425	C258	191.76	WL U/BRIDGE 191.850 COOLUMBOOLA CRK	183.6	[redacted]
2024/25 Total							[redacted]
Grand Total							[redacted]

Figure 8: Queensland Rail's proposed Timber Bridge Upgrades during DAU2

As the bridges are in poor condition, it is prudent to replace them to reduce maintenance costs, preserve safety and improve the efficiency of the line. We also note that the distances portrayed in Figure 8 align with the distances inferred from Queensland Rail's capital submission. There is no mismatch between Queensland Rail's capital-planning team and the capital submission.

7. 5 Efficiency

Queensland Rail has proposed a unit rate of [redacted] ($FY2018) for timber-bridge replacements. Queensland Rail's estimate is based on its actual/forecast data on the capital costs of 18 AU1 projects and distances of bridges replaced for those projects, noting that 9 projects are for duplicated track and 9 projects are for single-line track.[17]

The cost estimate includes the contract values with the external service providers to perform the work ([redacted]), plus internal and external costs set aside for the concept stage, development stage, project management, contract/design management, construction management, engineering support, track protection services, contract insurance, design consultant support, principal contractor contingency, planned risks, unplanned risks and the finalisation stage.

The total capital cost estimate is [redacted] and covers 15 cost components. The cost estimate is then divided by the total distances of bridges replaced (accounting for duplicated track); the total distance is

[17] B.*04636 West Moreton Timber Bridge* spreadsheet.

880.5 metres. Therefore, the unit rate is [redacted], which Queensland Rail has rounded down to [redacted] ($FY2018) for its submission.

Industry comparison

To supplement our unit-rate analysis, we undertook a benchmarking exercise of Queensland Rail's proposed unit rate of [redacted] against recent timber bridge upgrades for ARTC's Inland Rail project, namely the:

- Goonumbla 1 bridge ([redacted] for 21 metres), completed March 2018 - [redacted]
- Tomingley West bridg[redacted], completed March 2018 - [redacted]
- Goonumbla bridge [redacted], completed May 2018 - [redacted].[18]

To allow for an appropriate comparison of the [redacted]/metre range to Queensland Rail's unit rate of [redacted], to account for the bridges on Inland Rail being for a standard-gauge network (1,435 mm width) rather than a narrow-gauge network (1,067 mm width), we increased three of Queensland Rail's 15 cost components, namely Contract Value, Track Construction, and Queensland Rail Engineering Support by a factor of 1,435/1,067. (This step seeks to address which of the 15 cost components would be sensitive to track-gauge width.)

Our analysis yielded a unit rate of [redacted] for Queensland Rail's costs. On this basis, we consider that Queensland Rail's unit rate of [redacted] is comparable with, if not lower than, the unit rates that ARTC has achieved for the Inland Rail timber bridge upgrades.

Queensland Rail also provided data to us that showed the unit rates, from contractor prices alone, for timber bridge upgrades along its North Coast Line have exceeded [redacted][19].

Given the results of the benchmarking process, we consider Queensland Rail's proposed rate of [redacted] to be efficient.

7. 6 References

We relied on the following information from Queensland Rail during our peer review of the Timber Bridge Upgrade capital project:

- WM DAU2 Timber Bridge Upgrade Project (*Excel* workbook)
- B.04636 West Moreton Timber Bridge (*Excel* workbook)
- CW2254247 11 Specification and Statement of Work_rev4 (pdf)
- E-mail correspondence from Queensland Rail officers about the cost build up and assumptions underpinning the content of B.04636 West Moreton Timber Bridge (*Excel* workbook)
- E-mail correspondence from Queensland Rail officers about the recent actual costs of timber bridge replacements on the North Coast Line
- Department of Transport and Main Roads' *Project Cost Estimating Manual*.

[18] See https://www.artc.com.au/2018/05/01/inland-rail-leaders-visit-future-proofing-works-in-nsw/

[19] These data were not made available to us at this point of the peer review, as Queensland Rail was still bound by confidentiality requirements at its awarding stage of the contracts for the North Coast Line jobs.

8. Re-sleepering

8. 1 Recommendation

We do not recommend any changes to Queensland Rail's proposed scope of works or costs for Re-sleepering. We consider the scope established in the DAU2 proposal to be prudent, and the proposed expenditure to be efficient. Our findings are based on our site visit and the recent unit rates achieved for Re-sleepering activities.

8. 2 Project description

Re-sleepering is the *en masse* replacement of defective timber sleepers with new timber sleepers. It is important to note that the replacement of sleepers in this project differs from that occurring during Track Reconditioning; in that the latter activity involves the replacing of defective timber sleepers with concrete sleepers. Figure 9 shows deteriorated timber sleepers along the West Moreton system, as evidenced by the poor visual condition and lifted dog spike.

Figure 9: Deteriorated timber sleepers along the West Moreton network

Such deterioration contributes to track instability. This results in reduced structural integrity of track and an increased risk of derailment. Hence, Re-sleepering is a required capital activity to keep the rail network safe for above-rail operators.

8. 3 Queensland Rail's proposal

Queensland Rail has proposed the following costs for Re-sleepering (see Table 13). We note that the costs for Re-sleepering are not dependent on the throughput-scenario selection (i.e. the choice of 2.1 mtpa or 9.1 mtpa does not affect Queensland Rail's proposed scopes and costs over the DAU2 period).

Table 13: Queensland Rail's proposed expenditure for Re-sleepering ($000s, $FY2018)

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
2.1 / 9.1 mtpa	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
R2J	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
J2C	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Queensland Rail's proposed DAU2 expenditure for Re-sleepering are [redacted]. Works are proposed to occur in FY2021 and FY2025 for the R2J section (total of [redacted]), and only in FY2021 for the J2C section (total of [redacted]).

Queensland Rail proposed a unit rate of [redacted] for all Re-sleepering activities. The scope that reflects the above proposal is show below.

Table 14: Queensland Rail's proposed scopes for Re-sleepering (number of sleepers)

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
2.1 / 9.1 mtpa	**41,100**	**0**	**0**	**0**	**11,000**	**52,100**
R2J	2,600	0	0	0	11,000	13,600
J2C	38,500	0	0	0	0	38,500

In the next subsection, we discuss our approach to assessing whether Queensland Rail's proposed Re-sleepering program reflects prudent decision making.

8. 4 Prudency

Queensland Rail's estimates that timber sleeper degradation will be at a rate of 5% of the total population each year in its 10-year renewal program. With approximately 244,000 timber sleepers[20] in the West Moreton system, the total number of sleepers to be replaced over the five years (with 5% degradation rate each year) will be approximately 55,000, leaving approximately 198,000. This aligns with the DAU2 plan of replacing 52,100 timber sleepers, which demonstrates that there is alignment between Queensland Rail's proposed scope of work and the understanding of the asset condition in the renewal program.

During our site visit, we observed the condition of some of the timber sleepers that Queensland Rail intends to replace during the DAU2 period. From our observations we consider that Queensland Rail's proposed scope proposal is reasonable. Hence, we consider the proposed scopes to be prudent.

Capitalisation of expenditure

[20] 2017-18 AMP, p. 131

We understand that Queensland Rail has sought to classify the Re-sleepering activity as a capital, rather than maintenance expenditure activity. Queensland Rail's Capitalisation of expenditure specification indicates that a capital activity relates to a new asset or to improving an existing asset. Queensland Rail considers the term 'improve' to relate to the following:

> *…expenditure on assets must be capitalised (i.e. added to the carrying amount of the asset) when it improves the condition of the asset beyond its originally assessed standard of performance or capacity. This can occur through:*
>
> - *An increase in the service potential provided by the asset; or*
> - *Increasing the useful life of the asset.*[21]

Our engineering judgement indicates that the Re-sleepering program is capital in nature, because it is an *en masse* campaign of works, in comparison with spot Re-sleepering. In addition, we note that our position is consistent with Queensland Rail's about-to-be published latest Capitalisation of expenditure specification. If the Re-sleepering work is planned and it is for a total distance greater than 500 metres (South East Queensland (SEQ) region) over a short period (i.e. a financial year), then it can be classed as capital expenditure (as long as Queensland Rail spends at least [redacted] on the work and replaces at least 1 in 4 (>=25%) sleepers).[22]

We understand that each km of track generally has 1,500 sleepers, i.e. 750 sleepers for 500 metres of track. Replacing one in four sleepers means a minimum of 125 sleepers need to be replaced in order for it to be classed as capital works. This volume may be considered as the threshold necessary to achieve life extension works and/or improvement in performance for a given section of track. Queensland Rail's proposed Re-sleepering program satisfies the aforementioned requirements:

- 2,600 sleepers replaced in FY2021 [redacted] and 11,000 sleepers replaced in FY2025 [redacted], in the Rosewood-to-Jondaryan section
- 38,500 sleeper replaced in FY2021 [redacted], in the Jondaryan-to-Columboola section.

Accordingly, we consider Queensland Rail's Re-sleepering program to be a capital, not maintenance, activity.

8. 5 Efficiency

Queensland Rail has proposed a unit rate of [redacted] ($FY2018) for Re-sleepering, for both the Rosewood to Jondaryan section and the Jondaryan to Columboola section.

The recommendations from our top-down review of costs are as follows (analysis undertaken in real $FY2018 terms):

- Queensland Rail provided us FY2016 Re-sleepering cost data.[23] As mechanised Re-sleepering is a highly cyclical activity, such works do not occur every year. This explains why only one year of

[21] Page 20 of 39 of Queensland Rail's *Classification of Expenditure* specification.

[22] Even if the West Moreton system is considered to be part of the Regional, rather than SEQ, network, the distance threshold would increase to 2km and number of sleepers to 500 metres, which Queensland Rail's program will more than exceed.

[23] *Resleepering 15-16* spreadsheet.

historical data are available. We converted Queensland Rail's cost data into real terms ($FY2018). The unit rate for:

  - Rosewood to Jondaryan is [redacted], based on 11,898 sleeper replacements
  - Jondaryan to Columboola is [redacted]r, based on 49,739 sleeper replacements
  - Rosewood to Columboola, covering a total of 61,637 sleeper replacements, is [redacted]. This is within [redacted] of Queensland Rail's DAU2 proposed cost of [redacted].

- Over the DAU2 period, Queensland Rail will be replacing the following number of sleepers:
  - Rosewood to Jondaryan – 2,600 sleepers in FY2021 and 11,000 sleepers in FY2025
  - Jondaryan to Columboola – 38,500 sleepers in FY2021.

We note that Queensland Rail will not gain economies of scale in either of the two rail sections, since sleeper replacements in each year of the DAU2 period are less than what transpired in FY2016. As such, we do not recommend any changes to Queensland Rail's proposed rate of [redacted] over the DAU2 period.

To supplement our top-down analysis, we have reviewed the cost components that contribute to build up of yearly annual costs (analysis undertaken in nominal terms). Key findings are that:

- Out of the 26 cost components in the track-reconditioning project, the four components that contributed most to total costs in FY2016 are: sleepers [redacted]; internal labour [redacted]; use of internal machinery [redacted]; and miscellaneous permanent way components [redacted]).
- We did not assess the unit rates for machinery, as the data did not reveal what the various kit for the mechanised-resleepering process encompassed. The 'material description', 'purchase order text' and 'name' columns were blank in the relevant data spreadsheet.
- We did not assess the unit rates for miscellaneous permanent way components as the consumables that fall within this category are diverse (e.g. dog-spikes, screw dogs, plate sleepers and spike springs).
- We assessed the unit rates for sleepers and internal labour:
  - Sleeper (TI 230 X 115 MM X 2.15 M standard size) unit rates were within [redacted] to [redacted]. We consider these rates not to be excessive based on our engineering experience.
  - Hourly labour rates (FY2016) were within [redacted](Re-sleepering worker) to [redacted] (senior project engineer). We consider these rates reasonable as they are in line with our in-house data for labour rates.

In conclusion, data on the cost components have not triggered the need for us to revisit our top-down analysis. Hence, we consider Queensland Rail's proposed Re-sleepering unit rate o[redacted]/sleeper to reflect efficient costs.

8. 6 References

In reviewing for Formation Repairs, we peer reviewed the following documents:

- AU2 West Moreton Tariff Reset Capital Submission – July 2018
- Queensland Rail's Network Asset Management Plan – 2017/18
- Queensland Rail's Capitalisation of expenditure – June 2017

9. West Moreton Minor Signalling Renewals

9. 1 Recommendation

We do not recommend any changes to Queensland Rail's proposed scope of works or costs for this capital project. As Queensland Rail's proposal for this project is not based on measurable scope of activity and unit rate, the structure of this section is different from the civil-related projects.

9. 2 Our analysis

Queensland Rail proposes spending [redacted] ($FY2018) on WM Minor Signalling Renewals during the DAU2 period. This involves the following spending on the Rosewood-to-Jondaryan section:

- [redacted]
- [redacted].

We note that the following items are included in WM Minor Signalling Renewals project:

- Upgrading of 4.5V Solar Track Feed to 12V. This occurs in Helidon to Lockyer, Forest Hill to Laidley, and Yarongmalu
- Upgrade of Model 10 Mechanical Boom Gate
- Upgrading of Alternators at Grandchester, Yarongmalu and Rangeview
- Upgrading of Asbestos-containing location cases and cabinets.

We note that the projects are mainly required to overcome technology obsolescence and to manage safety requirements. Queensland Rail has also confirmed that changes to wiring-related specifications have resulted in minor signalling works needing large changes to surrounding infrastructure. This activity includes projects that were started in the AU1 period and that will be completed in the DAU2 period.

The replacement of signalling equipment includes many components and costs that may not be readily forecast due to the spasmodic failure rate of such equipment. In Queensland Rail's submission, no details on labour costs, individual components or work completed in the DAU2 period are provided; a detailed breakdown of costs has not been made available to us at this point and we cannot seek to verify the efficiency of Queensland Rail's proposal. We also note that the upgrading or boom gates, removal of asbestos and other projects would be of sufficient financial magnitude to be 'projects' in their own right.

Nothing emerged during our analysis of Queensland Rail's submission and our site visit to indicate that listed activities are not prudent. Subject to any further information being provided about the cost build up for WM Minor Signalling Renewals, we do not recommend any amendments to Queensland Rail's proposal.

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https://projects.ghd.com/oc/Advisory/queenslandrailwestmo/Delivery/Documents/Capital Expenditure/9110660 - GHD Capex Final Report (13 July 2018) (public sub to QCA).docx

Rev.No.	Author	Reviewer		Approved for Issue		
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Draft A	Hiresh Devaser Zach Zhang Bruce Parrey	John Portwood		Stephen Hinchliffe		27 June 2018
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Rev.No.	Author	Reviewer		Approved for Issue		
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Final	Zach Zhang	Hiresh Devaser		Hiresh Devaser		13 July 2018

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Attachment 5: West Moreton System DAU2 Maintenance Costs 2020-21 to 2024-25

West Moreton System
DAU2 Maintenance Submission

14 July 2018

Commercial-In-Confidence

QueenslandRail

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1. Overview

1.1 Context

Queensland Rail's West Moreton System provides rail infrastructure access to two coal mines on the West Moreton System—New Hope Coal's New Acland Stage 2 mine at Jondaryan and Yancoal's Cameby Downs mine that rails from Columboola. These two mines are forecast to move around 6.25 million tonnes in 2018-19. New Hope Coal's New Acland Stage 2 mine is nearing the end of its life, with the likelihood that coal reserves at this mine may be exhausted by mid-2020.

In September 2017, under section 133 of the *Queensland Competition Authority Act 1997* (QCA Act), the Queensland Competition Authority (QCA) has requested Queensland Rail to submit a draft access undertaking for the period 1 July 2020 to 30 June 2025 (DAU2), by 31 July 2018. If approved by the QCA, DAU2 will become the Queensland Rail Access Undertaking 2 (AU2).

As part of the DAU2 process, Queensland Rail has developed reference tariffs for the West Moreton System based on the 'building blocks' approach. This submission provides information supporting Queensland Rail's proposed maintenance program.

The DAU2 submission has been developed with considerable uncertainty about the potential future coal volumes that are likely to be moved on West Moreton coal system. In particular, New Hope Coal is yet to receive approval to develop the New Acland Stage 3 mine. New Hope Coal is continuing to progress with its development application, although there is no certainty about the potential outcome of this process.

For this reason, two maintenance scenarios have been developed and are presented in this submission:

- a 2.1 mtpa scenario—assuming that only Yancoal's mine at Cameby Downs is producing coal and hauling on the West Moreton System
- a 9.1 mtpa scenario—assuming the New Acland mine is developed and produces 7 mtpa of coal for hauling from Jondaryan, in addition to the 2.1 mtpa from Cameby Downs.

To assist stakeholders and the QCA in making a comparison of maintenance costs used for the Queensland Rail Access Undertaking 1 (AU1) period, Queensland Rail also makes comparison to a constant tonne scenario of 6.25mtpa.

1.2 Proposed DAU2 West Moreton System maintenance costs

Queensland Rail is proposing two potential maintenance cost forecasts for 2020–21 to 2024–25 (the DAU2 period):

- $101.825 million ($2020–21) to support the movement of 2.1 mtpa—see **Table 1**
- $140.921 million ($2020–21) to support the movement of 9.1 mtpa—see
- **Table** 2.[1]

Table 1: West Moreton coal maintenance costs—DAU2 ($2020–21 million)—2.1 mtpa

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Track	$16.426	$16.461	$16.498	$16.536	$16.576	$82.497
Structures	$2.719	$2.517	$2.322	$2.112	$1.884	$11.553
Trackside systems	$1.467	$1.467	$1.467	$1.467	$1.467	$7.337
Facilities/Other	$0.088	$0.088	$0.088	$0.088	$0.088	$0.438
Total	**$20.700**	**$20.533**	**$20.374**	**$20.202**	**$20.015**	**$101.825**

Table 2: West Moreton coal maintenance costs—DAU2 ($2020–21 million)—9.1 mtpa

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Track	$23.975	$24.049	$24.126	$24.207	$24.293	$120.649
Structures	$2.953	$2.717	$2.496	$2.286	$2.044	$12.497
Trackside systems	$1.467	$1.467	$1.467	$1.467	$1.467	$7.337
Facilities/Other	$0.088	$0.088	$0.088	$0.088	$0.088	$0.438
Total	**$28.483**	**$28.321**	**$28.177**	**$28.048**	**$27.891**	**$140.921**

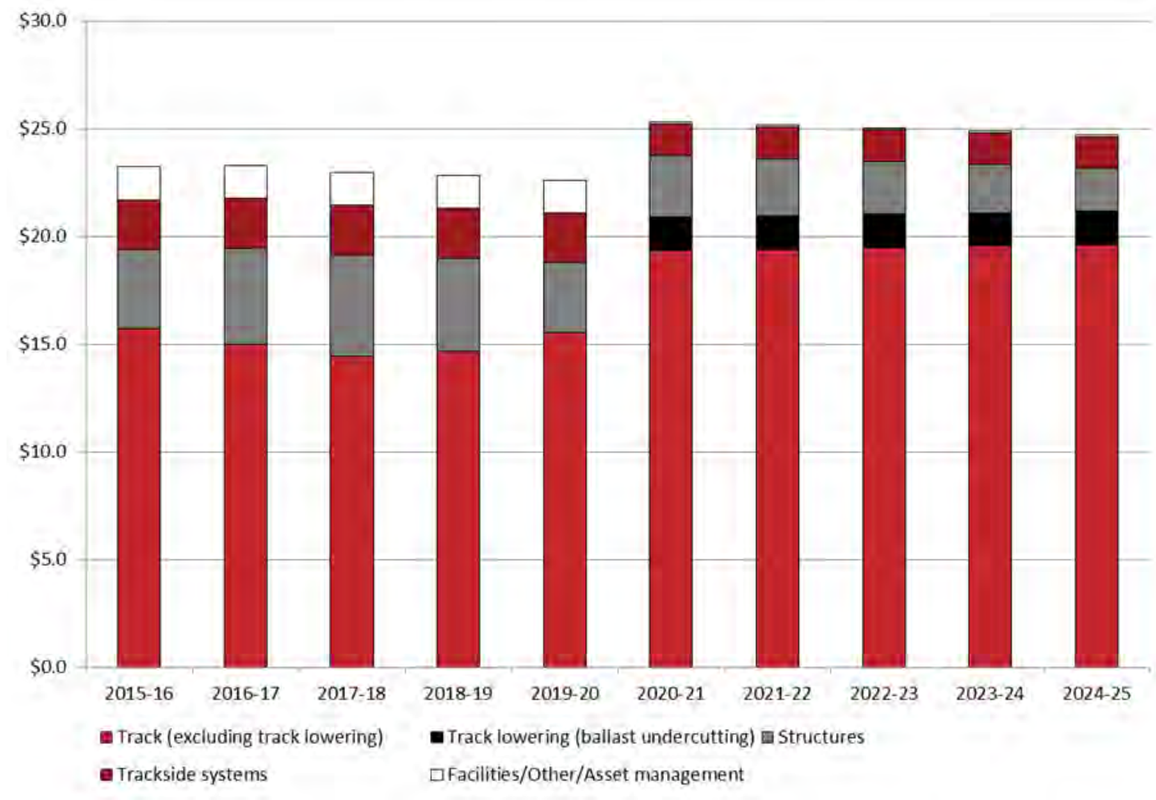
As shown in **Figure 1**, compared to a constant tonne scenario, the DAU2 maintenance costs are estimated to be, on average 8.7 per cent higher per annum in real terms than the AU1 maintenance allowance approved by the QCA.

However, if the effect of re-including $1.5 million per annum ($2020–21) in ballast undercutting costs in the DAU2 maintenance allowance is excluded,[2] DAU2 maintenance costs are forecast to be an average 2 per cent per annum higher over the DAU2 period.

1 The 9.1 mtpa scenario for DAU2 assumes that New Hope Coal's proposed Acland Stage 3 mine receives the necessary environmental approvals, and that the new mine commences production on 1 July 2020 to coincide with the approval of the new undertaking.

2 For AU1 the QCA decided that this activity was capital in nature, however the track lowering activities do not meet Queensland Rail's capitalisation guidelines and Queensland Rail will seek to have the QCA decision reversed as part of the DAU2 process.

Figure 1: Comparison of West Moreton coal maintenance costs—DAU2 ($2020–21 million)—assuming constant tonnes (6.25 mtpa)



This submission has been prepared in the context of the *2018–19 West Moreton System Asset Management Plan* (AMP) which outlines the system's characteristics, traffic types, business environment, key drivers and details the high level asset descriptions and strategies by which the system is managed.

2. Background

2.1 Overview of system characteristics and current infrastructure

The West Moreton System is an important link in the supply chains that exports coal and agricultural products from areas of south-west Queensland through the Port of Brisbane. The system begins on the western side of Rosewood on the Main Line and runs through Toowoomba to Miles on the Western Line. This section is the predominant coal corridor for the system. The West Moreton System does not include the Glenmorgan Line which runs from Dalby and now stops at Meandarra, the South Western Line from Toowoomba to Wyreema and beyond or the Ebenezer loading loop, which is part of the Metropolitan System.

Figure 2: West Moreton System characteristics and infrastructure

Route length	321 km narrow gauge
Track length	407 km narrow gauge
Rail size	41, 50, 60 kg/m
Mainline sleepers	Concrete, interspersed steel and timber sleepers, predominantly 1 in 2
Maximum axle load	15.75 tonne axle load (tal)
Max. operating speed	80 km/h
Signalling	RCS and DTC
Reference train length	673.8 metres

2.2 Current traffic types, operators and key customers

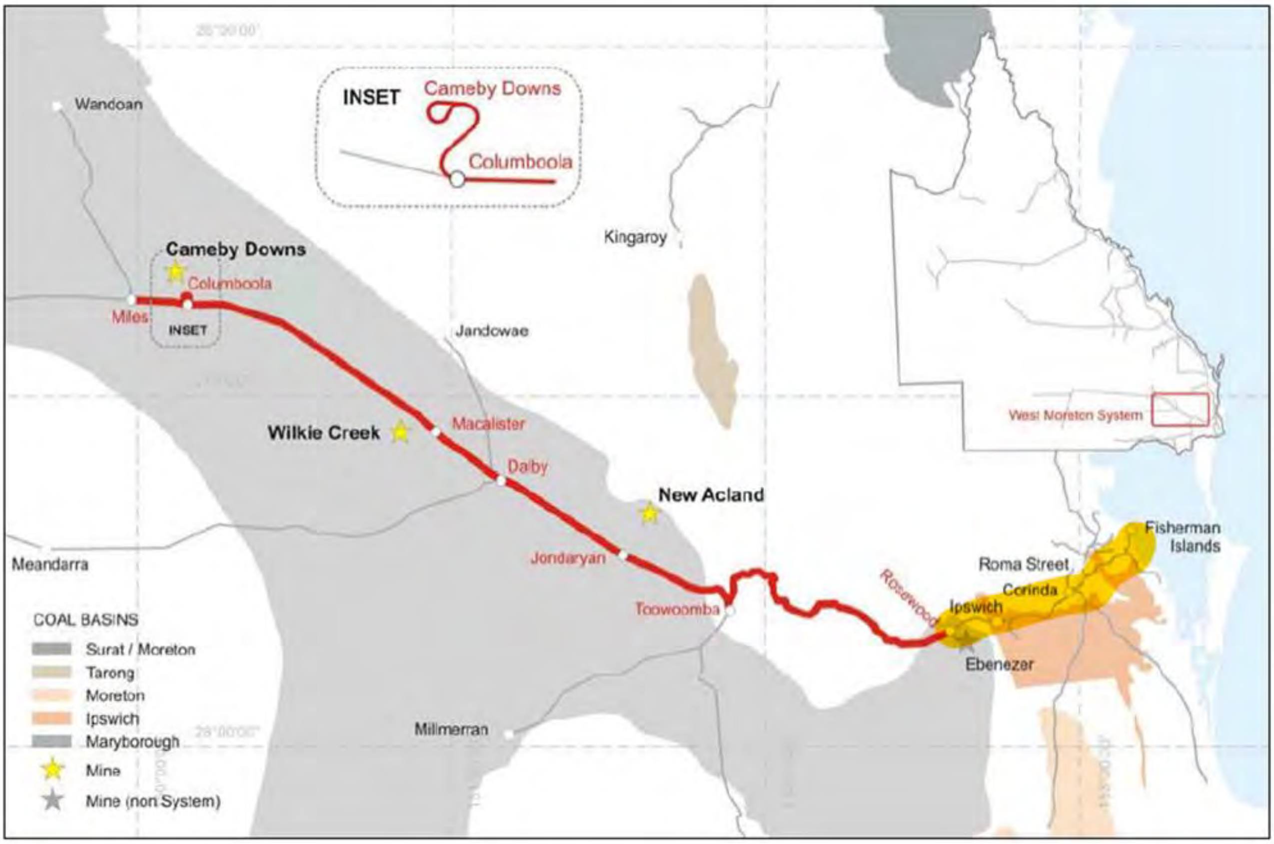
The West Moreton System is a multi-use system with coal, freight and passenger utilising paths. Coal dominates traffic from west of Toowoomba and is the predominant driver for the asset strategies for the system. Trains are limited to 15.75tal with a reference train length of 673.8m.

As at 30 June 2018, Aurizon is the only freight service operator on the West Moreton System. However, Graincorp has announced that it will contract with Watco from the end of 2019 for the movement of bulk grain in Queensland, including the South West.

Agricultural traffic from the South West System joins the West Moreton System at Toowoomba. The South West System carries seasonal grain traffic. The Queensland Government has provided Queensland Rail with funding to increase tunnel clearances on the Toowoomba and Little Liverpool ranges, with the intention that 9’6” high shipping containers can be moved down the ranges. This should allow for the carriage of cotton by rail, with no cotton movements on the rail system since 2013.

Queensland Rail is the passenger service operator running the Westlander from Brisbane to Charleville. Traffic from the South West System joins West Moreton at Toowoomba. The South West System carries bulk grain traffic with Aurizon as the current freight service operator.

Figure 3: Surat / Moreton Coal Basin



3. Maintenance Strategy

3.1 Queensland Rail's maintenance philosophy

3.1.1 Maintenance and supply chain efficiency

A key way that Queensland Rail can contribute towards the development and ongoing enhancement of an efficient coal supply chain is via its network maintenance strategy. This is by ensuring that the system is maintained to a standard that delivers an appropriate level of service to users.

Maintenance can impact service quality in a number of ways. The fundamental means is by ensuring that the system can be consistently operated at its maximum operational capability (that is, to the maximum speed and axle load that it has been designed to carry), which in turn enables throughput to be maximised. Service quality will be degraded by the introduction of speed restrictions or disruptions to network availability due to incidents such as derailments or unplanned possessions.

The management of possessions can also influence service quality. Track closures are a necessary part of being able to maintain the network. Their timing and duration have an impact on throughput, particularly where there is limited stockpile capacity at the port and/or mines. The management of possessions is, therefore, an important part of Queensland Rail's maintenance strategy. As part of Queensland Rail's management of possessions, Queensland Rail actively seeks ways to undertake the required maintenance task without increasing possessions.

3.1.2 Trade-offs in the maintenance strategy

The cost of maintenance is driven by the standard required to achieve a given level of service quality. There is clearly a trade-off between these two factors; given there will be a direct relationship between the standard of the network and the cost of maintaining the network to that standard. Queensland Rail's maintenance regime seeks an appropriate balance between service quality and cost.

If the asset is under-maintained, reduced costs and fewer maintenance possessions are experienced in the short term, however in the longer term, network availability could be reduced as speed restrictions are imposed (to ensure that safety is maintained) and the number and duration of unplanned maintenance possessions increases. It can also result in capital expenditure being brought forward where assets must be replaced due to early failure.

If an asset is over-maintained, users may be bearing a higher cost of maintenance than is necessary to maintain the desired level of service quality. It could also mean that network availability is being compromised as planned possessions are likely to be more frequent.

The balance between service quality and cost can change through time. For example, if the system is not capacity constrained, there may be a higher degree of tolerance for track closures and speed restrictions to the extent that this has less of an impact on the ability of users to meet the requirements of their customers. At the same time, Queensland Rail still has to maintain the network to an appropriate standard to preserve the long-term integrity of its assets and ensure safety is not compromised.

Maintenance of the network to a high standard is particularly important given the implications that speed restrictions and unplanned possessions could have on network availability. At the same time, while unplanned maintenance needs to be minimised it cannot be avoided, so Queensland Rail needs to maintain sufficient flexibility to be able to respond quickly and effectively where unforeseen issues arise. In the current environment, the opportunity cost of foregone throughput to the mines will be very high. However, this will still necessitate taking possession of the track for maintenance in a manner that minimises the impact on users.

A focus on achieving contracted tonnage throughput does not mean that cost becomes less important. Queensland Rail is acutely aware that the costs need to be reasonable and efficiencies should still be extracted to the extent possible. The implications of this on the maintenance strategy (and its associated cost) are a key consideration for Queensland Rail.

The appropriate balance between capital expenditure and maintenance requires the application of judgment and will vary depending on:

- the nature of the asset
- the historical maintenance regime
- current market conditions.

Consequently there are no ‘hard and fast’ rules that are applied by Queensland Rail in evaluating capital expenditure versus maintenance, other than ensuring that this is routinely considered in planning decisions based on a whole-of-life analysis.

3.1.3 Vision for the maintenance program

Queensland Rail’s vision for maintenance is to maintain the network to a standard that maximises supply chain efficiency in a manner that is consistent with the level of service quality desired by users. This is done within the context of a maintenance strategy that maintains the long-term integrity and safety of the network.

3.2 Planning, implementing and managing the program

3.2.1 Maintenance planning

Queensland Rail, as maintenance provider, develops a forecast of the expected works required. This forecast is done on a number of levels. The annual System Maintenance Plan forecasts work to be undertaken each year, whilst the Asset Management Plan considers a 10 year maintenance horizon.

3.2.2 Asset monitoring and analysis

Asset monitoring and analysis is also a very important part of maintenance planning and delivery. Asset monitoring technology and the associated analytical tools are becoming increasingly sophisticated; delivering more accurate and robust data that is then directly fed into the maintenance planning process. More accurate monitoring of potential defects enables a more proactive maintenance program, which should also generate efficiencies over the longer term. In 2014 Queensland Rail implemented an Enterprise Asset Management System which enables Queensland Rail to better understand and monitor the actual condition and degradation of the network.

3.2.3 Preventative versus reactive maintenance

One of the key trade-offs in the maintenance regime is preventative versus reactive maintenance. Preventative maintenance is maintenance that is undertaken at regular programmed intervals to maximise availability and reliability. It is a more proactive approach that seeks to anticipate the likely maintenance effort required based on an understanding of the asset's characteristics and the impact of throughput on its performance. Further, as mentioned, this assessment is improved by regular asset monitoring and analysis.

Reactive maintenance is performed in response to a defect, noting that assets can require attention for a number of reasons (including incidents on the network). This will generally need to be prioritised depending on the risks arising from the defect failure. Immediate corrective maintenance will be undertaken where the defect has a potentially significant safety, environmental or operational risk. Deferred corrective maintenance, which may be identified during the course of preventative maintenance, is performed where the potential risk is not significant. The maintenance may be deferred because of the scale and scope of work required.

It could be argued that the more preventative maintenance is carried out, the less corrective maintenance is required; however, this does not mean preventative maintenance should not be efficient and targeted. There are levels of preventative maintenance beyond which additional maintenance is not efficient (that is, it is effectively 'over maintaining' the asset). In addition to this there are circumstances that could lead to asset failure, which are independent of the level of preventative maintenance that has been undertaken, such as extreme weather events or derailments that are not caused by track defects. Maintenance planning therefore needs to achieve an appropriate balance between preventative and reactive maintenance, taking into consideration constraints imposed by possessions.

3.3 Driving efficiency and innovation in maintenance

Driving continuous improvement needs to be an integral part of the maintenance regime irrespective of the current demand environment. However, the constraints imposed by demand pressures may determine what is regarded as 'efficient'. For example, efficiency is not necessarily limited to doing more with less, or finding ways to reduce costs.

4. Key drivers for DAU2 maintenance costs

4.1 History of the West Moreton System and relationship to maintenance costs

The West Moreton System was constructed and opened to traffic in 1865 between Ipswich and Grandchester, with subsequent extensions reaching Toowoomba in 1867. Historically the line catered for passenger, livestock, freight and primary products (e.g. grain and cotton).

Coal carrying services commenced in 1982 initially from mines located just west of Ipswich. Rail export commenced via rail from Macalister in 1994 (closing in 2013), Jondaryan in 2002 and from Columboola in 2010.

The network's historical origins present continuing challenges for its operation. The West Moreton System was initially constructed on black soil plains with no engineered formation; resulting in regular failures requiring reconstruction to ensure suitable track geometry is maintained.

Early track standards have resulted in an alignment that is lower than contemporary standards for stand-alone heavy haul railway built specifically for coal carrying services. As a consequence of the network's age and track standard, the section between Rosewood and Miles in particular requires a higher level of intervention than would be required for a more modern, stand-alone heavy haul railway in order to safely and reliably deliver contracted tonnages.

The age and history of the West Moreton System, particularly the relationship between maintenance and the value of assets was considered extensively as part of the QCA's approval of AU1—including approval of the Regulated Asset Base (RAB) and maintenance cost allowance. While Queensland Rail has been slowly improving the quality of the track through the capital program, the same maintenance issues associated with the history of the network still drive the maintenance requirements for DAU2.

For the DAU2 period, Queensland Rail has proposed what it considers to be efficient maintenance costs for the West Moreton System having regard to the age and condition of the network, and the volumes proposed to be hauled over a network that was not originally designed for this purpose.

4.2 Current condition of the West Moreton System

4.2.1 West Moreton System asset management plan

The West Moreton System AMP provides an overview of the condition of individual components of the system. A summary is provided in **Table 3.**

Table 3: Summary of asset condition, by rail infrastructure component, as at 1 July 2018

Rail infrastructure component	Condition
Formation	There are many challenges with the current formation that result in sub-optimal performance. These include age, tonnage and use, seasonal weather conditions such as heavy rain and unstable ash deposits from the original steam trains. These challenges stem from the historical use of non-engineered formations built on black soil plains. Over the past decade approximately 30km of formation has been upgraded. Works are prioritised on the extent of the formation failure together with location and speed restriction impacts. Repair activities include the renewal of the formation and installation of drains. High level estimates show that there is approximately 200km of formation to be upgraded to ensure that the poor black soil and ash formations are removed and an engineered solution is put in place. The Toowoomba Range has suffered major landslides in recent history due to flooding. The range is geotechnically unstable which presents challenges to the reliability of the West Moreton System in the supply chain.
Rail	The Toowoomba Range and Little Liverpool Range have tight radius 41kg check rail curves which are subject to high wear rates. This wear contributes to the degradation and failure of check rail bolts. The 41kg rail in the system is in fair condition, with wear and emerging internal defect issues becoming apparent. The majority of rail defects picked up through Non Destructive Testing (NDT) are found in the 41kg rail sections. The 41kg rail on the Western Line west of Jondaryan is still in an operational condition, however between Jondaryan and Dalby it needs to be closely monitored having shown high defect levels in 2010 and 2011. The immediate issue west of Jondaryan is rail creep and the occasional broken joint/pull apart. Work is being done to weld rails into 220m lengths to reduce the number of joints and gain stability. Creep will be monitored and anchorage of timber sleepers may be necessary.
Sleepers	The West Moreton System has approximately 635,000 sleepers. The average life of a timber sleeper is less than 17 years as opposed to 20 years in the past. This is due to poor supply of quality hardwood timbers. Rosewood to Toowoomba has sections of 100 per cent concrete, steel and timber as well as sections of timber interspersed with steel. At completion of the Toowoomba Range tunnel lowering project the Toowoomba Range will have 100 per cent concrete sleepers with check rails on curves where required. Toowoomba to Miles has 100 per cent concrete sleepers to the 45km mark (Jondaryan) with 1in2 steel/timber pattern from Jondaryan to Miles. The concrete sleeper on tight radius curves are proving to have some operational issues with excessive pad wear and lack of ability to adjust gauge to allow for side wear on rails. This is leading to rail pads and rail being replaced at excessively short intervals. Currently there is interspersed timber and steel-sleepered track with defective timber sleeper percentages approaching Civil Engineering Track Standards (CETS) limits between Macalister and Chinchilla. Intervention in these areas has been initiated by maintenance gangs however the efficiencies of mechanised resleepering are required. Sections of track are creeping east on the Western Line between Malu and Bowenville. This section is 1-in-2 interspersed steel and in line with CETS, the timber sleepers are not anchored. While they supply load bearing support, they do not provide any longitudinal rail constraint.
Ballast	The ballast fouling is due predominantly to the lack of engineered formation. This fouled condition causes poor drainage, breakdown of the ballast stone, formation damage and loss of top and line. This is managed through planned ballast renewals and track lowering.

Rail infrastructure component	Condition
Turnouts	Turnouts in the system are in good condition with the main line turnouts being upgraded to 60kg Rail Bound Manganese (RBM) on concrete bearers over the last decade. Seven Swing Nose Crossings (SNX) were installed east of Toowoomba. Timber bearer turnouts are in place where joining infrastructure enters the system. The Willowburn Yard has turnouts that are in poor condition. The four access turnouts are sites of recent derailments.
Structures	The current defect situation shows that the bridges in the system are in a reasonable condition for the current loading situations. Reductions in bush timber skills and availability of quality materials are becoming an issue for Queensland Rail. Non-standard piers and pier type configurations are more evidenced with capsilling and butt splicing of piles being undertaken in lieu of driving timber piles. This is an issue west of Jondaryan with straight wide-centred piled piers pushing under traffic. Timber bridges on the Toowoomba Range are generally tall, requiring scaffolding and those off the main road are difficult to access in wet conditions. There are two old poured in-situ concrete bridges, one major structure at Lockyer Creek sustaining undermining and cracking in the 2011 floods. These bridges in the West Moreton System have recently been reviewed by AECOM. This high level study was undertaken to determine the structural adequacy of the West Moreton bridge assets for future upgrades of the system to achieve either a combination of increased tonnages, increased axle loads and longer trains. One of the recommendations from the study was a requirement for further detailed investigations into some of the bridges analysed. These bridges were shown to have structurally deficient components, including fatigue, for existing traffic when analysed against the new design requirements. The analysis also showed that the timber bridges were structurally deficient when assessed against the Australian Standard but have been proven to have sufficient capacity to support the existing trains. To allow these bridges to remain in service a performance based assessment is used which requires that the train loadings do not increase and that a maintenance program is in place to preserve their condition. Culverts on the Toowoomba Range are critical to the reliability of the network on the range. These culverts are inspected six-monthly as opposed to the two-yearly requirement of Civil Engineering Structure Standards (CESS). This ensures all culverts are kept in a clean, safe and reliable condition. Many of the culverts are heritage listed and the maintenance to keep them in their original condition is onerous. There are various culverts through the system including culverts between Malu and Bowenville that are of old cast in-situ construction. Two of these culverts are being replaced by the current capital program. Recent inspections have shown that a large set of culverts in Grandchester are also suffering from concrete defects. Maintenance gangs are doing remedial works on these culverts.

4.2.2 Indicators of track condition on the West Moreton System

AU1 requires Queensland Rail to report of two indicators which are intended to provide some measure of track condition—the Overall Track Condition Index (OTCI) and Temporary Speed Restrictions.

Overall track condition index (OTCI)

Figure 4 shows the OTCI for West Moreton December 2009 to June 2018. The West Moreton System OTCI has been within the 40–45 range over the last decade, the exception being a period over the summer of 2013-14 related to weather.

Figure 4: West Moreton System OTCI, December 2009 to June 2018

The West Moreton's OTCI is higher than those for Aurizon's Central Queensland Coal Network (

Table 4), noting that the lower the indicator, the better the track quality. The higher OTCI for the West Moreton System is in large part a function of the network's history, which was not originally designed to be a heavy-haul railway.

Table 4: Aurizon Network, OTCI by system January–March 2018[3]

OTCI	Blackwater	Goonyella	Moura	Newlands
Jan–March 2018	32.77	29.68	31.11	25.80

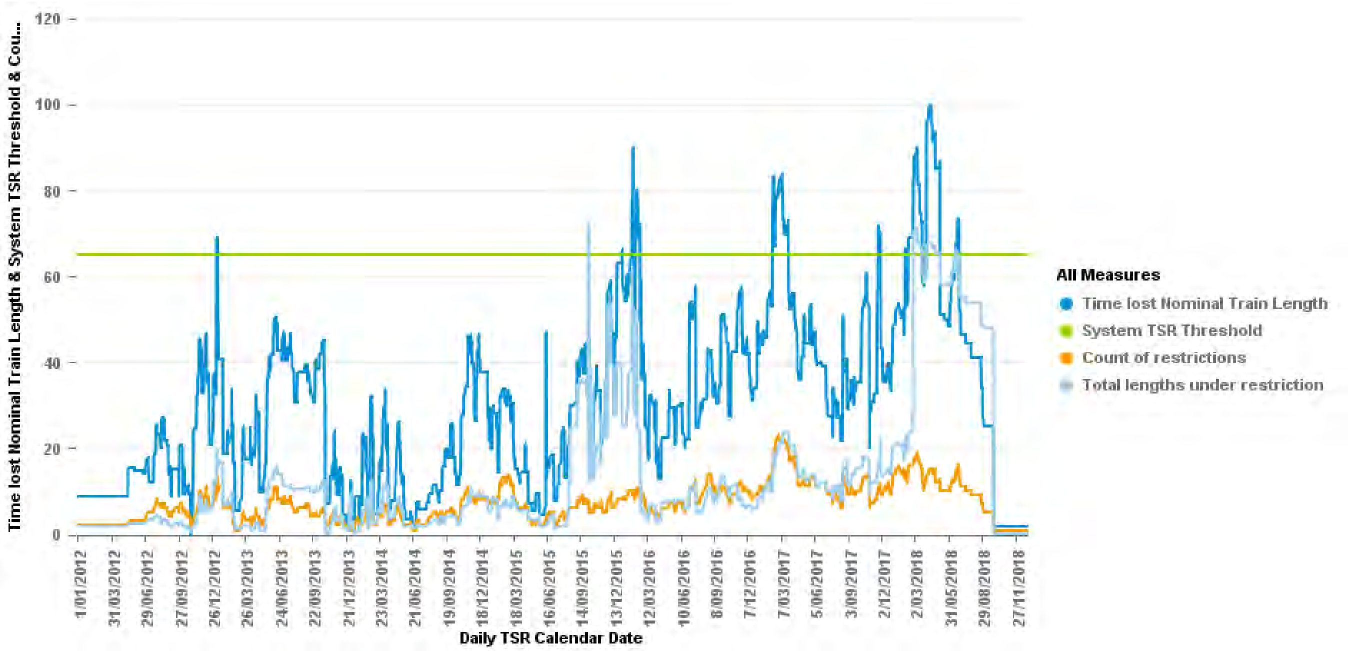
However, Aurizon notes that the OTCI should only be used as an indicator of abnormality. A single number which is an average over a defined length cannot reflect all the variations within a coal system.[4] Worley Parsons also noted significant limitations on use of the OTCI as an indicator:

> *The OTCI is calculated from the mean plus three standard deviation points of the distribution of each Parameter Index over a track section. This means it is a measure of the quality of the very worst track locations. While this can be used to ensure no section of track exceeds an allowable maximum roughness it is not a good indicator of overall track condition.*
>
> *Monitoring the condition of only the very worst track locations can cause problems. It can cause the track maintainer to focus effort on a small number of difficult locations. Lack of attention to other locations can cause the overall track condition to deteriorate.5*

Temporary speed restrictions (TSRs)

Queensland Rail also reports on temporary speed restrictions. Figure 5 shows TSR for the West Moreton System from 1 January 2012 to 30 June 2018.

Figure 5: West Moreton Network Temporary Speed Restrictions, January 2012 to June 2018



3 Aurizon Network, Quarterly Maintenance Cost Report, January–March 2018 p 8

4 Aurizon Network, Quarterly Maintenance Cost Report, January–March 2018 p 8

5 Worley Parsons, QR Network Comments on Service Level Specification for Rail Infrastructure Maintenance Central Queensland Coal Region, p 3

Weather events, the deterioration in track quality prior to scheduled resurfacing and routine maintenance all influence temporary speed restrictions. The periods where TSR have exceeded the System TSR threshold have largely been driven by summer heat events.

4.3 2018–19 maintenance budget as base for DAU2

4.3.1 Implementation of Enterprise Asset Management System (EAMS)

In 2015–16, Queensland Rail implemented a new Enterprise Asset Management System (EAMS) for the planning and management of maintenance and capital expenditure. EAMS replaced the previous system of product reporting, which was used as the base for developing the AU1 maintenance cost allowances.

The implementation of EAMS has included the simplification of the number of maintenance categories for planning and reporting purposes. As Queensland Rail no longer budgets or reports using the previous product reporting, Queensland Rail has used the new EAMS system as the base for estimating DAU2 maintenance costs. Comparison of previous product codes to new EAMS system is provided in Attachment 1.

Queensland Rail notes that the overall maintenance cost forecasts are largely comparable between AU1 and DAU2 at the category level (eg. track, structures, facilities etc.), although a number of activities are no longer directly comparable eg. track repairs now include a range of previous products such as level crossing maintenance and turnout maintenance. Further the previous Asset Management function is no longer separately identified—and these costs are included as part of the build-up of the activity to which asset management relates eg. the allocated asset management costs will be included in rail renewal.

4.3.2 2018–19 West Moreton System maintenance budget (6.25 mtpa)

The 2018–19 West Moreton System maintenance budget has been selected as the representative 'base year' to estimate the efficient costs to support 6.25 mtpa of coal haulage, as well as the non-coal tonnage for grain and livestock, plus two return Westlander services per week.

The 2018-19 West Moreton maintenance budget has been reviewed to remove 'one-off' expenditure including steel bridge painting, plus any other activities not related to the provision of coal services including stations and depots not supporting West Moreton coal.

Table 5 shows a comparison for the 2018–19 West Moreton coal maintenance budget (developed consistent with EAMS) against the QCA AU1 allowances based on the previous product reporting approach, all escalated to $2020–21. The AU1 maintenance estimates excluding mechanised resleepering in 2015-16, and which have been proposed as capital expenditure for the DAU2 period.

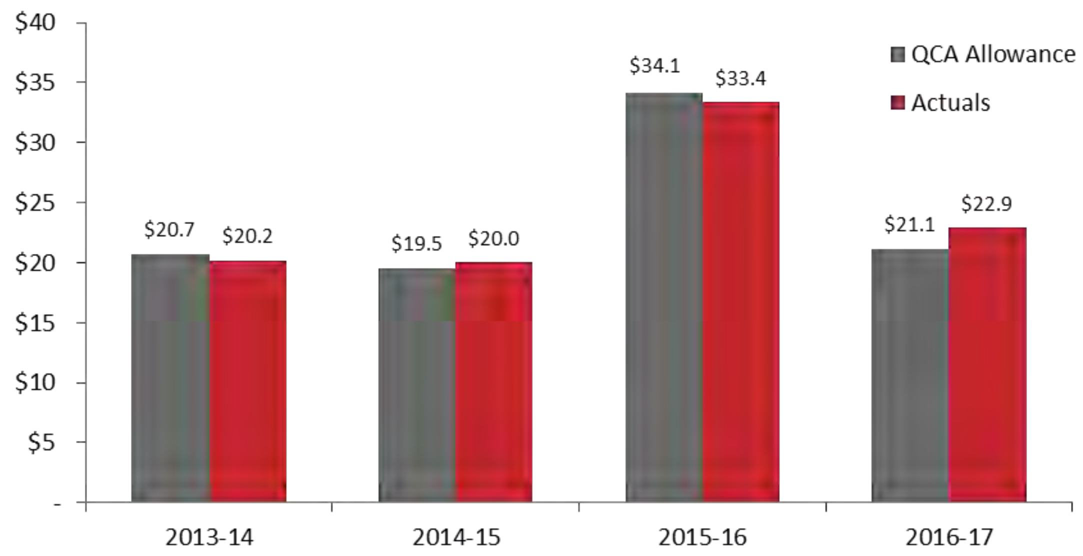
Table 5: AU1 West Moreton coal maintenance and 2018–19 budget for West Moreton coal (6.25 mtpa) ($2020-21 million)

	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Track (excluding track lowering)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Track lowering (ballast undercutting)						[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Structures	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Trackside systems	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Facilities/Other/Asset management	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$23.2**	**$23.3**	**$23.0**	**$22.8**	**$22.6**	**$25.3**	**$25.2**	**$25.0**	**$24.9**	**$24.7**

If the effect of re-including $1.5 million per annum ($2020–21) for track lowering (ballast undercutting) in the DAU2 maintenance allowance is excluded, maintenance costs are forecast to be an average 2.1 per cent per annum higher over the DAU2 period. Including track lowering as maintenance shows that in the 2018-19 constant tonnes scenario, the DAU2 maintenance costs are estimated to be, on average 8.7 per cent higher per annum in real terms than the compared to the AU1 maintenance allowance approved by the QCA.

Queensland Rail also notes that while 2018-19 has been used as the base year for estimation of DAU2 maintenance costs, it actual maintenance costs have been tracking close to the QCA's maintenance allowances for the period 2013-14 to 2016-17.

Figure 6: West Moreton QCA AU1 maintenance allowance and actual maintenance costs—2013–14 to 2016–17 ($million, nominal)



Queensland Rail note there is significant variation in maintenance costs at the activity level as evidenced between 2015-16 and 2016-17. This is not unusual given the relatively small size of the network and the large number of activities carried out, however it means that forming views about individual maintenance activities in the absence of considering the maintenance package as a whole is problematic.

While the overall expenditure across the West Moreton System (excluding track lowering) is forecast to increase by around 2 per cent in real terms, there is a marked difference in the allocation of maintenance costs by section.

For AU1, total maintenance costs for the West Moreton System were split by each corridor's forecast percentage of gtks operated on the system, while for DAU2, with the use of EAMS and the capacity to ascertain maintenance requirements in detail by corridor, the allocation of maintenance costs is proposed to be amended to reflect forecast costs by corridor.

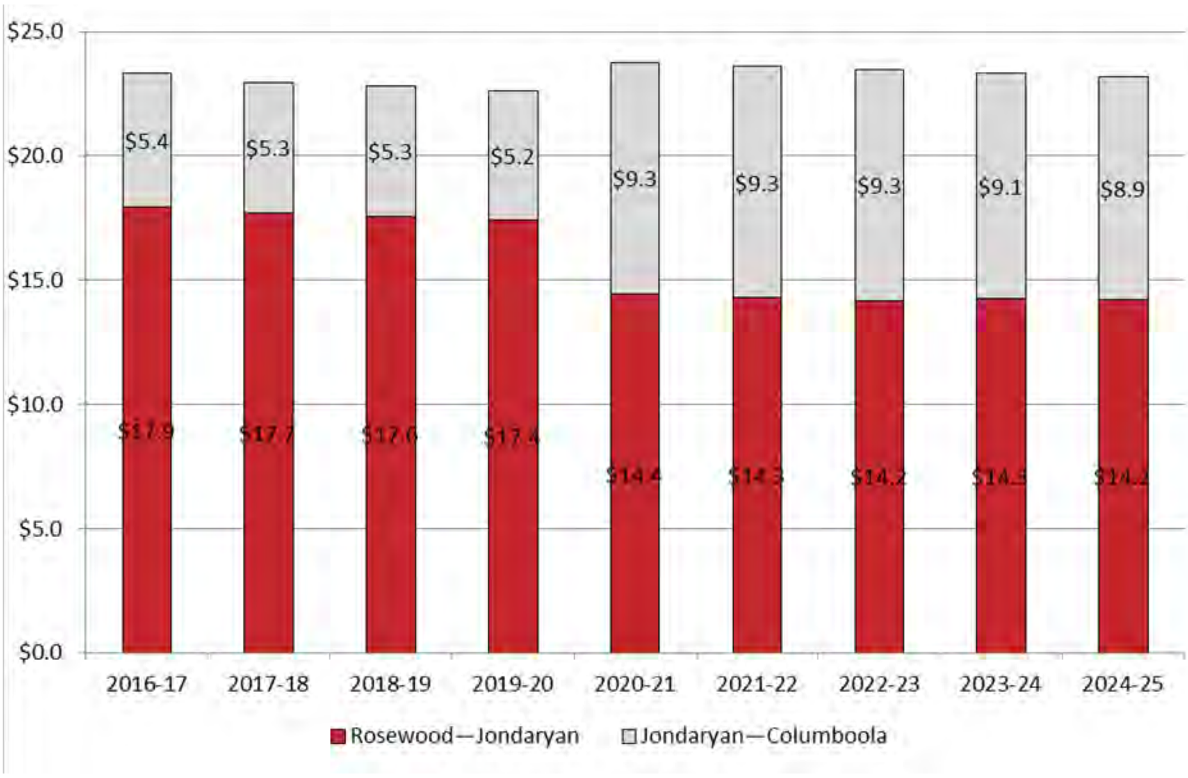
The percentage allocation of costs by corridor for AU1 and DAU2 is shown in **Table 6**, while **Figure 7** shows total maintenance costs split between the two corridors assuming a constant tonne scenario of 6.25 mtpa.

Table 6: AU1 West Moreton coal maintenance and 2018–19 budget for West Moreton coal (6.25 mtpa) ($2020-21 million)

Corridor	AU1—% of gtks	DAU2—Forecast corridor maintenance
Rosewood—Jondaryan	76—79%	61%
Jondaryan—Columboola	21—24%	39%

Note: The variable costs for AU1 maintenance costs are changed for Endorsed Variation Events and Review Events

Figure 7: West Moreton maintenance costs by corridor—AU1 maintenance allowances and proposed DAU2 maintenance allowance ($2020–21 million)



4.4 Tonnage forecast impacts

One of the key challenges for estimating maintenance costs for the DAU2 period is developing a methodology to estimate the impact of two different tonnage scenarios operating over the network (ie. 2.1 mtpa and 9.1 mtpa).

While Queensland Rail has had some history with the movement of between [redacted] in 2011–12 and 2012–13 (which is closer to the 9.1 mtpa scenario), there is no comparable history for a 2.1 mtpa scenario. However, extensive consideration was given to the fixed and variable proportion of maintenance costs on the West Moreton system for the AU1 process.

Queensland Rail engaged GHD to review the reasonableness of the QCA's fixed and variable splits for individual maintenance activities on the West Moreton System. GHD's 'bottom up' assessment of Queensland Rail's maintenance costs, by activity, generates a 62:38 fixed: variable split.

Queensland Rail also considered the QCA's estimates for fixed and variable costs, which for the tonnage dependent activities for DAU2 generate an estimated 54.4:46.6 fixed: variable split.

4.4.1 Application of QCA's variable cost estimates

In the interests of reaching agreement on the methodology for adjusting the 6.25 mtpa scenario to derive the 2.1 mtpa and 9.1 mtpa scenarios, Queensland Rail has adopted the QCA estimates for the tonnage dependent maintenance activities. Given the conclusions of the GHD report, Queensland Rail considers that using the QCA's approach is reasonable for the circumstances.

A summary of the QCA's estimate of the fixed and variable proportions of Queensland Rail's maintenance activities is set out in **Table 7**. Queensland Rail has also reviewed the extent to which each of its activities are tonnage or non-tonnage dependent. Table 5 also sets out where Queensland Rail has formed a different view than the QCA on tonnage dependence and the reason for doing so.

Table 7: Assessment of the application tonnage and non-tonnage activities, and QCA fixed cost assessment

Maintenance activity	Tonnage dependent	QCA AU1 Fixed Proportion (%)[6]	Comments
Structures and civil	Y	75%	
Ballast Undercutting	Y	10%	
Earthworks—non-formation (including drainage).	N	n.a.	For AU1, the QCA applied a 5% variable component to earthworks maintenance. Queensland Rail does not consider that this activity is affected by tonnes and is more likely to be related to weather and age. As well as non-formation and drainage work, this activity includes the maintenance of access roads, walkways, disposal of surplus material, the reshaping and cleaning of surface drains, reshaping cess drains, widening cuttings, building up embankments, widening cesses, and maintaining cuttings and embankments by the removal of rocks and loose materials. In recent years there have been significant experiences relating to land slips/slides, rock falls, embankment failures, and washouts. The majority of the challenges relating to non-formation earthworks are on the Toowoomba and Little Liverpool Ranges where there is need for a continual program of drainage and access road maintenance.
Minor yard maintenance	N	n.a.	For AU1, the QCA considered that 50% of this minor yard works were variable and related to tonnes. Queensland Rail does not consider that this activity is affected by tonnes. This activity covers all day to day maintenance works performed within rail yards that do not have their own corridor code or functional location. This includes any maintenance performed by local or mechanised work groups.
Rail joint management	Y	80%	
Rail renewal	Y	50%	
Turnout maintenance	Y	30%	

6 B&H Supplementary Report Master relating to submissions by stakeholders in response to the QCA's Draft Decision of Queensland Rail DAU 2015 (May 2016), p 12

Maintenance activity	Tonnage dependent	QCA AU1 Fixed Proportion (%)[6]	Comments
Signage	N	n.a.	For AU1, the QCA considered that 30% of signage/monument maintenance was variable and related to tonnes. The activity covers all activities associated with the survey and erection of track monuments, mast information plaques, creep markers and general signage such as speed boards. It does not include signage at level crossings. It is difficult to see how this activity would be affected by the number of tonnes running over the network.
Maintenance ballast	Y	20%	
Sleeper management	Y	40%	
Fire & vegetation management	N	n.a.	For AU1, the QCA considered that 15% of fire and vegetation costs were variable and related to tonnes. It is difficult to see how fire & vegetation management would be affected by the number of tonnes running over the network. Queensland Rail has not applied the QCA's estimate of variable costs for this activity.
Rail stress adjustment	N	n.a.	For AU1, the QCA considered that 30% of rail stress adjustment costs were variable and related to tonnes. This activity includes rail stress testing, creep marker monitoring, and the complete process of rail stress adjustment, for example additional rail and anchors. Due to the nature of the task, track closure is necessary to carry out the works. The costs included in this product include restressing of sections where track works and modifications have occurred. Queensland Rail has assessed this activity not to be tonnage dependent, with rail stress adjustment related to a range of other factors including track condition (with higher costs on the 41kg track), track length and weather. In areas where rail stress presents as an issue, the greatest variation in rail neutral temperature is caused by temperature related lateral shifts, that is, a curve pulling in due to the rails contracting in a cold winter, after which the track does not return to the original alignment, thus lowering the neutral temperature and leaving the track susceptible to buckling in the following summer.
Asset inspections	N/Y	80%	Queensland Rail undertakes both routine asset inspections, and inspections for non-compliance of assets. Queensland Rail has applied QCA's fixed cost estimate to non-compliance asset inspections, with only this activity tonnage dependent.
Rail lubrication	Y	50%	
Top & line resurfacing	Y	20%	
Rail repair	Y	50%	
Resurfacing	Y	20%	
Rail grinding	Y	5%	
Facilities	N	n.a.	
Tele-communications	N	n.a.	For AU1, the QCA considered that 10% were variable and related to tonnes. However, the QCA provided insufficient information about what aspects of telecommunications were affected by tonnes for Queensland Rail to make a considered assessment. Queensland Rail considers that maintenance of the telecommunications network will be related to the age of the asset—and is not tonnage dependent.

Maintenance activity	Tonnage dependent	QCA AU1 Fixed Proportion (%)[6]	Comments
Signalling	N	n.a.	For AU1, the QCA considered that 20% were variable and related to tonnes. However, the QCA provided insufficient information about what aspects of signalling were affected by tonnes for Queensland Rail to make a considered assessment. Similar to telecommunications, Queensland Rail considers that maintenance of signalling systems is related to the age of the asset—and is not tonnage dependent.

4.4.2 Estimated tonnage impact on maintenance costs for DAU2

To estimate total maintenance costs for DAU2 under the two scenarios, the QCA's fixed costs percentages were applied to the Rosewood—Jondaryan section, using the 6.25 mtpa scenario as the base. No change was made to the Jondaryan—Columboola section, which is assumed to carry 2.1 mtpa under both scenarios.

Applying the QCA's fixed cost estimates to the tonnage dependent Rosewood—Jondaryan activities provides a weighted average fixed to variable split of 54.4:45.6 fixed: variable for the DAU2 period The fixed proportion estimated for DAU2 is lower than the QCA's estimate for AU1, with the ratio of 57.3 per cent fixed, 42.7 per cent variable. The lower fixed proportion on the DAU2 tonnes is largely driven by the removal of mechanised re-sleepering from the maintenance costs.

Figure 8 shows the build-up of the total maintenance costs to a 9.1 mtpa scenario, with the incremental costs of increasing tonnes from 2.1 mtpa to 9.1 mtpa shown.

Figure 8: Assessment of the application tonnage and non-tonnage activities, and QCA fixed cost assessment

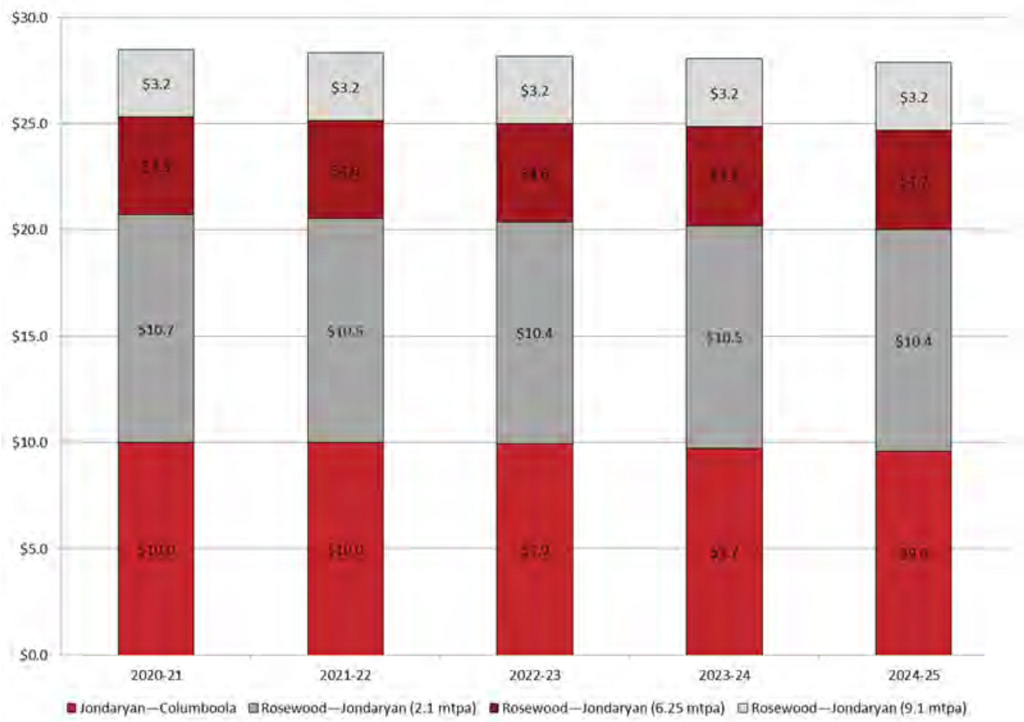
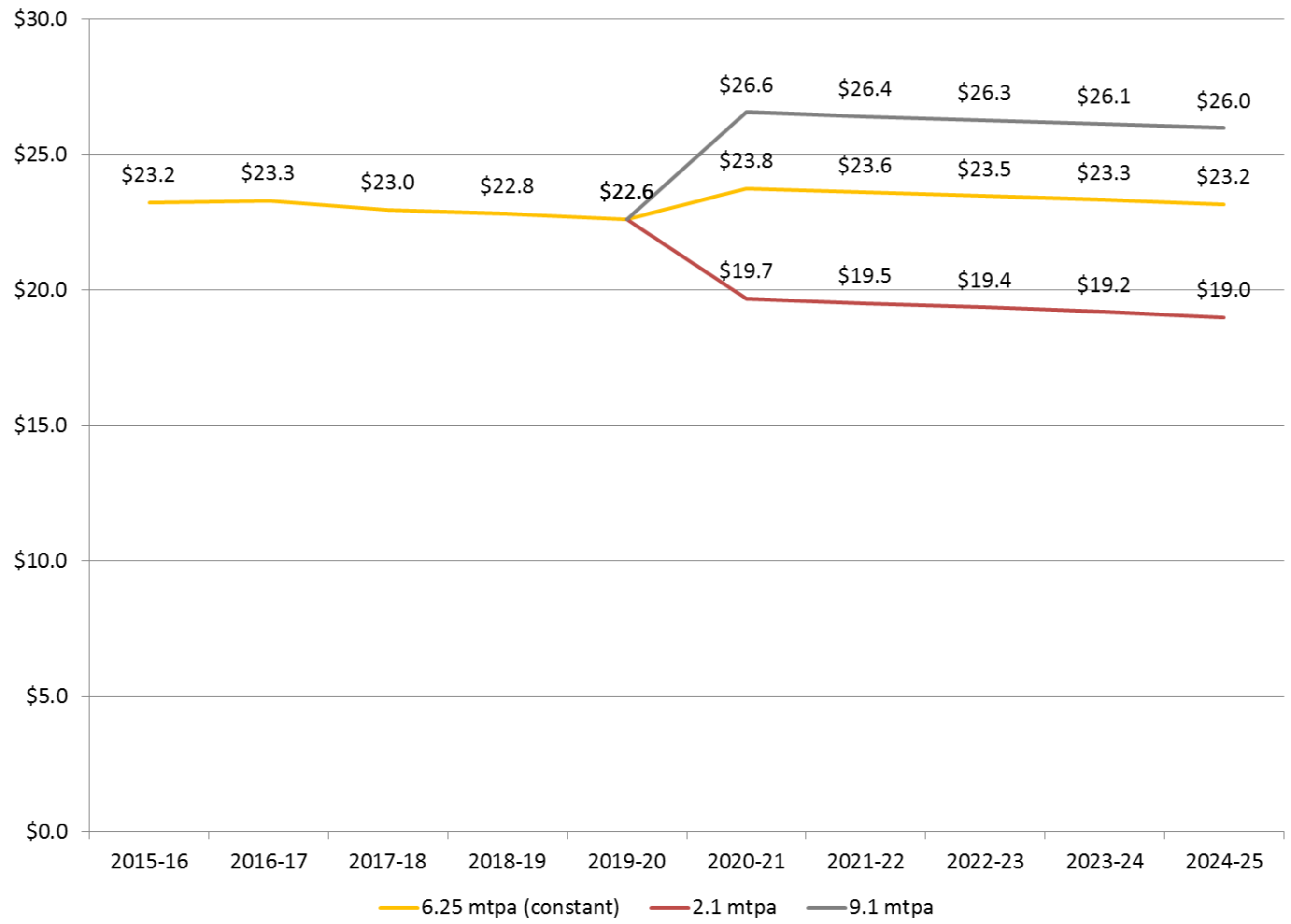


Figure 9 shows the effect of applying the QCA's fixed allocations to the 6.25 mtpa constant tonnes scenario, and makes a comparison to the AU1 QCA allowances. The forecast decline in real costs over the DAU2 period for all scenarios is driven by maintenance cost reductions for timber bridges as bridges are progressively replaced through the capital program.

The 2.1 mtpa scenario is 17 per cent lower over five years than the 6.25 mtpa constant tonnes scenario, while the 9.1 mtpa scenario shows a 12 per cent increase. To provide a 'like for like' comparison, to AU1, the effect of re-including track lowering (ballast undercutting) in the maintenance allowance has been excluded.

Figure 9: AU1 maintenance allowance and proposed DAU2 maintenance allowance (excl. ballast undercutting), by tonne scenario ($2020-21 million)



4.5 Inland Rail

Consideration has been given to the possible construction of the Inland Rail which would eventually strand Queensland Rail Network assets between Toowoomba and Rosewood. Queensland Rail has considered the maintenance required to ensure that investment in the network is targeted to ensure the reliable operation of the network while avoiding unnecessary expenditure.

4.6 Maintenance planning assumptions

The following assumptions have been made when determining the forecast asset maintenance programs:

- 5 x 4 day closures (planned possession); 2 x 3 day closures; 2 x 2 day closures; and 6 x 12 hour closures per year
- 15.75 tonne axle load
- speed of 60km/hr (loaded train) and speed of 80km/hr for empty trains
- a reference train comprised of 2 x 90 tonne locomotives plus 41 coal wagons.

4.7 Cost indexation

The $2018–19 cost estimates have been indexed to $2020–21 with an assumed rate of 2.5 per cent per annum. This is based on the inflation trend implied by the Statement on Monetary Policy issued by the Reserve Bank of Australia.

4.8 Independent peer review

The projects presented in this document have been subject to an internal peer review process and have been externally reviewed by GHD. The GHD report is provided separately for the QCA's consideration.

5. DAU2 maintenance costs

Chapter 5 sets out in detail Queensland Rail's proposed maintenance costs under two potential maintenance scenarios:

- 2.1 mtpa—assuming that only Yancoal's mine at Cameby Downs is hauling coal from Columboola to Rosewood (and then through the Metropolitan Network to Fisherman Islands)
- 9.1 mtpa—assuming the New Acland Stage 3 mine is developed and rails 7 mtpa of coal from Jondaryan, in addition to the 2.1 million tonnes from Cameby Downs. For simplicity, Queensland Rail has assumed that the commencement of coal haulage from the New Hope Coal's Stage 3 mine coincides with the QCA's approval of DAU2 on 1 July 2020.

The maintenance costs forecasts are for the movement of all coal and non-coal (including passenger) services on the network between Rosewood and Miles. The methodology for the allocation of costs between coal and non-coal services is dealt with separately in the DAU2 submission.

5.1 Total maintenance costs

5.1.1 Total maintenance costs—2.1 mtpa coal

Queensland Rail has proposed a maintenance cost estimate of $101.825 million ($2020–21) over the DAU2 period for the movement of 2.1 mtpa of coal, with [redacted] of maintenance costs on the Rosewood—Jondaryan section and [redacted] of costs from Jondaryan—Columboola.

Table 8: Proposed DAU2 West Moreton coal maintenance costs by function ($2020-21 million)—2.1 mtpa

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Track	$16.426	$16.461	$16.498	$16.536	$16.576	$82.497
Structures	$2.719	$2.517	$2.322	$2.112	$1.884	$11.553
Trackside systems	$1.467	$1.467	$1.467	$1.467	$1.467	$7.337
Facilities/Other	$0.088	$0.088	$0.088	$0.088	$0.088	$0.438
Total	**$20.700**	**$20.533**	**$20.374**	**$20.202**	**$20.015**	**$101.825**

Table 9: Proposed DAU2 West Moreton coal maintenance costs by corridor ($2020-21 million)—2.1 mtpa

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Rosewood—Jondaryan	$10.705	$10.538	$10.431	$10.470	$10.424	$52.568
Jondaryan—Columboola	$9.995	$9.995	$9.943	$9.733	$9.591	$49.257
Total	**$20.700**	**$20.533**	**$20.374**	**$20.202**	**$20.015**	**$101.825**

5.1.2 Total maintenance costs—9.1 mtpa coal

For the 9.1 mtpa scenario, Queensland Rail has proposed a maintenance cost estimate of $140.921 million ($2020–21) over the DAU2 period, with [redacted] of maintenance costs on the Rosewood—Jondaryan section and [redacted] of costs from Jondaryan—Columboola.

Table 10: Proposed DAU2 West Moreton coal maintenance costs by function ($2020-21 million)—9.1 mtpa

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Track	$23.975	$24.049	$24.126	$24.207	$24.293	$120.649
Structures	$2.953	$2.717	$2.496	$2.286	$2.044	$12.497
Trackside systems	$1.467	$1.467	$1.467	$1.467	$1.467	$7.337
Facilities/Other	$0.088	$0.088	$0.088	$0.088	$0.088	$0.438
Total	**$28.483**	**$28.321**	**$28.177**	**$28.048**	**$27.891**	**$140.921**

Table 11: Proposed DAU2 West Moreton coal maintenance costs by corridor ($2020-21 million)—9.1 mtpa

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Rosewood—Jondaryan	$18.488	$18.326	$18.234	$18.316	$18.300	$91.664
Jondaryan—Columboola	$9.995	$9.995	$9.943	$9.733	$9.591	$49.257
Total	**$28.483**	**$28.321**	**$28.177**	**$28.048**	**$27.891**	**$140.921**

5.2 Track

5.2.1 Summary of track maintenance costs DAU2

Track maintenance for the West Moreton System includes rail, ballast, sleepers and formation. The main track-related activities performed are:

- Periodic inspections
- General repairs, including replacement of defective components
- Sleeper replacement
- Ballast maintenance
- Mechanised rail grinding
- Rail lubrication and joint management, including welding/destressing
- Track resurfacing and geometry recording
- Track lowering and re-profiling
- Fire and vegetation management and control.

Queensland Rail has proposed $82.497 million ($2020–21) for track maintenance for the 2.1 mtpa scenario, 81 per cent of the total maintenance costs proposed for the DAU2 period. For the 9.1 mtpa scenario, the track maintenance costs are estimated at $120.649 million ($2020–21), [redacted] of the total maintenance costs for the DAU2 period.

Track maintenance costs for the Jondaryan—Columboola corridor are the same in both scenarios—Table 11. Track maintenance costs for Rosewood—Jondaryan under the 2.1 mtpa scenario and 9.1 mtpa scenario are shown in Table 12 and Table 13 respectively.

Table 12: Forecast track maintenance costs, Jondaryan—Columboola, by activity ($2020-21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Asset inspections	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Planning & technical support	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rail grinding	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Resurfacing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Track lowering	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Other	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$7.799**	**$7.799**	**$7.809**	**$7.819**	**$7.829**	**$39.056**

Table 13: Forecast track maintenance costs, Rosewood—Jondaryan 2.1 mtpa, by activity ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Asset inspections	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Planning & technical support	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rail grinding	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Resurfacing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Track lowering	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Other	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$8.627**	**$8.662**	**$8.698**	**$8.737**	**$8.777**	**$43.500**

Table 14: Forecast track maintenance costs, Rosewood—Jondaryan 9.1 mtpa, by activity ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Asset inspections	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Planning & technical support	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rail grinding	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Resurfacing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Track lowering	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Other	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$16.175**	**$16.249**	**$16.327**	**$16.408**	**$16.493**	**$81.652**

5.2.2 Asset inspections

Regular inspections are undertaken to maintain both track and civil infrastructure. These inspections ensure that the infrastructure operates safely and effectively. These inspections are carried out in accordance with *Queensland Rail's Civil Engineering Track Standards Module CETS 1—Track Monitoring.*

Defects found during these inspections are entered into the EAMS for actioning and repairing. From EAMS, work programs are developed to remove/repair the defects within the timeframes that are specified. Queensland Rail targets zero overdue repairs in line with its business principles.

The following inspections are undertaken to maintain track and civil infrastructure:

- Scheduled hi-rail patrol inspection every 96 hours (twice a week)
- Front of train general inspection every four months
- Planner hi-rail patrols at six week intervals
- Track recording car inspections every four months
- Asset Manager hi-rail Inspection every six months
- Engineering hi-rail Inspection yearly
- Hot weather/flood hi-rail inspection when the ambient temperature exceeds 38 degrees celsius or when local flooding is evident
- Sleeper inspections, every timber sleeper is inspected every five years
- Periodic walking Inspection by the planner
- Points and Crossings Inspection by the planner
- Other inspections/events that generate defect identification (eg. driver reports, noise complaints, derailments)

The track asset inspection costs are forecast to remain unchanged from the AU1 period to the DAU2 period, in real terms with the 2018-19 budget year applied as the base year.

Queensland Rail has applied the QCA's estimate of 20 per cent variable cost to the non-compliance asset inspections to estimate the 2.1 mtpa and 9.1 mtpa scenarios for the Rosewood—Jondaryan corridor. No change in costs is proposed to routine inspections, which are not tonne dependent.

5.2.3 Rail grinding

Rail grinding is an essential maintenance function that Queensland Rail performs for the West Moreton System. Wear and surface defects are the dominant factors in determining the life of rails and wheels. Rail and wheel profiles are designed to maintain a controlled average 'contact band', with sufficient contact radii to cater for a range of wear conditions.

It is imperative that wheel/rail contact be accurately maintained and conditions not allowed to depart too far from the average. The objectives are to efficiently introduce, and thereafter maintain appropriate rail profiles, and to remove small surface fatigue cracks. Benefits include, extending rail life, reducing resurfacing cycles (predominately for turnouts), extending track component life, reducing wear rates on rolling stock wheels, and reducing wheel squeal and flange noise.

The different types of rail grinding work carried out are as follows:

- profile establishment (i.e. modification of rail head shape to establish a new shape)
- profile maintenance (i.e. grinding of rail to maintain rail profile shape)
- corrective profiling (i.e. rails with surface defects)
- profile modification (i.e. stress reduction to allow increased axle loads)
- removal of rail corrugations.

Mainline rail grinding

The maintenance grinding frequency is determined by the combined effects of gross tonnages, axle loads, train speeds, alignment curvature and traffic loads. These are the dominant factors in deciding return frequencies.

Rail grinding is currently outlined in the Civil Engineering Track Standards (CETS) as to be performed every:

- 10 million gross tonnes (MGT) on curves less than 1,000m radius
- 20 MGT on curves between 1,001m and 2,500m radius
- every 40 MGT on other track.

Through implementing a grinding regime, rail life is significantly increased. Without rail grinding the life of the rail is drastically reduced for curves less than 1000 m radius. From a risk perspective, once the 40 MGT threshold is reached without a grinding cycle, the risk of the rail breaking due to the propagation of a surface initiated cracking defects increases dramatically.

Current grinding plans are to grind all curves less than 1000m radius and selected straights where there are defects such as corrugations or where new rail has been installed. The grinding of new rail is done to ensure the wheel-rail interface is optimal and reduces rail and wheel wear.

The Civil Engineering Track Standards are based around grinding for 20TAL lines and hence consideration needs to be given to the grinding on the 15.75TAL West Moreton System. Grinding in the future financial years is to be refined 6-12 months prior to grinding occurring through inspections and rail wear measurements. These measurements are taken using specialised rail wear equipment and monitoring the change in rail profile.

All major rail grinding in the West Moreton System is currently done by contract with Aurizon, with the existing contract based on rail grinding to support the movement of coal based on the AU1 coal tonne forecasts.

Queensland Rail would need to negotiate new arrangements for a different tonnage profile. However, to estimate the rail grinding estimates for DAU2, Queensland Rail has applied the QCA's estimate of rail grinding being 95 per cent variable to the estimate rail grinding costs for 2018–19.

5.2.4 Earthworks—Non-formation

The railway is designed to manage surface and groundwater flows through the use of drains along the side of the railway (known as cess drains) and across ridges and spurs on slopes above the railway (known as diversion drains), and culverts diverting water flow below the railway.

This activity comprises of all non-formation related earthworks and drainage construction and maintenance. Other tasks include the maintenance of access roads, walkways, disposal of surplus material, the reshaping and cleaning of surface drains, reshaping cess drains, widening cuttings, building up embankments, widening cesses, and maintaining cuttings and embankments by the removal of rocks and loose materials. In recent years there have been significant experiences relating to land slips/slides, rock falls, embankment failures, and washouts.

The majority of the challenges relating to non-formation earthworks are on the Toowoomba and Little Liverpool Ranges where there is need for a continual program of drainage and access road maintenance.

The close proximity (typically 1.5-2 meters) between the railway and the cut slopes, and the tight radius curves required to manage the steep topography limits the opportunity to re-align the track further away from the toe of the cut slope to create a buffer to geotechnical hazards.

Vegetation and surface water drainage have a significant influence on contributing to small scale slope instability and rock fall. If not diverted into adjacent gullies, water run-off shedding down the spurs and ridges above the railway will wash over the cutting face and recharge these slopes, increasing the potential of circular-type slumping failure in weathered rock.

The West Moreton System requires regular re-establishment of the original diversion drains across the topography upslope of railway cuttings to effectively minimise the flow of surface water run-off away from the cuttings. This reduces the risks associated with elevated pore water pressures causing slumps, and scouring of surface water aggravating dislodgement of rocks. This work involves accessing the slopes to clear the diversion drains of re-growth vegetation, and re-establishing the flow of water along the drains by removing silt and rock build-up.

These actions assist in reducing water flow over the face of cuttings and significantly reduce the risk of rock fall or larger geotechnical slope failure. The cess drains along the edge of the railway on the ranges' areas' are generally adequate to manage normal rain fall events (e.g. rain fall <25 mm per day), but in many areas are filled with fine material washed from the slope, or rock fall debris. This reduces their ability to adequately manage water flow from high rain fall events resulting in potential track washout issues.

The cess drains require routine clearing of fine material and rock debris to promote water flow towards the established culverts. In many areas, the cess drain is very close to the railway, and will present access issues for earthmoving equipment.

Queensland Rail is proposing maintaining earthworks—non-formation costs constant in real terms from the 2018–19 maintenance budget. Queensland Rail does not consider this activity to be tonnage dependent.

5.2.5 Fire and vegetation management

Fire and vegetation management activities involve the control of vegetation by chemical and mechanical means; burn offs to eliminate vegetation interference with train running and track maintenance. This includes the following processes: vegetation control around bridges, slashing, brush cutting, hi rail and manual herbicide treatment, tree surgery, fire and vegetation management, fire breaks, burning off, tree planting, firefighting and pest management plans. This activity does not typically require track closures.

Queensland Rail has externally contracted some of this activity to an external party. The DAU2 estimates have been adjusted to reflect these costs. Despite the view formed by the QCA for AU1, Queensland Rail does not consider this activity to be tonnage dependent.

5.2.6 Ballast maintenance

This activity involves the purchase, freight and running out of ballast for restoration of ballast profile only. The majority of maintenance ballast costs are associated with the deploying of ballast trains.

Ballast maintenance is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the 6.25 mtpa cost estimates to reflect the 2.1 mtpa and 9.1 mtpa scenario, applying the QCA's estimate that these costs are 80 per cent variable. No other adjustments have been proposed for this activity.

5.2.7 Rail joint management

Rail joint management includes all activities associated with the maintenance of a rail joint. This encompasses welding of joints, bolt and fish plate maintenance, glue joint maintenance, joint lifting, top and lining joints.

This product takes into account the cost associated with the works currently being done and planned for welding of 220m lengths through the timber and steel sleepered sections.

Rail joint management is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the 6.25 mtpa cost estimates to reflect the 2.1 mtpa and 9.1 mtpa scenario, applying the QCA's estimate that these costs are 80 per cent variable. No other adjustments have been proposed for this activity.

5.2.8 Rail renewal

Controlling the rate of rail wear is a critical aspect of optimising rail life. Managing rail wear rates through rail husbandry and monitoring ensures safety and commercial objectives are met.

Rail wear occurs as table wear, side wear or as a combination of both. The manner in which rail wears will depend upon a number of factors including; wheel and rail profiles, rail size, rail metallurgy, track structure, track geometry, traffic type, traffic loading, and traffic mix.

Queensland Rail's civil maintenance staff examine the rail head profile for excessive wear on a regular basis. The side and table wear of the head of the rail is measured and the percentage head wear loss is determined. Queensland Rail programs replacement of rail so that the limits of wear specified in Civil Engineering Track Standard are not exceeded.

All curves are measured a minimum of once a year with tangent track measured when deemed necessary based on rail age, tonnage, ultrasonic testing results and walking inspections. Queensland Rail System has established a rail wear database to keep accurate records that enable rail life predications to be made and have systems in place to ensure that worn rail is replaced in a timely manner.

In general, all new rail installed on tight radius curves is now 50 kg/m head-hardened rail which will give an extended rail life and longer intervals between remedial grinding. Head hardened rail does not give the same benefits in tangent and larger radius curves as there have been examples where defects propagate quicker in these applications.

The scope of the Rail Renewal program in the Maintenance Plan is replacing life expired 50kg/m rail with new 50kg/m head-hardened rail, predominantly in curves with radius less than 300 metres between Rosewood and Jondaryan. There is 36.4km of these curves in this area, and the average life of the rail based on wear is 15–18 years. Approximately 2.8km of these curves requires rail renewal per year at the proposed tonnage. The wear rate is based on the high leg rail on the curves, which would certainly wear faster than the low leg, and the scope will concentrate on the high leg only, for this assessment period. The unit rate for renewal of single rail in a curve is approximately [redacted].

Queensland Rail's *Specification MD-12-376 Capitalisation of Expenditure* applies the following rules rail replacement:

- *•Where only the dual rail lines are replaced, the replacement costs, including demolition costs are to be capitalised where the track is at least 110 metres in length. Any replacement costs of track shorter than 110 metres must be expensed as incurred and the existing track is not disposed of.*

- *Where only a single rail line is replaced due to wear and tear, the entire costs of replacement are expensed as incurred.*

The rail renewal costs including the DAU2 maintenance budget are only for those rail renewal costs that do not meet the definition for capitalisation ie. where one rail only is renewed for any length, or both rails for a length less than 110 metres. Where both rails are renewed for a length greater than 110metres, these costs are capitalised.

Rail renewal is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the 6.25 mtpa cost estimates to reflect the 2.1 mtpa and 9.1 mtpa scenario, applying the QCA's estimate that these costs are 30 per cent variable. No other adjustments have been proposed for this activity.

5.2.9 Rail repair

Rail repair includes all activities associated with spot renewal or repair of rail due to identified defects. Failures or defects in rail such as wheel burns, defective welds, internal rail defects, defect glued joints, broken bolts and other associated activities such as distribution, unloading rail, and flagging are all concerned with this activity. This product also includes the repair of running rail by maintenance or arc welding.

Queensland Rail has also proposed a four per cent real increase in the annual cost of rail repair from the 2018–19 budget, to take account of the variability in rail repair work—with the budget for 2018–19 lower than actual costs in 2016-17.

Rail repair is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the 6.25 mtpa cost estimates to reflect the 2.1 mtpa and 9.1 mtpa scenario, applying the QCA's estimate that these costs are 40 per cent variable.

5.2.10 Rail stress adjustment

This activity includes tasks such as rail stress testing, creep marker monitoring, and the complete process of rail stress adjustment, for example additional rail and anchors. Due to the nature of the task, track closure is necessary to carry out the works. The costs included in this product include restressing of sections where track works and modifications have occurred.

Rail stress adjustment costs have been, on average, nine per cent higher for Jondaryan—Columboola section than on the Rosewood—Jondaryan section. The Jondaryan—Columboola section has also exhibited considerable year on year variability, while Rosewood—Jondaryan has been stable. The difference in costs is a related to the difference in track structure 50kg rail on concreate sleepers compared to the 41kg rail on timber/steel sleepers.

The 6.25 mtpa constant tonne scenario has been adjusted for the Rosewood—Jondaryan section to reflect the three year average expenditure from 2015-16 to 2017-18. Queensland Rail has increased the proposed cost estimate for the Jondaryan—Columboola section to take account of the significant variation evident in these costs over the last three years.

Queensland Rail does not consider that rail stress adjustment is tonnage dependent, with track quality, length and weather more likely to be a cost driver.

5.2.11 Repairs

Repair costs include turnout maintenance, level crossing maintenance and minor year maintenance, with turnout maintenance being the largest cost driver within this activity.

The turnout maintenance component of repairs is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the 6.25 mtpa cost estimates to reflect the 2.1 mtpa and 9.1 mtpa scenario, applying the QCA’s estimate that these costs are 30 per cent variable. No other adjustments have been proposed for this activity.

5.2.12 Sleeper management

In the interspersed timber and steel sections of track the sleeper management task encompasses activities such as spot insertion of sleepers, reboring, regauging, plating, respacing and fastener installation by local track teams. Typically the most significant task in sleeper cluster management. Due to the nature of the task, track closures are necessary to carry out the works.

In the concrete sleeper sections of track, particularly in tight radius curves, the sleeper management task includes replacing warn and crushed rail seat pads, gauge foot spacers and clip fastenings to maintain gauge and toe load. Heavy duty spacers have been developed to reduce crushing, and options have been developed to facilitate adjusting gauge in as rail wears in 3mm increments.

Sleeper management is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the 6.25 mtpa cost estimates to reflect the 2.1 mtpa and 9.1 mtpa scenario, applying the QCA’s estimate that these costs are 60 per cent variable. Sleeper management costs have also been escalated by 5 per cent per year to take account of the additional maintenance costs prior to the next periodic mechanised resleepering program. Escalation commences in 2021-22 for Rosewood-Jondaryan and 2022-23 for Jondaryan-Columboola.

5.2.13 Top and line resurfacing

Top and line spot resurfacing encompasses all activities associated with restoring top and line to track using manual or mechanically assisted processes. It involves restoring top and line on bridge ends, open track, using manual processes or small spot tampering machinery (e.g. modified bobcat, portable tamper, mini excavator etc.). Top and line resurfacing excludes activities undertaken by major production resurfacing machines.

Top and line resurfacing is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the 6.25 mtpa cost estimates to reflect the 2.1 mtpa and 9.1 mtpa scenario, applying the QCA's estimate that these costs are 80 per cent variable. No other cost adjustments have been proposed for this activity.

5.2.14 Mechanised resurfacing

Mechanised resurfacing is a standard railway maintenance function applied to keep track within design geometry parameters. It assures correct levelling and lining, which keeps vertical and lateral forces and accelerations within acceptable limits by shifting the track into the correct position.

Mechanised resurfacing is performed at intervals depending on numerous conditions, including speed, tonnage and deterioration rate of the track to name a few. The task is completed using self-propelled on-track machines that are able to lift and line the track to a pre-determined level, and compact the ballast under the rail seat to support the new track position.

Scope of the resurfacing products has been forecast based on the historical performance of the asset whilst taking into account new capital investments that will reduce the maintenance demand over the duration of the DAU2. The scope for mechanised resurfacing is generally driven by:

- gross tonnes across the track
- the standard of track construction (e.g. rail size, sleeper type, etc.)
- the current condition of the track and formation components
- the historical performance of the infrastructure in service
- weather events (i.e. high rain fall).

The planning of track maintenance works, particularly to maintain track geometry, requires considerable skill and experience to achieve cost-effective outcomes. Long term resurfacing programs have been developed based on fixed protocols to minimise changes. This plan has allocated "shifts" where resurfacing machines will be available to work within the West Moreton System. Work has been done working with the train operations planning team to plan for opportunities to maximise possession windows within each shift.

The mechanised resurfacing costs have been based on number of shifts required to maintain the West Moreton System at 6.25 million tonnes in the 2018-19 West Moreton maintenance budget and escalated to 9.1 mtpa for DAU2. No other amendments have been made to the forecast costs.

5.2.15 Rail lubrication

This product includes all activities associated with rail lubrication which involves the lubrication of track on curves, including maintenance and filling of the lubricators. The majority of lubricators in the district are a Portec mechanical type lubricator.

Rail lubrication is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the 6.25 mtpa cost estimates to reflect the 2.1 mtpa and 9.1 mtpa scenario, applying the QCA's estimate that these costs are 50 per cent variable. No other cost adjustments have been proposed for this activity.

5.2.16 Track lowering (ballast undercutting)

Queensland Rail is seeking for the QCA to reconsider its treatment of track lowering (recorded against the ballast undercutting—other cost code in EAMS, for lack of a specific cost code for this activity).

For AU1, the QCA decided that the ballast undercutting was actually *track reconditioning* involving lowering of the track by removing the track and grading the ballast and that these costs should be capitalised.[7]

Queensland Rail's track lowering maintenance activities are associated with managing excessive ballast depth, which affect track stability and poor vertical alignment. Track lowering is not a substitute for formation repairs. This activity predominantly reuses existing ballast and removes excessive ballast depth to regain stability of the track structure—it is not an extension of the ballast life, but simply a reduction in top and line and track stability issues. Track lowering includes all works involved in either:

- undercutting of track sections
- lowering of excessively ballasted sections of track.

Undercutting works are performed in the district by the use of an excavator mounted under cutter bar. Track lowering is generally carried out in large sections and is done by removing the track and grading ballast away and then replacing the track. Ballast during track lowering exercises is generally reused some new ballast is required for undercutting works.

Queensland Rail's proposed track lowering activities for the West Moreton System fail the first two criteria for asset definition set out in *Queensland Rail Specification - Capitalisation of Expenditure – MD12-376*:

- Will the expenditure generate future savings through increased revenue or decreased expenses?
- Does the expenditure relate to a) a new asset or b) the improvement of an existing asset?8

Track lowering is part of the routine maintenance costs required to provide safe and reliable services on the West Moreton System, with no future savings arising as part of the activity. Further, unlike track reconditioning, there is no new asset components involved, with ballast, sleepers and rail all placed back into position after the track has been lowered. Track lowering does no improve the service quality of the existing asset; with this maintenance undertaking to ensure the asset remains 'fit for purpose'.

Queensland Rail's Specification - Capitalisation of Expenditure – MD12-376 guidelines also show that for this activity, the length of track subject to track lowering is also not a consideration for whether the asset should be expensed of capitalised.

Table 15: Queensland Rail guidelines for capitalisation of track specific costs as operating expenditure[9]

Asset condition	Expenditure Type	Area	Rail	Ballast	Sleepers
Not expired / Expired / Damaged	Like replacement	Regional	< 2000 meters	< 2000 meters	< 1 in 4 (25%) or less than 500 meters
	Improvement	Regional	< 2000 meters	N/A	< 1 in 4 (25%) or less than 500 meters
	Single rail	Statewide	Any length	N/A	N/A
	Undercutting (track height adjustment only)	Statewide	N/A	Any length	N/A
	Resurfacing(top up)	Statewide	N/A	Any length	N/A

7 B&H Supplementary Report Master relating to submissions by stakeholders in response to the QCA's Draft Decision of Queensland Rail DAU 2015 (May 2016), p 14

8 Queensland Rail Specification—Capitalisation of Expenditure—MD12-376, p59

9 Queensland Rail Specification—Capitalisation of Expenditure—MD12-376, p 20

Track lowering is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the 6.25 mtpa cost estimates to reflect the 2.1 mtpa and 9.1 mtpa scenario, applying the QCA's estimate that these costs are 10 per cent variable (the estimated used by B&H in September 2015). No other cost adjustments have been proposed for this activity.

5.3 Structures

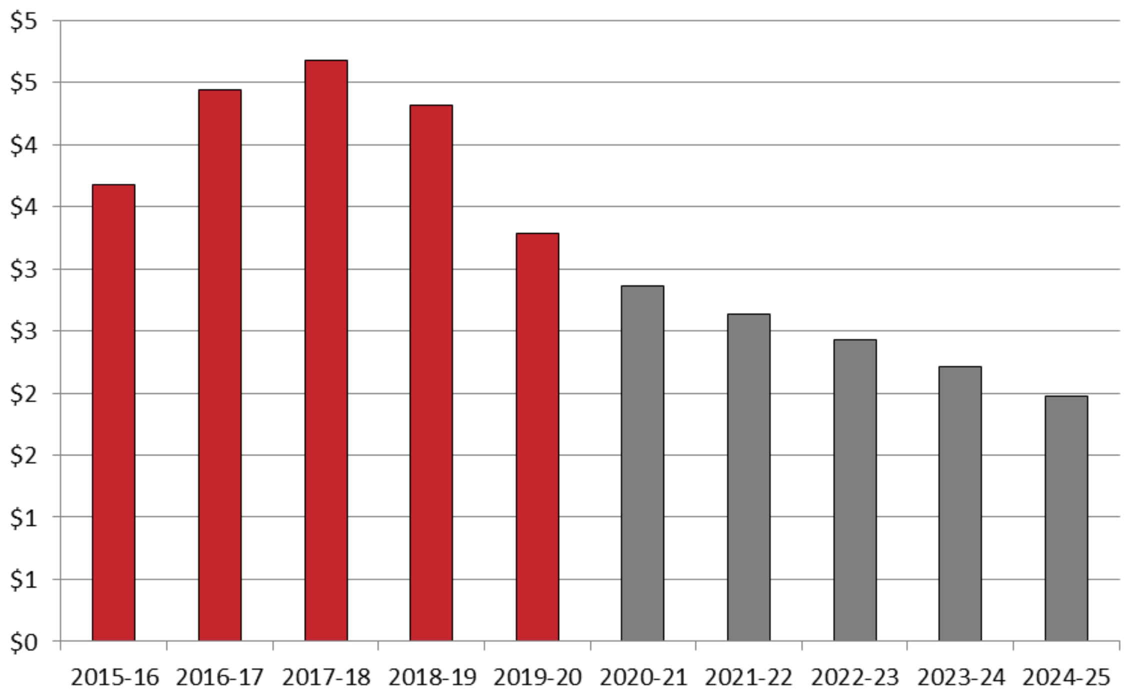
Activities included under structures maintenance are those that relate to maintenance that effect structures that support rail over road crossings, road over rail crossings and those structures that provide drainage under the track. The main structures-related activities are:

- Periodic asset inspections
- General repairs, including replacement of defective components
- Bridge bearing replacement
- Pier replacement.

Queensland Rail has been progressively replacing timber bridges on the West Moreton System, as part of the capital expenditure program under AU1, as well as undertaking periodic maintenance on steel bridges.

Noting the limitations on making exact comparison between the AU1 maintenance allowance and the proposed DAU2 maintenance allowance, Figure 10 shows the projected reduction in maintenance expenditure on structures, assuming the continuation of the 6.25mtpa scenario.

Figure 10: Comparison of forecast structure allowance AU1 to DAU2 constant tonnes 6.25 mtpa ($2020–21 million)



5.3.1 Summary of structures maintenance costs DAU2

Queensland Rail has proposed $11.553 million ($2020-21) for structures maintenance for the 2.1 mtpa scenario, 11 per cent of the total maintenance costs proposed for the DAU2 period. For the 9.1 mtpa scenario, the structures maintenance costs are estimated at $12.497 million ($2020-21), 9 per cent of the total maintenance costs for the DAU2 period.

Structures maintenance costs for the Jondaryan—Columboola corridor are the same in both scenarios—Table 16. Structures maintenance costs for Rosewood—Jondaryan under the 2.1 mtpa scenario and 9.1 mtpa scenario are shown in Table 17 and respectively.

Table 16: Forecast structures maintenance costs, Jondaryan—Columboola, by activity ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Asset inspections	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$1.714**	**$1.714**	**$1.662**	**$1.452**	**$1.311**	**$7.853**

Table 17: Structures track maintenance costs, Rosewood—Jondaryan 2.1 mtpa, by activity ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Asset inspections	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$1.004**	**$0.803**	**$0.660**	**$0.660**	**$0.574**	**$3.700**

Table 18: Forecast structure maintenance costs, Rosewood—Jondaryan 9.1 mtpa, by activity ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Asset inspections	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$1.239**	**$1.003**	**$0.834**	**$0.834**	**$0.733**	**$4.644**

5.3.2 Asset inspections

Inspections are undertaken to maintain the civil infrastructure. These inspections ensure that the infrastructure operates safely and effectively. These inspections are carried out in accordance with Queensland Rail's Civil Engineering Track Standards Module CETS 1—Track Monitoring.

Defects found during these inspections are entered into the EAMS for actioning and repairing. From EAMS, work programs are developed to remove/repair the defects within the timeframes that are specified. Queensland Rail target's zero overdue repairs in line with its business principles.

The following inspections are undertaken to maintain track and civil infrastructure:

- Patrol Inspection
- General inspection
- Detailed inspection—unscheduled

- Detailed inspection—scheduled
- Deck / ground level inspection
- Stage inspection
- Underground inspection
- Visual inspections under traffic
- Underwater inspection.

Structures inspection costs are forecast to decline over the DAU2 period as timber bridges are progressively replaced.

5.3.3 Repairs

Timber bridges

This activity includes all maintenance and repairs to timber bridges that involve the replacement/renewal of any components. This includes walkway/escape repairs, pier/abutment renewals, top and lining, tightening fastenings, component renewal/repairs (e.g. corbels, headstocks, girders, transoms, and piles).

The majority of existing bridges in the West Moreton System are rated to 15.75 TAL. These bridges were originally designed for 12 TAL (Imperial) and dynamic loads imparted by B16 steam locomotives. The bridges from Rosewood to Miles have been assessed with respect to their suitability to the axle configuration of existing traffic and loading of consists. The desktop assessment has shown that, under the existing loadings, these bridges are operating at the limit of their capability.

Due to the existing gross tonnages on the West Moreton System, timber bridges are incurring high maintenance costs, increased closure requirements and carry an elevated risk of derailment compared to concrete and steel alternatives.

Maintenance of timber bridges is necessary due to the biodegradation of timber, mechanical wear and damage, corrosion of fasteners, erosion of wood at joints and insect attack. All of these factors cause a timber bridge to deteriorate and become less serviceable until maintenance is undertaken.

Timber bridges require a substantial quantity of timber for their maintenance. With the supply of timber decreasing these trends indicate that wood production is unlikely to meet forecast demand in the near future increasing the price of raw materials.

While the rate of hardwood plantation establishment has increased in recent years this timber is not suitable for most timber bridge components until it is of the order of 40 to 50 years old. In addition, hardwood saw millers have started to rationalise and amalgamate their operations reducing the supply of such construction material.

Timber bridge general maintenance involves checking of alignment and tightening of bolts to the correct geometry. A typical six metre timber span has six piles, two headstocks, six corbels, three girders and 12 transoms which, as well as the need for general maintenance, requires care for, and replacement of components. Wood is a biological material, and is therefore subject to various types of degradation, fungal decay, wood destroying insects, weathering and fire, all of which can lead to hazardous situations, and to which concrete and steel are largely immune.

Concrete and steel bridges do not require regular component replacement. Concrete and steel structures general maintenance involves inspections and monitoring of cracks of all components and bearings. Steel structures require regular cyclic maintenance involving painting and transom replacement. Timber bridge maintenance is resource intensive compared to the maintenance regime required for concrete or steel structures.

It is becoming very difficult to recruit and retain skilled people in the regional areas of Queensland. Timber bridge carpentry is a specialised skill and one that very few other industries require. Maintenance of steel and concrete structures, as well as not being as labour intensive as that for timber structures, is adequately serviced by skills that are readily available in the labour market place.

Timber bridges on the low tonnage freight lines can sustain timber bridging for many more years. However, timber bridges on the West Moreton System are subject to large annual tonnages with most axles being loaded to the bridges' maximum capabilities making maintenance of these old structures a continuing task.

At the beginning of DAU2 there will be approximately 2,540 metres of timber bridges remaining in the West Moreton System. Queensland Rail is of the view that a strategy to continue the reduction in the amount of timber bridging is essential to manage the reduced supply of timber, accommodate skilled labour shortages, and provide structures that meet contemporary performance standards. Achieving this goal will take decades and therefore the continued maintenance of these assets is necessary.

Timber bridge repair costs are forecast to decline over the DAU2 period as timber bridges are progressively replaced.

Timber bridge repairs are tonnage dependent with costs for Rosewood—Jondaryan adjusted from the 6.25 mtpa cost estimates to reflect the 2.1 mtpa and 9.1 mtpa scenario, applying the QCA's estimate that these costs are 75 per cent variable. No other adjustments have been proposed for this activity.

5.3.4 Other (including steel bridges/drainage and pest control)

The activities include:

- all repairs to steel and steel and concrete composite bridges that involve the replacement/renewal of any components. This includes walkway repairs, pier/abutment renewals, top and lining, transoms renewal, girder repairs and tightening fastenings;
- the general maintenance activities in maintaining drainage structures. The Toowoomba Range is a critical link that relies on the adequate operation of drainage structures
- pest control on all structures and termite control and other pest management activities.

These activities are not tonnage dependent with the 2018-19 budget applied as the base for the DAU2 forecast, noting that the one-off costs of steel bridge painting during the AU1 period have not been carried forward into DAU2.

5.4 Trackside systems

There are two main forms of maintenance within Trackside systems—preventative and corrective: maintenance. These are defined as:

- Preventative maintenance is undertaken on equipment at regular programmed intervals to maximise its availability and reliability. In the TSMS database assets are categorised into asset classes with each asset class including various types of equipment. For each piece of equipment up to five scheduled maintenance services may apply (known as A, B, C, D and E services). Each of these services has a check sheet that details the activities undertaken.

- Corrective maintenance involves actions performed as a result of a known defect to restore an item or asset to its predetermined condition (as far as possible). Corrective maintenance is also known as repair or unplanned maintenance. The factors that cause assets to develop defects are many. Corrective maintenance can be classified into two forms, immediate and deferred corrective maintenance.

5.4.1 Summary of trackside systems maintenance costs DAU2

Queensland Rail has proposed $7.337 million ($2020-21) for trackside system maintenance over the DAU2 period, five per cent of the total maintenance costs proposed. Trackside system maintenance is not considered to be tonnage dependent, so is the same for the 2.1 mtpa scenario and 9.1 mtpa scenarios.

Proposed DAU2 trackside system maintenance for the Jondaryan—Columboola and Rosewood—Jondaryan corridors are shown in Table 19 and Table 20 respectively.

Table 19: Forecast trackside system maintenance costs, Jondaryan—Columboola ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Signalling	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Telecommunications	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$0.451**	**$0.451**	**$0.451**	**$0.451**	**$0.451**	**$2.253**

Table 20: Forecast trackside system maintenance costs, Rosewood—Jondaryan ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Signalling	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Telecommunications	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$1.017**	**$1.017**	**$1.017**	**$1.017**	**$1.017**	**$5.083**

5.4.2 Signalling

Activities included under signalling maintenance are those that relate to the overall performance of the signalling infrastructure. These activities ensure that the signalling system is maintained to a safe and appropriate operating level.

Signalling activities include:

- preventative maintenance of field equipment associated with signalling control including cabling. This activity takes up approximately 30 per cent of the time of the trackside system teams and primarily involves maintenance of signalling systems assets
- corrective maintenance of field equipment associated with signalling control including cabling. A significant proportion of signalling equipment is maintained on a ‘fix on failure’ basis, as a result there is a requirement to have a 24/7 callout roster in place
- scheduled maintenance and repair of level crossing protection installations including pedestrian gates
- maintenance and repair of cableways, markers, troughing, cable pits and cables with the exception of fibre testing and repairs
- investigations into performance issues in relation to the Automatic Train Protection (ATP), replacement of faulty transponders and adjustment of radio levels
- maintenance and repair of trackside monitoring and measuring equipment such as Dragging Equipment Detectors (DEDs), Hot Bearing Detectors (HBDs), Wheel Impact Load Detectors (WILDs), weather monitors, out-of-gauge detectors and level crossing monitors.

Queensland Rail is proposing maintaining signalling costs constant in real terms from the 2018–19 maintenance budget for the DAU2 maintenance allowance. Queensland Rail does not consider this activity to be tonnage dependent.

5.4.3 Telecommunications

Telecommunication maintenance are those maintenance activities that relate to the overall performance of the telecommunications infrastructure. Telecommunications activities include:

- preventative maintenance of the major bearer systems and infrastructure providing bandwidth for voice and data services as well as the base network for train control and maintenance radio systems
- corrective maintenance of the major bearer systems and infrastructure providing bandwidth for voice and data services as well as the base network for train control and maintenance radio system
- installation, moves or changes to phone and fax services including horizontal cabling installation, moves or changes to tail modem links, horizontal cabling and dumb terminal equipment for mainframe and Local Area Network (LAN) services.

Queensland Rail is proposing maintaining telecommunications costs constant in real terms from the 2018–19 maintenance budget for the DAU2 maintenance allowance. Queensland Rail does not consider this activity to be tonnage dependent.

Attachment 1: Comparison of product codes to EAMS

Old Code & Description	Old Definition	New Code	New Description
A01 Derailment & Collision Repairs	All activities associated with derailment damaged infrastructure eg investigation costs, inspections, restoration, clean up, future monitoring, hire of equipment	N14	Derailments, Collisions& Dewire
A02 Flood & Natural Disaster Repairs	All activities associated with flood/ natural disasters damaged infrastructure eg as above	N22	Flood & Natural Disaster Repair
A05 Plant Procurement/Disposal	Plant Procurement/Disposal	N10	Commissioning/Procurement
A06 Accident Investigation	Accident Investigation	N25	Investigation
A09 Consulting/Technical Advice	This relates to the provision of specialist advice, implementation of systems (eg. SAMS), coordinating warranty type work, design, providing technical advice or specific business improvement initiatives to satisfy customer requirements.	N12	Consulting/Technical Advice
A10 Above Rail Operator Support	Unplanned Above Rail Operator Support - unbudgeted and as requested	N46	Rolling stock Support
A13 External Work	All activities required to perform non-infrastructure related activities for external customers (ie external to QR). This includes providing TPOs to external customers.	N20	External Work
A16 3rd Party Damage Repairs	Any abnormal damage or repairs from 3rd Parties	N59	3rd Party Damage Repairs
A18 Project Management & Services	Any activities associated with the project management of capital programs	N38	Project Management & Services
A24 Line Pull up	All activities associated with a line pull up	N16	Disposal / Decommissioning
A25 Audits	All activities associated with audits -Track audits, Alliance Audits and Safety Audits	N05	Audits
A26 Unclaimable 3rd Party Damage Repairs	Any abnormal damage or repairs from 3rd Parties that is either unclaimable or no third party is able to be identified	N59	3rd Party Damage Repairs
B04 Repairs Concrete Bridges	All repairs to concrete bridges which results in the replacement/renewal of any components. Inc. kerb raising, walkway repairs, pier/abutment renewals, top & lining and ballast replacement.	N45	Repairs
B05 Repairs Steel Bridges	All repairs to steel and steel &concrete composite bridges which results in the replacement/renewal of any components. Including walkways/escape repairs, pier/abutment renewals, top & lining, transoms renewal, girder repairs, tightening fastenings	N45	Repairs
B06 Repairs Timber Bridges	All repairs to timber bridges which results in the replacement/renewal of any components. inc. walkways/escape repairs, pier/abutment renewals, top & lining, tightening fastenings, component renewal/repairs eg corbels, headstocks, girders, transoms, piles	N45	Repairs
B07 Tunnel Repairs	Repairs to tunnels which results in the replacement/renewal of any components. Escape repairs, fixed fastening maintenance, repairs to portals eg rail to concrete slab	N45	Repairs
B10 Steel Bridge Paint (Contract)	Painting of steel bridges and/or components using contract labour (contract painting), (excludes structural repairs)	N35	Painting
B12 Concrete Bridge Construction	Construction of prestressed concrete bridge. Including bridge elimination where replaced by a concrete bridge. Includes walkway construction	N11	Construction
B13 Steel & Concrete Bridge Construction	Construction of steel and concrete bridge. Including bridge elimination where replaced by steel & concrete bridge including walkway construction.	N11	Construction
B15 Steel Bridge Painting (Spot Paint)	Painting of steel bridge components using QR day labour. Includes spot painting, painting of bridge components (excludes structural repairs)	N35	Painting

Old Code & Description	Old Definition	New Code	New Description
B50 Structures Inspections	All inspections of structures. CESS inspections, pile exams, stage exams, underwater inspections, maintenance team inspections, termite inspections, structures master audits, construction audits	N04 / N03	Assets Compliance Inspection / Asset Inspections Non Compliance
B51 Structures Pest Control	Pest control on all structures. eg termite control and other pest management activities (excludes C44 Vegetation Control)	N36	Pest Control
B52 Drainage construction	Construction of drainage by use of concrete and/or steel components eg culverts, helicor pipes, includes bridge elimination where replaced by a drainage structure.	N11	Construction
B53 Drainage maintenance	Repairs to drainage including maintenance activities such as drain cleaning and grouting repairs	N45 / N09	Repairs / Cleaning/Clean up
B54 Retaining wall construction	Any work in relation to construction of retaining walls	N11	Construction
B55 Retaining wall maintenance	Any work in relation to repairs of retaining walls	N45	Repairs
B56 Ancillary structure const.	Construction of ancillary structures. eg buffer stops, foundations for gantry cranes, inspection pits, noise barriers, tank stands, light towers, electrification barriers, positions of safety	N11	Construction
B57 Ancillary structure maintenance.	Repairs to ancillary structures. eg buffer stops, foundations for gantry cranes, inspection pits, noise barriers, tank stands, light towers, electrification barriers, positions of safety	N45	Repairs
B58 Footbridge Construction	All activities associated with the construction of footbridges	N11	Construction
B59 Footbridge Maintenance	All activities associated with maintenance of footbridges at stations and within the corridors	N45	Repairs
B60 Walkways Construction	All activities associated with construction of walkways on Bridges	N11	Construction
B61 Walkways Maintenance	All activities associated with the maintenance of walkways on bridges	N45	Repairs
C02 Ballast Undercutting (Other)	Involves excavation of the fouled ballast, mud holes from beneath the sleepers by a ballast undercutter or other means, after which fresh ballast is added to the track and then tamped to restore the track to correct height and ballast depth.	N06	Ballast Undercutting
C03 Ballast Undercutting - Turnout	Involves excavation of the fouled ballast, mud holes from beneath turnouts/ diamonds by a ballast undercutter or other means, after which fresh ballast is added to the track and then tamped to restore the track to the correct height and ballast depth.	N06	Ballast Undercutting
C05 Formation Repairs	Includes all activities associated with formation repairs. Works may Include limeslurry injection, top 600 renewal, shear keys installation, cantrel drains and track reinstatement including ballast, welding, resurfacing and restressing of rail if required	N62	Formation repairs
C06 Earthworks - Non Formation	Includes all non-formation related earthworks and drainage construction and maintenance. Involves access roads, disposal of surplus materials, walkways, cleaning out, reshaping surface drains, reshaping cess drains, widening cuttings, building up embankment	N17	Earthworks - NonFormation
C07 Fencing	Any activity associated with the construction and maintenance of fencing. New fencing, complete replacement, repairs, gates, warning signs, removal of fencing, any earthworks, flagging associated with fencing. (excludes noise barriers refer B11)	N45	Repairs
C08 Rail Joint Management	All activities associated with the maintenance/ replacement of a rail joint. Includes flashbutt welding, thermite welding of joints, bolt and fish plate maintenance, glued joint maintenance/replacement, joint lifting, top lining joints and associated rest	N41	Rail Joint Management
C09 Rail Renewal	All activities associated with rail replacement in a section of track because of upgrading or fatigue reasons. Replacement of rail that has worn outside of CETS limits. Works include related rail restressing.	N63	Rail Renewal

Old Code & Description	Old Definition	New Code	New Description
C10 Turnout Maintenance	Any maintenance associated with turnout where activities include the repair or replacement of components such as switches, vees, guard rails, associated jewellery including bolts, chair lubrication, spot tie replacement (manual), maintenance welding, top	N45	Repairs
C11 Complete Turnout Replacement	Any replacement of a complete turnout including ties. Only to be used if the complete turnout is to be replaced including all components and ties	N44	Renewals
C12 Track Reconditioning & Removal	Extensive track maintenance attention given to a section of track, to restore it to an acceptable condition. Includes removal of redundant track infrastructure and extensive (over 50%) renewal of sleepers, rail, rail restressing and additional ballast use	N55	Track Reconditioning & Removal
C18 Mechanised Resleepering	Replacement of any sleepers including turnout ties in a pattern or at random by a specialised re-sleepering team that uses purpose designed machines to achieve high production rates. Includes resleepering components/ fastenings, sleepers.	N31	Mechanised Resleepering
C19 Mechanised Resurfacing	All maintenance resurfacing carried out on track excluding resurfacing associated with other products. Involves mechanical lifting, lining and tamping of the track with a Tamper Liner, followed by the profiling of the ballast by a Ballast Regulator.	N32	Mechanised Resurfacing
C23 Mechanised Resurfacing - Turnouts	All maintenance resurfacing carried out on turnouts excluding resurfacing associated with other products. Involves mechanical lifting, lining and tamping of the track with a Tamper Liner, followed by the profiling of the ballast by a Ballast Regulator.	N32	Mechanised Resurfacing
C24 New Track Laying	Complete construction of new track including all components such as ballast, sleepers, rail and associated jewellery. (excludes formation works, culverts and bridges)	N11	Construction
C25 Rail Grinding - Mainline	High production process of establishment and maintenance of rail head profile on mainline track. Conducted by mechanised rail grinders and any associated work (eg removal of lubricators). (excludes Rail Strategy Inspections see C50)	N40	Rail Grinding
C26 Rail Grinding - Turnouts	High production process of establishment and maintenance of rail head profile on turnouts. Conducted by mechanised rail grinders.	N40	Rail Grinding
C28 Minor Yard Maintenance	All day to day maintenance works performed within rail yards that do not have their own corridor code or functional location. This includes any maintenance performed by local or mechanised work groups regardless of the product being undertaken.	N45	Repairs
C29 Track Geometry Recording	Operation of specialist track vehicles and rolling stock used to measure and record the physical geometric characteristics of track. (Includes onboard vehicle ride accelerometers)	N54	Track Geometry Recording
C30 Ultrasonic Test Ontrack Machine	Comprises the ultrasonic testing of rail and associated components by on-track testing vehicles as well as rail testers using hand held non-destructive testing equipment to validate defects from the vehicle. (Includes any support activities such as rail t	N57	Ultrasonic Test Ontrack Machin
C34 Bridge Screen Installation	Bridge Screen Installation	N11	Construction
C36 Mast/Gantry Erection	Mast/Gantry Erection Overhead and Signalling Construction only	N11	Construction
C37 Monument /Signage Maintenance	All activities associated with the survey and erection of track monuments, mast information plaques, creep markers and general signage such as speed boards etc. (Specifically excludes Level Crossing Signage refer C04)	N45	Repairs
C39 Platform Construction	Platform Construction support works	N11	Construction
C42 Maintenance Ballast	Includes the purchase, freight and running out of ballast for restoration of ballast profile only. This specifically includes ballast used for C18 Mechanised Resleepering. (excludes all other ballast work)	N30	Maintenance Ballasting

Old Code & Description	Old Definition	New Code	New Description
C43 Sleeper Management	Spot insertion of sleepers, reboring and regauging by Local Track Teams. (i.e. excludes any activities NOT carried by the Major Resleepering Teams in C18). Includes local sleeper tests, resleepering components/fastenings, and sleepers. Also clipping up of con	N51	Sleeper Management
C44 Fire & Vegetation Management	Vegetation control by chemical, mechanical and burning off operations to eliminate interference with train running and track maintenance. This includes the following processes: vegetation control around bridges (previously B09), slashing, brush cutting	N21	Fire & Vegetation Management
C47 Rail Stress Adjustment	Any activities associated with the "standalone product" of rail stress testing and adjustment. Works include rail stress testing, creep marker monitoring, rails stress adjustment and documentation.	N42	Rail Stress Adjustment
C48 Ultra Sonic Testing (Manual)	Any activities associated with the manual ultrasonic testing of rail and other non-destructive testing methods. Works includes rail testers, ultrasonic testing of rail, turnout components and welds.	N56	Ultra Sonic Testing (Manual)
C50 Track Inspections	All inspections of track. CETS inspections such as engineering inspections, road patrols, engine inspections, turnout, walking, track stability, track clearance, level crossings, hot weather, yard inspections, trackmaster audits, construction audits, ZET	N04 / N03	Assets Compliance Inspection / Asset Inspections Non Compliance
C51 Track Clean-up	All activities associated with investigating and rectifying the spillage of coal and other materials on the rail network. Coal removal from turnouts, track and loadouts. Acid trains spillage, grain spillage, removal of animal remains from corridor.	N09	Cleaning/Clean up
C52 Rail Lubrication	All activities associated with rail lubrication. Involves the lubrication of track on straights and curves, maintenance & filling of any lubrication systems or devices.	N29	Lubrication
C53 Top & Line Spot Resurfacing	All activities associated with restoring top and line to track using manual or mechanically assisted processes. This does NOT include activities undertaken by major production resurfacing machines. Involves restoring top and line on bridge ends, open tra	N53	Top & Line Spot Resurfacing
C54 Rail Repair	All activities associated with "spot renewal or repairs to rail" due to identified defects. Failures or defects in rail such as wheel burns, defective welds, internal rail defects, other associated activities such as distribution, unloading rail, flagging	N64	Rail Repair
C55 Graffiti Management	Removal of all and any graffiti from QR property including signs, building, speed boards, machinery etc. (Replaces C27).	N23	Graffiti Management
C57 Level crossing maintenance	All activities associated with the construction, elimination and replacement of ALL level crossings. Involves the renewal of any track components such as rail, sleepers, plates, signage, ballast & the renewal/repair of the road surface.	N45	Repairs
C58 Level crossing construction/reconditioning.	All activities associated with the repair of ALL level crossings. Involves the renewal of any track components such as rail, sleepers, plates, signage, ballast & the renewal/repair of the road surface. Works include activities such as track resurfacing, t	N11	Construction
F01 Facilities/Building Construction	Capital funded construction for Facilities only	N11	Construction
F21 Plumbing	Plumbing maintenance	N37	Plumbing
F22 Carpentry	Carpentry maintenance	N08	Carpentry
F23 Electrical	Electrical Maintenance	N18	Electrical
F24 Painting	Painting Services	N35	Painting
F25 Locksmith	Locksmith services	N28	Locksmith
F26 Tiling	Tiling services	N52	Tiling
F27 Signage	Signage - managed and arranged by Facilities	N50	Signage Management

Old Code & Description	Old Definition	New Code	New Description
F28 Plumbing Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N04	Assets Compliance Inspection
F29 Electrical Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections, Electrical test and tag	N04	Assets Compliance Inspection
F30 Fire Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N04	Assets Compliance Inspection
F31 Asbestos Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N04	Assets Compliance Inspection
F32 Height Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N04	Assets Compliance Inspection
F33 Pole Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N04	Assets Compliance Inspection
F34 Confined Space Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N04	Assets Compliance Inspection
F35 Graffiti Management	Work associated with the removal of graffiti from QR's assets	N23	Graffiti Management
F36 Vandalism	Work associated with the repair of acts of vandalism to QR's assets. (does not include graffiti)	N58	Vandalism Management
F37 Litter Control	Corridor Enhancement litter control (Corridor litter control only - to NA customer)	N09	Cleaning/Clean up
F38 Grass Cutting	Corridor enhancement verge control (particularly SEQ - to NA only)	N21	Fire & Vegetation Management
F39 Tree Management	Corridor enhancement vege control (particularly SEQ - to NA only) - cutting of trees	N21	Fire & Vegetation Management
F40 Fencing Management	Construction and maintenance of fences	N45	Repairs
F41 Asphalt Management	Work associated with bitumen activities	N45	Repairs
F42 Air Conditioner Management	Maintenance of Air conditioners	N45	Repairs
F44 Property Management	Management of residential tenancies and the payment of rates and electricity on behalf of QR Business Groups	N39	Property Management &Utilities Search
F45 Car Park Management	Maintenance of Car Parks	N45	Repairs
F46 Precinct Management	all activities of beautifying a station - vege control, litter control, and misc activities undertaken while there at the station performing vege control & litter control	N45	Repairs
F47 Estimates / Quotes	Provide estimates or Quotes for major tasks	N19	Estimates / Quotes / Planning
F48 Lifts & Escalators Maintenance	Maintenance of Lifts and escalators	N45	Repairs
F49 Building Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N45	Repairs
F50 Pest Control	Pest Control Services	N36	Pest Control
F51 Industrial Waste Removal	Waste removal services	N24	Industrial Waste Removal
F52 Cleaning	Cleaning services	N09	Cleaning/Clean up
P00 SAM System Inspections	SAM System Inspections	N04 / N03	Assets Compliance Inspection / Asset Inspections Non Compliance

Old Code & Description	Old Definition	New Code	New Description
P02 Defect Repairs	Repairs that are undertaken following a planning process. These repairs can be deferred, as they do not significantly affect machine productivity or safety.	N45	Repairs
P04 Shutdown (planned)	The machine is shut down in the field for planned repairs ie. it is not part of the overhaul program for the machine. A period (usually 2-10 days) when the machine is withdrawn from service to allow trades staff un-hindered access to perform routine, strat	N45	Repairs
P06 Preventative / Scheduled Maintenance	Preventative / scheduled maintenance	N45	Repairs
P08 Overhauls	The machine is taken out of production as part of the overhaul program and is completely stripped down and overhauled. A period (usually 8-16 weeks) nominally every 6-10 years when a machine will be returned to a major workshop for a full strip to frame a	N43	Refurbishment / Overhaul
P09 Commissioning	Commissioning	N10	Commissioning/Procurement
P11 Training	Provide training to trade staff, this would include the co-ordination and delivery of training courses put on by the MPO and courses provided by external service providers.	N33	Training
P16 Condition Monitoring	Includes oil sampling, thermal imaging, noise measurement and vibration monitoring.	N04 / N03	Assets Compliance Inspection / Asset Inspections Non Compliance
P20 Component Refurbishment	Component refurbishment of plant. This will only affect inventory items.	N43	Refurbishment / Overhaul
P50 Fitter/Operator Maintenance	Fitter/Operator Maintenance	N45	Repairs
P51 Fleet Compliance	All activities associated with mechanised fleet inspections for Plant Engineering for special yearly inspections on all on track equipment.	N04 / N03	Assets Compliance Inspection / Asset Inspections Non Compliance
P52 Fleet Elect Compliance	Any activities associated with the Electrical Services Unit for Plant Engineering who completes inspections for all of the On Track equipment on a legal compliance basis.	N04 / N03	Assets Compliance Inspection / Asset Inspections Non Compliance
T04 Locomotive Support	Maintenance of fixed radios on locomotives used for accessing train control, yard shunting/loading/unloading systems and maintenance radio systems as well as locomotor control operation: and maintenance of hardware of on-board DTC and ATP equipment. All c	N46	Rolling stock Support
T05 Mobile Radios	Maintenance/moves/changes/installs of fixed radios on road based vehicles and non-locomotive on track machines used for accessing train control, yard shunting/loading/unloading systems and maintenance radio systems.	N45	Repairs
T06 Passenger Information Systems	Maintenance of station platform monitors and associated controlling equipment provided to display or control and communicate passenger related train information to the public address systems located in QR facilities	N45	Repairs
T08 Portable Radio & Yard Shunt Systems	Maintenance of portable radios used for accessing train control, yard shunting/loading/unloading systems and maintenance radio systems as well as the associated yard repeater/base equipment	N45	Repairs
T10 Prevent Tele Bkbone Network Maintenance	Preventative maintenance of the major bearer systems and infrastructure providing bandwidth for voice and data services as well as the base network for train control and maintenance radio systems. Also see MAT definition of preventative maintenance on Pag	N04 / N03 / N45	Assets Compliance Inspection / Asset Inspections Non Compliance / Repairs
T11 Correct Tele Bkbone Network Maintenance	Corrective maintenance of the major bearer systems and infrastructure providing bandwidth for voice and data services as well as the base network for train control and maintenance radio systems. Also see MAT definitions of repairs – on site and repairs –	N45	Repairs
T12 Telecoms Backbone Modification	Upgrades and improvements to the major bearer systems and infrastructure for voice and data services as well as the base network for train control and maintenance radio systems that are not covered by capital works funding	N34	Modifications

Old Code & Description	Old Definition	New Code	New Description
T13 Phone/Data Maintenance	Maintenance and repairs of phone and fax services including horizontal cabling. Maintenance of tail modem links, horizontal cabling and dumb terminal equipment for mainframe and LAN services.	N45	Repairs
T14 Phone/Data Move/Change/Install	Installation, moves or changes to phone and fax services including horizontal cabling. Installation, moves or changes to tail modem links, horizontal cabling and dumb terminal equipment for mainframe and LAN services.	N34	Modifications
T24 Preventative Overhead Maintenance	Preventative maintenance of the overhead network which includes isolations that are required for maintenance, repair of traction bonds, heights and staggers adjustment etc	N18	Electrical
T25 Corrective Overhead Maintenance	Corrective maintenance of the overhead network which includes isolations that are required for maintenance, repair of traction bonds, heights and staggers adjustment etc, patrols as a result of trips. Dewirements should be charged to product 365.	N45	Repairs
T26 Preventative FS & TSC Maintenance	Preventative maintenance of Feeder Stations, Track Section Cabins Motorised Isolators and Auto Transformers including RTU's and Fault locators.	N18	Electrical
T27 Corrective FS & TSC Maintenance	Corrective maintenance of Feeder Stations, Track Section Cabins Motorised Isolators and Auto Transformers including RTU's and Fault locators.	N45	Repairs
T28 Prevent Signalling Field Maintenance	Preventative maintenance of field equipment associated with signalling control including cabling	N18	Electrical
T29 Correct Signalling Field Maintenance	Corrective maintenance of field equipment associated with signalling control including cabling	N45	Repairs
T30 Traction Power Renewals	Long term or one-off maintenance programs/upgrades. Includes replacement of copper ply wire used in the Brisbane overhead system, replacement of Yugoslavia disc insulators, vapour phasing and re-winding of autotransformers for the Blackwater and Goonyella	N44	Renewals
T50 Signalling Renewals	Long term or one-off maintenance programs/upgrades. Includes refurbishment of level crossings, points machines, level frames, overhaul of diesel standby alternators etc. Upgrades include installation of lighting arrestors, replacement of interlocking.	N44	Renewals
T52 Weighbridge Maintenance	Maintenance and repair of in motion weighing equipment used for freight measurement and overload detection	N45	Repairs
T53 Signalling Level Xing Protect	Maintenance and repair of level crossing protection installations including pedestrian gates	N45	Repairs
T54 Signalling Control Systems	Maintenance of control centre based equipment relating to the signalling and power systems control of trains (including SCADA	N45	Repairs
T56 Tramway Crossing	Maintenance and repair of tramway crossings	N45	Repairs
T57 Scales	Maintenance and repair of static weighing equipment used for freight measurement	N45	Repairs
T58 Cable Route Maintenance	Maintenance and repair of cableways, markers, troughing and cables with the exception of fibre testing and repairs	N45	Repairs
T62 Signalling Train Protect System	Maintenance and repair of ATP, ATC and AWS equipment	N45	Repairs
T63 Wayside Monitoring System Maintenance	Maintenance and repair of trackside monitoring and measuring equipment such as DED's, HBD's, WILDs, Weather Monitors, Out-of-gauge detectors etc	N45	Repairs
T64 11KV Substation/Low Voltage Maintenance	Maintenance and repair of yard lighting and non-traction sub-stations	N45	Repairs
T65 Dewirement	Dewirement	N14	Derailments, Collisions& Dewirement
T67 CCTV Systems	Design, Maintenance and repair of closed circuit television equipment	N45 / N15	Repairs / Design
T68 Property Utilities Search	Property search to identify cables, power etc.	N39	Property Management &Utilities Search

Attachment 6: GHD Peer Review of West Moreton System DAU2 Maintenance Costs 2020-21 to 2024-25

GHD Advisory

Peer review of Queensland Rail's proposed maintenance expenditure for DAU2

Queensland Rail

27 July 2018

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Executive summary

Queensland Rail engaged GHD (us) to undertake a peer review of its proposed maintenance costs for the West Moreton network during the Draft Access Undertaking 2 (DAU2) period, covering 2020-21 (FY2021) to FY2025. The West Moreton network is divided into two segments, namely: Rosewood to Jondaryan; and Jondaryan to Columboola; the network is approximately 407 km long (321 km route) and is an aged narrow gauge network from the 1860s with steep gradients, tight curves and non-engineered formations on key parts of the network.

Queensland Rail is proposing two throughput scenarios as part of our commission, namely:

- a 2.1 million tonne per annum (MTPA) scenario, where only Yancoal's mine at Cameby Downs operates
- 9.1 MTPA scenario, where Yancoal's mine and New Hope Group's New Acland mine expansion comes to fruition.

Queensland Rail has asked us to undertake our peer review on the basis of whether the prudency and efficiency of Queensland Rail's existing practices indicate whether proposed costs for the DAU2 period reflect outcomes that are prudent (is the maintenance activity needed?) and efficient (is the maintenance activity being delivered in the most efficient way?). Against this requirement, our analysis has been geared at identifying whether Queensland Rail's maintenance activities, including its planning practices and use of machinery/labour, are likely to lead to the aforementioned prudent and efficient outcomes.

In agreement with Queensland Rail, we undertook a review of eight maintenance activities, namely: mechanised resurfacing; top and line spot resurfacing; ballast undercutting (track lowering); rail renewal; rail joint management; sleeper management; maintenance ballasting; and rail stress adjustment. Based on FY2018 costs for the network, these eight activities account for more than 40% of total costs, which we consider a reasonable sample size to achieve given the timeframes for, and nature of, our peer review for Queensland Rail.

As part of our engagement, we undertook a two-day site visit to the West Moreton system, with a view to observing parts of the network that Queensland Rail considered a well-maintained standard had been achieved and parts of the network that Queensland Rail had scheduled for maintenance in the near future. This provided context and valuable insights for our predominantly desktop-based assessment of whether Queensland Rail's existing practices for maintenance are consistent with generating prudent and efficient outcomes.

Our findings are that, overall, Queensland Rail's maintenance activities and practices reflect prudent and efficient outcomes. Key observations from our site visit are that parts of the network that Queensland Rail had earmarked for maintenance in the near future do indeed require the maintenance work that Queensland Rail plans to undertake for them, hence fulfilling the prudency requirement. Our assessment of, where the data were available, machinery performance, use of shifts and unit rates for raw materials support the position that Queensland Rail is achieving efficient maintenance outcomes for its West Moreton network. In conclusion, we find that Queensland Rail's existing practices for maintaining its railway reflect prudent and efficient outcomes, and that this translates to its cost proposals for the 2.1 Mtpa and 9.1 Mtpa scenarios over the DAU2 period reflecting prudent and efficient outcomes.

As a final part of our peer review, Queensland Rail asked us to offer a view on the fixed/variable nature of maintenance costs, in the context of the fixed/variable split of 57.3%/42.7% that the Queensland Competition Authority has proposed in AU1. We find that an appropriate fixed/variable maintenance-cost split is 62%/38%, noting that our line-by-line review of maintenance activities is based on MAT codes rather than the previous classifications that Queensland Rail had used as part of AU1.

This report has been prepared by GHD for Queensland Rail and may only be used and relied on by Queensland Rail for the purpose agreed between GHD and the Queensland Rail as set out in section 2 of this report.

GHD otherwise disclaims responsibility to any person other than Queensland Rail arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared. The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Queensland Rail and others who provided information to GHD (including Government authorities), information for which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

This report, which is a peer review of Queensland Rail's proposed costs for the DAU2 period, has been prepared in the context that Queensland Rail's submission is being provided as a response to an economic-regulation process.

1 Introduction

Queensland Rail has engaged GHD (us) to undertake a peer review of its proposed maintenance expenditure for the DAU2 period, covering FY2020-21 (FY2021) to FY2025. The peer review includes:

- Identifying efficient costs for the forecast maintenance tasks, noting the throughput scenarios to be considered are for 2.1 million tonnes per annum (Mtpa) and 9.1 Mtpa
- Undertaking a comparative analysis, where relevant, of the proposed cost forecast with a suitable rail system and/or corridor to demonstrate that costs are appropriate.

Our peer review acknowledges that Queensland Rail's proposed maintenance expenditure for the DAU2 period will be subject to review by the Queensland Competition Authority (QCA) and its consultants in the QCA's draft decision on the DAU2. Hence, our assessment has been undertaken in the context of an economic-regulation expenditure review.

1.1 Queensland Rail's proposal

A summary of Queensland Rail's proposed maintenance expenditure, for each throughput scenario, is presented in Table 1.

Table 1: Queensland Rail's proposed maintenance expenditure ($M, $FY2021) over DAU2

Scenarios	FY2021	FY2022	FY2023	FY2024	FY2025	Total
2.1 Mtpa	20.700	20.533	20.374	20.202	20.015	**101.825**
9.1 Mtpa	28.483	28.321	28.177	28.048	27.891	**140.921**

Under the 2.1 Mtpa scenario, total costs are $101.8 million ($FY2021). In comparison, costs are $140.9 million under the 9.1 Mtpa scenario. Table 2 sets out Queensland Rail's maintenance categories for the DAU2 period, including an assessment of whether Queensland Rail considers them to be tonnage-dependent.

Table 2: Queensland Rail's proposed maintenance categories for DAU2 period

Categories	Queensland Rail assessment of tonnage dependence
Structures and civil	Yes
Ballast Undercutting	Yes
Earthworks—non-formation (including drainage).	No
Minor yard maintenance	No
Rail joint management	Yes
Rail renewal	Yes
Turnout maintenance	Yes
Signage	No
Maintenance ballast	Yes

Categories	Queensland Rail assessment of tonnage dependence
Sleeper management	Yes
Fire & vegetation management	No
Rail stress adjustment	No
Asset inspections	Partial
Rail lubrication	Yes
Top & line resurfacing	Yes
Rail repair	Yes
Resurfacing	Yes
Rail grinding	Yes
Facilities	No
Telecommunications	No
Signalling	No

1.2 Structure of GHD's report

We have adopted a prudency-and-efficiency approach to identify if Queensland Rail's proposed maintenance expenditure for DAU2 is appropriate. Our report is structured as follows:

- Approach for assessing prudency and efficiency (including limitations of our review)
- Sampling approach
- Observations from our site visit of the West Moreton system
- Analysis for the sampled maintenance activities

  Fixed/variable split of below-rail maintenance costs on the West Moreton system.

2 Approach for assessing prudency and efficiency

2.1 Prudency

Prudency relates to whether a maintenance activity is *needed*. What needs to be established is whether a maintenance activity is required for Queensland Rail to deliver the below-rail declared service and what regulatory driver supports that expenditure is related to, for example:

- Replacement and refurbishment of assets to maintain foreseeably required capacity and conformance with performance standards in customers' access agreements
- Compliance with applicable legislation (e.g. for rail, Transport (Rail Safety) Act 2010 (Qld) (TRSA Act) and Transport (Rail Safety) Regulation 2010 (Qld) (TRSA Regulation), the Professional Engineers Act 2002 (Qld) and mandatory standards and operating licences)
- Maintenance of regulated assets to achieve planned service life (typically on a least life-cycle-cost basis hence allowing for capital expenditure and maintenance expenditure trade-offs).

Our assessment considers whether Queensland Rail's proposal provides a clear link between the maintenance activities and the provision of the below-rail service.

2.2 Efficiency

An efficient expenditure is one that is the most cost effective for delivering the required standard of service. This could relate to the maintenance activity selected to meet the service requirement, the unit costs being assumed, the amount of materials used and/or labour forecasts for the relevant period. To assess whether a cost estimate for the maintenance activity is efficient, we would seek to consider whether the costs are:

a. in keeping with the appropriate scope for the required task

b. the least costs (taking into account asset lifecycle cost)

c. in keeping with market rates

d. comparable with industry benchmarks (taking into account locational and operating factors that may impact on costs)

e. in keeping with those costs that an operator would have incurred, if it were subject to competitive pressures to retain market share. We note that this is a subjective assessment that requires engineering and commercial judgement.

Where possible, trade-offs with capital expenditure are also considered.

2.3 Limitations of the review

In some cases, we were unable to extract useful maintenance scopes (e.g. distance of top and line resurfacing works) from the cost data and defect notification data that Queensland Rail provided us for the DAU 2 period. As part of our peer review, we undertook scope analysis independently of Queensland Rail, and Queensland Rail may or may not have the same information for the scope of works previously conducted. Hence, we were not in a position to assess the efficiency of unit rates that we were not able to derive from the data or find an appropriate measurement for benchmarking (e.g. the many maintenance activities in rail joint management).

Given this, our assessment has focussed on: prudency; from the perspective of whether a project is needed, rather than the quantum of works to support that need; and efficiency, on an exceptions basis, in that only if we observed anomalies in the data or our site visit that indicated we should review the efficiency associated with the relevant maintenance activity, then we would do so.

3 Sampling approach

We have adopted a sampling approach to undertake a targeted and in-depth review of major maintenance categories. The premise of this approach is that it allows a wide-ranging review of the efficiency and prudency of major maintenance cost categories, which ultimately represent the overall efficiency and prudency of the maintenance works being performed in the West Moreton system.

3.1 Principles for selecting sample

The principles that we have adopted for selecting the sample are as follows:

- At least 40% of total maintenance-expenditure costs are covered
- A broad mixture of tonnage-driven and tonnage-independent sub-categories have been selected
- Some of the selected maintenance cost categories should have a relationship with Queensland Rail's proposed capital-expenditure plans (e.g. if a timber bridge upgrade program is completed during DAU2, then we would expect a reduction in maintenance costs of 'repair timber bridges'.

3.2 Sample selected

The sample of maintenance projects that we selected to review is presented in Table 3. A total of eight categories were selected.

Table 3: Maintenance activities assessed as part of our peer review

Maintenance activity	MAT Code
Mechanised Resurfacing	N32
Top & Line Spot resurfacing	N53
Ballast undercutting (track lowering)	N06
Rail renewal	N63
Rail joint management	N41
Sleeper management	N51
Maintenance ballasting	N30
Rail stress adjustment	N42

Each maintenance activity is assessed below in the context of our site visit of the West Moreton system.

4 Site visit

This section sets out the key observations we made from our site visit in the West Moreton network on 5-6 June 2018. We undertook the site visit to validate the context of Queensland Rail's position that the West Moreton network is an aged system that was built when limited track technology (e.g. un-engineered formation options only) was available. Hence, we kept in mind that the condition of the asset would reflect the age and topography of the network and the engineering-practice norms in the 1860s.

We visited locations between Rosewood to Toowoomba on 5 June and locations between Toowoomba to Miles (Columboola) on 6 June.

We visited eight locations during the site visit:

- Rosewood/Lanefield (-27.654763,152.559239)
- Laidley (-27.629573, 152.395023)
- Forest Hill (-27.589068,152.357624)
- Forest Hill (-27.585077,152.351730)
- Ringwood (-27.548893,152.243048)
- Lockyer (-27.520685,152.093959)
- Murphy's Creek (-27.450844,152.029583)
- Blue Mountain Heights/Ballard (-27.492947, 151.965048).

Figure 1 shows the locations that we inspected. Locations 1 to 7 were within Rosewood to Toowoomba, and location 8 was from Toowoomba to Miles.

Figure 1: Map of locations that we inspected in the West Moreton system during our site visit of 5-6 June 2018

Seven of the locations were within Rosewood to Toowoomba, with one of the locations just beyond the west of Toowoomba.

4.1 Resurfacing and top & line (spot) resurfacing

Resurfacing is required when the track is uneven, either longitudinally or laterally, resulting in poor line and level. The cause is often due to the ballast and/or subgrade formation being in poor condition e.g. worn or unstable ballast, mud holes etc.

Mechanical (or Top & Line Spot) Resurfacing is required to lift and compact the ballast while aligning the rail line to the required design level. The site team identified that the Jondaryan to Miles section of the track had several locations that require mechanised resurfacing.

4.2 Ballast undercutting (track lowering)

Track lowering works are required in the West Moreton System where repetitive passes of mechanised resurfacing (or Top & Line spot resurfacing) have raised the top of the ballast structure to the point where it exacerbates ballast deterioration and creates track instability. These numerous passes of mechanised resurfacing are required in certain parts of the West Moreton System where the sub-ballast has merged into the subgrade formation (non-engineered black soil), causing the loss of top and line in the track geometry.

Site 8 had issues with the above described formation as evidenced by the vegetation coming through the sleeper bays, as shown in Figure 3 and Figure 4 below. Figure 2 below shows an example of recent track lowering works performed near Laidley, with the difference in track height clearly noticeable (although this is not suggestion that the down-road track is excessively high, this is shown to demonstrate the actual work).

Figure 2: Recent track lowering works near Laidley on the up-road track

Figure 3: Poor formation conditions evidenced by the vegetation in the sleeper bays

Figure 4: Dense vegetation growth through the track bed in parts of the track between Toowoomba and Miles, a symptom of the non-engineered formation characteristic of the West Moreton System

Figure 5 below demonstrates an area in need formation repairs

The vegetation growth suggests that fine particles have been pumped from the formation subgrade and interspersed with the ballast. If left untreated this can cause waterlogging/mud holes and will impede the integrety of the track structure.

Figure 5: Poor formation issues and vegetation growing from track-bed

The formation between Jondaryan to Bowenville is generally in poor condition noting the historical nature of the tracks, with pumping issues in some locations. Formation upgrade maintenance was conducted on some portions of track between Jondaryan and Bowenville approximately four years ago, and these parts are in good condition. The formation in the Dalby to Miles section is also in poor condition, with changes in soil conditions causing formation problems including ballast depth issues.

These issues arise a consequence of the West Moreton Network's historical construction.

4.3 Rail renewal

The track is upgraded based on condition and priority, for example; the Down road (loaded traffic) has more tonnage and more associated deterioration and is therefore upgraded before the Up road which has predominantly unloaded traffic.

The Jondaryan to Bowenville track section had wearing issues and will need replacement. Likewise, Bowenville to Koomi had higher than average wear due to high tonnage rates and will subsequently need frequent re-railing as part of capital expenditure. Legacy issues exist between Jondaryan to Miles, where the original track was laid prior to the use of heavy machinery and mechanical compaction (this is what we refer to as the 'legacy issues'). In the Toowoomba range track section, significantly more wear was noticed on the outside rail head in the tight radius curves, caused by the large lateral forces exerted from passing rolling stock on the outside rail. These tight radius curves and their outside rails will subsequently require regular rail renewal (as opposed to re-railing).

4.4 Rail joint management

The longitudinal rail movement resulting from thermal initiated expansion and contraction, need to be allowed for at the time of track construction set up and monitored during maintenance works and subsequent inspections. Poor joint management can result in rail buckling, caused through compression and excessive gaps caused through contraction.

Figure 6 below shows a frozen joint, which does not allow for adequate expansion and contraction to accommodate thermal induced longitudinal movement, resulting in the ends of each rail being damaged (slightly battered).

Figure 6: Frozen joint

4.5 Sleeper management

In Site 1, concrete sleepers were used on the down track, while the up track used an even mix of timber and steel sleepers instead (Figure 7).

Figure 7: Use of a mix of steel and timber sleepers on parts of the West Moreton system

Site 2 demonstrated the need for regular and consistent sleeper management (Figure 8). Steel sleepers are lighter than concrete sleepers and are not as secure and more readily move when subject to above-rail movement. This sleeper movement is especially prevalent in the up track, due to the tight radius of the curves and additional associated stresses.

Figure 8: Mix of timber and steel sleepers

Figure 9: Skewed sleepers caused by excessive longitudinal forces

Figure 10: Missing dog spike

Figure 11: Missing sleeper clips and nylon

Site 8 was a similarly curved section, and experienced comparable sleeper damage and excessive lateral movement resulting in damage to the sleepers, fittings and associated alignment issues. Timber sleeper damage can be seen in Figure 12 below, which is likely a result of excessive radial loading compounded by constricted lateral movement.

Figure 12: Skewed timber sleeper splintering

The Jondaryan to Bowenville section has issues with sleepers under joints and sleeper spacing issues from 51 km to 55 km, due to rail creep. Rail creep is the longitudinal movement of rail that is mainly caused through train accelerating or decelerating, causing movement to the adjoining sleepers and resulting in sleeper spacing issues. Sleepers laid under rail joints can cause difficulties for Queensland Rail's rail-joint-management practices.

4.6 Maintenance ballast

The level crossing located at Site 3 shows the impact of poor track drainage (see Figure 13).

The transition between track stiffness at the level crossing and off the end of the level crossing has resulted in pumping and development of a mud hole. This ballast was last maintained over a decade ago; possibly due to the constraints which the tamper machines have in lifting the rail (the rail is firmly held by the surrounding asphalt).

These mudholes have been creeping into the asphalt, contaminating the pavement and resulting in structural failure of the subgrade below. This increases the likelihood of surface asphalt failure. Furthermore, these mudholes can cause waterlogging issues in the ballast, allow for vegetation to grow in and around the rail tracks.

Figure 13: Impact of poor drainage on the condition of ballast

4.7 Rail stress adjustment

A tight radius curve leads into Site 2, adjacent to the Laidley yard (see Figure 14 and Figure 15). The track is laid on a combination of steel and timber sleepers and traverses under a low bridge (an 'overbridge'). During warmer months, the track buckles from the heat, resulting in track stability problems. We understand that Queensland Rail often cools the track with water from a water-spraying track car, with the objective of minimising track buckling.

Since our site visit, Queensland Rail has reconditioned the track structure and replaced the interspersed steel and timber sleepers with concrete sleepers and 50 kg/m rail (as can be seen in the background of Figure 14), and used low profile concrete sleepers under the overbridge as part of its capital expenditure program.

Figure 14: Tight radius curves (1)

Figure 15: Tight radius curves (2)

A tight radius curve leads into Site 6. This area has been known to succumb to rail buckling due to the stress arising from temperature effects on the tight curves. These curves also pull the sleepers to one side (see Figure 12 again), creating voids in the ballast on the outer edge side of the track. Rail stress management is required to minimise the likelihood of buckling.

Several tight curves in the Toowoomba range lead into Site 7. Kings Bridge is also situated here and is scheduled to receive stress monitoring through on-site detectors. Further along this section of track, a tight radius curve occurs. This curve receives extra support from a check rail on the inner track. It was also noticed that the track section between Jondaryan to Bowenville had issues with rail creep. As noted above, rail creep is the longitudinal movement of rail that is mainly caused through train accelerating or decelerating, causing movement to the adjoining sleepers and resulting in sleeper spacing issues.

4.8 Summary

Whilst we observed several defects in the West Moreton System, particularly with respect to missing fastenings, frozen joints, fouled ballast and pumping, it is important to note that the purpose of the site visit was to identify the prudency of the maintenance activities, not to highlight track sections in good condition. As such the site report is not intended to provide commentary on the overall condition of the West Moreton System or Queensland Rail's overall maintenance strategy and we are cognisant that the ongoing maintenance requirements continue to be influenced by the rail network's history. We recognise where Queensland Rail has performed either capital or maintenance works, the quality of the product is to a high standard.

5 Mechanised Resurfacing

5.1 Background

The geometry of the rail line facilitates the interface between the track and the above-rail operators. It represents the final element of the track structure extending from the subgrade through to the rail. The integrity of the track geometry is a critical component for operational safety and efficiency. Poor geometry results in increased risk of derailment and the implementation of speed restrictions. As a result, geometry is susceptible to misalignment from two primary avenues: changes to each component in the track system that arise from deterioration and wear, and from general wear and tear due to standard operation of the line.

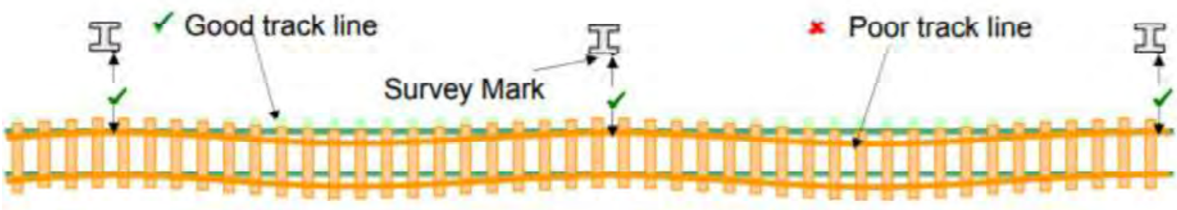

Figure 16: Rail line deviation superimposed on original track line design. Re-alignment is necessary to achieve the good track line from the deviated poor track line[1].

[1] Engineering Manual (Track): TMC 202 Track Fundamentals, Transport Rail Corp 2012.

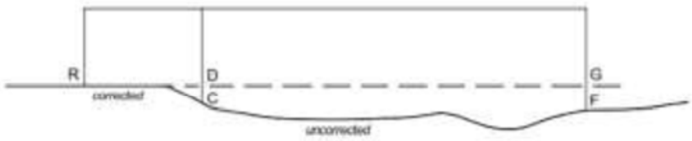

Figure 17: Resurfacing levelling (lifting) process. The uncorrected track is lifted to the pre-determined track line (line RG) and cross-fall[2].

As the track geometry deteriorates from the specifications set out in the maintenance standards, it is necessary to resurface the track. The purpose of the mechanised-resurfacing activity is to reinstate the designed track geometry top and line, as is diagrammatically explained in Figure 16 and Figure 17. To achieve this, the resurfacing activity aims to ensure integrity of the ballast component through tamping, and to adjust the geometry by aligning the track line to pre-determined coordinates and also the track top via track lifting.

Mechanised resurfacing is undertaken via on-track equipment such as tampers and regulators. The characteristics of this resurfacing activity surround production line work and are generally deployed for significant resurfacing distances.

5.2 Prudency

The need for resurfacing coincides with the need to maintain line safety and the desire for network capacity. Consequences of improper resurfacing maintenance involve speed restrictions and increased risk of derailments. The geometry changes arise through several factors such as network usage, formation condition, and weather events.

General track usage causes wear and tear on the geometry as a result of the forces exerted through the train wheel interface with the rail. This stress wears members of the track structure system such as the sleeper alignment (particularly around curves), ballast and formation.

Another contributing factor identified arises from the formation. As the Queensland Rail West Moreton network was developed in the nineteenth century, the formation has offered challenges of late due to factors such as:

- Cumulative tonnage
- Out-dated formation design
- General formation age and deterioration

The impact of these factors were evident in various sample sections of the line visited during the site visit (as is expected from an operational railway). Given normal wear and tear, and the formation condition, it is clear that for Queensland Rail to maintain the West Moreton System safety and network capacity from a geometry stand point that the resurfacing activity is a necessity.

5.3 Efficiency

Resurfacing may be conducted via several methods of varying efficiencies and costs. The major determinant in selecting the appropriate method relates to the distance of resurfacing required, occupation window and resource allocation requirements. Key factors are:

[2] Mechanised Track Surfacing, Track and Civil ARTC Page 11

- Manual/ Localised capacity: Excavator with tamper head and rail threader or manual methods.
- Production capacity: On-Track tamper machine

To conduct this resurfacing activity in a production capacity, On-Track machines are a necessity due to the time restriction of occupation windows, and higher efficiency of working on a face with a machine. These machines will have inherent performance characteristics relating to their size and capabilities.

The track occupation opportunities, particularly on a coal freight network, present challenges in windows of time to complete work. If the necessary work meets the length criteria of this resurfacing activity, the need for higher production resurfacing equipment commonly arises. This favours the higher production On-Track units. We recognise the following measures that Queensland Rail takes to increase the efficiency of its mechanised resurfacing activities:

- The West Moreton maintenance planning team works with the above-rail-operator team to adjust train paths to create larger possession windows, to maximise use of machinery and to increase plant operating time during possessions; and
- During planned track closure possessions, the mechanised resurfacing team will work night shifts from 6:30 pm to 4:00 am where needed to ensure completion of maintenance work following reinstated track, as opposed to completing work outside of track closure.

Furthermore, analysis of the 291 km of mechanised resurfacing[3] (71.4% of the total track distance in the West Moreton System) that occurred FY2017 showed that Queensland Rail exceeded its planned plant usage, with [redacted] plant utility for every [redacted] crew hour[4], as opposed to typical planned usage of [redacted] in a [redacted].

We also note that in our review for the same financial year, we found that Queensland Rail achieved an [redacted], which is lower than Aurizon Network's proposed UT5 unit rate of [redacted][5] for FY2018. Noting the modern condition of the Aurizon Network rail system, including its far superior mechanised resurfacing plant and its relative advantage with respect to economies of scale, the evidence is testament to the efficiency and organisation of Queensland Rail's mechanised resurfacing activities.

6 Top & line (spot) resurfacing

6.1 Background

As with mechanised resurfacing, Top and Line (spot) resurfacing is a maintenance activity conducted to prevent the rail top and line geometry from misaligning from the track standards, or to correct existing defective geometry. The Top and Line correction process is presented in Section 6.1 Figure 16 and Figure 17.The need for this process arises from the discussed factors such as wear and tear from use, impact from the formation condition and weather.

[3] Queensland Rail Access Undertaking 1 – 2016-2017 Annual Performance Report

[4] 6 Mechanised resurfacing team members between a regulator and a tamping machine.

[5] Aurizon Network's UT5 Maintenance Allowance Presentation

6.2 Prudency

As with Resurfacing, Top and Line (Spot) resurfacing is a necessary activity arising from the need to maintain the safety of the line by minimising the risk of derailment (from geometry contribution) in addition to maintaining the track speed rating for the line capacity. Top and Line (Spot) resurfacing specifically establishes its own need over the alternative mechanised resurfacing through several advantages offered in relation to compatibility for a given work scenario.

Top and Line (Spot) resurfacing offers several benefits over alternative resurfacing methods that establish a need for this particular activity, over the application of mechanised resurfacing. The reason for this, is that Mechanised units are (in relation to manual resources) less compatible for certain work scenarios if the correct operating environment is not presented. Examples of this include:

- The length and distribution of work. Mechanised units favour long production work on a face (Due to efficiency). In comparison, for low production and highly distributed work, manual work groups are at times more efficient due to accessibility (ie, level crossings, other On-Track machines or discontinuous track due to other work, potential for On-Track machine derailment).
- Availability of mechanised resources – mechanised resurfacing machines are not always to the West Moreton system
- Disturbance from other work groups (flexibility). As mechanised units are On-Track and present great risk to other work groups, this reduces their flexibility compatibility for certain work sites. In comparison, manual resources are more flexible to work around other work groups during maintenance activities.

The variety of advantages and disadvantages owing to each activity will drive a difference between the two resurfacing strategies employed. These differences establish a specific need for the Top and Line (Spot) resurfacing activity. When coupled with the principal drivers for maintaining track geometry from a safety and line capacity stand-point, it is evident that Top and Line (Spot) resurfacing is an essential, and necessary activity as a part of Queensland Rail’s maintenance program.

6.3 Efficiency

The employment of Top and Line resurfacing over mechanised resurfacing offers potential for efficiency improvements, due to the numerous differences observed and explained in Section 7.2. As a result, it is important for a dynamic blend of each activity to be implemented through the maintenance plan. As is evident in the data presented from Queensland Rail regarding the West Moreton network, these two activities have been applied in a joint effort to achieve greater efficiency and production. This is evident in the FY2016 to FY2018 work scopes.

Analysis of the resurfacing work scopes presents insight into the strategy driving the application of Top and Line Resurfacing. Over the past three years, Queensland Rail’s scope of Top and Line Resurfacing has presented significant variability. From the FY2016 scope of 983 km, peaking at 1,342 km in FY2017 and decreasing to 507 km in FY2018. A different trend was observed in mechanised resurfacing, where a steady decline in scope has been evident over FY2016 to FY2018 with a 47% decrease in production. Several observations can be made from this data:

1. A possible catch up of baseline resurfacing activity evident in the mechanised scope declination. A component of this result may arise from the reduced train paths observed from FY2014 to FY2016 of 14.6%.
2. Optimisation of resourcing for higher priority works, evident in the 62% drop-off of top and line scope in 2018. This may coincide with the completion of the major sleeper replacement project in 2016 which

included significant resurfacing requirements. This is in addition to 94% less ballast undercutting and (track lowering) scope from FY2016 to FY2018 and the increased focus on rail-renewal scope in FY2018.

We note that Queensland Rail has taken the approach to dynamically apply Top and Line Resurfacing, particularly surrounding works that present compatibility such as the sleeper renewal project, and receives the benefits from this activity over mechanised resurfacing. This strategy represents an efficient approach to application of this method. As such, we consider that Queensland Rail's current Top and Line Resurfacing practices and expenditure to be efficient.

7 Ballast undercutting (track lowering)

7.1 Background

Decay (and in some cases failure) of the formation subgrade is a common operational issue faced by rail networks, particularly when developed in certain geographical areas such as over black soil, like the West Moreton system. Over time, regular track use and other factors such as weather events, initial formation construction and freight material (coal dust contamination), naturally enhances the rate of decay of this formation.

Subgrade deflection and/or failure causes a systematic change in the formation extending up to the track line impacting geometry. Not addressing these issues increases the risk of rail derailments, which compromises the safety of above-rail operators on the track. There are two primary methods employed to rectify such track deficiencies:

- Resurfacing of top and line – the addition of ballast to allow a tamper to lift the track to re-instate the geometry. Eventually, this triggers the need for track lowering. Resurfacing of top and line and track lowering are considered to be maintenance activities.
- Formation repairs – the full excavation and re-laying of formation to ideal compactness and moisture content to reinstate the original capacity of the formation. Formation repairs are considered to be a capital activity.

As with the resurfacing option, track lowering is needed to trim the excess top ballast that grows due to lift during tamping and track alignment operations to prevent the ballast reaching the point of instability. Track lift (explained in Figure 17) is a component of the resurfacing activities and is required to achieve the desired top (level). Track lift is often desirable up to a limit of 50 mm[6]. The resurfacing and track lowering method, in comparison to formation repair, is a quick fix to the track geometry deterioration. Whereas the formation repair method can be described as a more invasive and lengthy process. As a part of maintaining the West Moreton system, Queensland Rail is required by the QCA to demonstrate the prudency and efficiency of each maintenance method employed.

7.2 Prudency

Track geometry requires monitoring and maintenance to prevent an increase to the risk of derailment due to deterioration of the top and line. The track geometry is monitored to identify deviance from geometry criteria to a maximum limit (up to 7mm tolerance in certain networks)[7]. The work necessary to maintain this

[6] Mechanised Track Surfacing, Track and Civil ARTC Page 11

[7] Mechanised Track Surfacing, Track and Civil ARTC Page 14

geometry is achieved through mechanised resurfacing, and depending on the state of the formation under the track, repair work through to the subgrade may be necessary as a comprehensive alternative to prevent ongoing elevated rates of deterioration. This comes as a direct result of the historical formation construction that the West Moreton line was built on since 1865, which in comparison to the present time is not structured nor filled with appropriate material.

The need for this maintenance work also comes about as a result of both the location and natural characteristics of the network, being laid on black soil, and other factors such as the: high tonnage rates (Class H loading in excess of 6 mtpa)[8,9], numerous curves and gradients observed throughout the line, particularly extending from the Toowoomba ranges; weather events; and the remaining ash deposits from steam trains[10]. Given the expected increase in tonnage over the next 3 – 5 years as outlined in the 17/18 AMP, it is likely that the network will see an associated rise in formation deterioration as this has been correlated to the tonnage rate, and will also be subsequently reflected in the top & line resurfacing, mechanised resurfacing and track lowering costs.

The track lowering work arises as a result of the decision to maintain the geometry through several rounds of resurfacing (over time) despite poor formation condition. For open haul track the level should not exceed +75 mm of approved grade level, provided minimum ballast level is achieved[11]. Alternatively, formation repair may be undertaken for significantly deteriorated locations, provided appropriate occupation windows are met. The benefit of this work being that the deterioration rate will significant slow as a result of renewed formation[12]. Numerous factors influence the decision as to what method should be employed; these are taken into consideration upon assessing the prudency of the proposed work.

As a rail line approaches the end of its useful life expectancy and operational capacity, then it is unlikely that it would be efficient to conduct full formation repair. The costs of this work will simply not be recovered before reaching the end of line usefulness. A preliminary analysis of the length of life extension and associated cost of each method are recommended (significantly depending on many factors).

Queensland Rail has identified factors that would dictate the asset management strategy surrounding the useful life of certain track sections in the West Moreton system. These factors are: competition from the Inland Rail, affecting Rosewood to Gowrie; and uncertainty in the future of freight market, affecting Gowrie to Miles. Queensland Rail's 2017-18 AMP[13] proposes that as it currently stands, there is no alteration to the existing strategy regarding these two key factors. Therefore, from Queensland Rail's current perspective, the formation repair strategy should maintain as is.

From our capex analysis and the data provided by Queensland Rail, we have identified a ratio of mechanised resurfacing/track lowering/ formation repairs of approximately 29/1/1 (ratio of km). When considering the cost of formation repair (approximately [redacted]), mechanised resurfacing (approximately [redacted]) and track lowering (approximately [redacted]) in addition to the required frequency of work, we consider that the ratio identified is prudent.

[8] Where < 2MGT is considered 'Low' by ARTC standards – Engineering (Track & Civil) Code of Practice 2012.

[9] Class H loading as described by AS 2758.7 - 2009

[10] Identified in the West Moreton Maintenance Submission 2020 – 2025, Queensland Rail 2018. & the Queensland Rail Asset Management Plan (AMP) 2017-2018.

[11] ARTC track and Civil: Track Geometry Standards for Construction, Upgrading and Maintenance Works, Page 10 ARTC, 2013.

[12] Design Life Prediction of a Heavy Haul Track Formation, Grabe & Shaw 2009.

[13] Page 126 of the Queensland Rail Asset Management Plan 2017/2018

7.3 Efficiency

The duration of track occupation is a determining factor that will influence the decision made to perform resurfacing, track lowering and formation repairs. The average length of works performed is approximately: 1.5-2 km per day for mechanised resurfacing; 0.5 km per day for track lowering; and 0.5 km per day for formation repairs. The labour cost of track possession should be taken into consideration (and so can the opportunity costs of longer track possessions, but this is not discussed here, as the focus is on direct, rather than indirect, costs).

Queensland Rail's line data for the West Moreton system indicates typical occupations of 11.5 hours for mechanised resurfacing. Due to the inability to create significant windows of track occupation, the formation repair efficiency would be significantly affected as it would require much more mobilisation to and from site and less production per day. However, on the odd occasion that there is a lengthy occupation (such as during the Commonwealth Games), it would be advantageous to undertake formation repairs.

Another significant factor influencing the maintenance method relates to the current available resources, the Enterprise Asset Management System (EAMS) defect notification priority system and Queensland Rail's overall maintenance strategy for the West Moreton System. If there is insufficient opportunity for Queensland Rail to undertake formation repair works, either due to a lack of available track possessions of suitable length or a lack of on-the-ground resources, then it is efficient for Queensland Rail to undertake the more expedient resurfacing option. This is required by Queensland Rail to maintain its strategic maintenance goal, which is to maintain the network to the standard required by users whilst balancing expenditure to achieve this objective. This outcome is likely more favourable than hiring external resources to address the track-geometry defects at a greater expense via conducting formation repairs.

Overall, the evidence provided by Queensland Rail on its maintenance-cost proposal for ballast undercutting (track lowering) to be consistent with achieving efficient outcomes.

7.4 Maintenance or capital in nature?

Queensland Rail sought our advice on the appropriateness of treating Ballast Undercutting (Track Lowering) as maintenance expenditure as opposed to capital expenditure. Track Lowering relates to a removal of ballast, followed by grading and the addition of minimal ballast to the track to maintain top and line; it does not involve any substantive replacement of ballast.

Queensland Rail's request for our advice was triggered by Queensland Rail's need to address the following position of B&H in its May 2016 *Supplementary Report Part 1 – Discussion Relating to Maintenance and Capital Estimates.* This is in relation to Submissions by Stakeholders in response to the *QCA's Draft Decision Of the Queensland Rail DAU 2015*. B&H's position (pp. 2 & 6) was as follows:

> *In Queensland Rail's December 2015 submission it is asserted that this activity is (only) track lowering to remove excessive ballast. It involves, according to Queensland Rail's 2015DAU "carried out in large section and is done by removing the track and grading ballast away…", a highly invasive activity involving the cutting of rail, removal of sleepers, grading the ballast and replacement of same. It appears to be a reconstruction of the track.*
>
> *This activity is not Ballast Undercutting as would normally be termed in the Australian rail industry: it is track reconstruction.*

Queensland Rail's December 2015 submission does not indicate whether any "district….excavator mounted" activity is involved in the program.

As Track Reconstruction the activity is definitely capital works and also for the large single portion of expenditure at an average of approximately $1.5m per year, this is not maintenance activity.

It is also astounding that so much "excessive ballast depth" has been created during maintenance (or Capex) activity and changes to maintenance methods are required. Therefore there is no change to our estimate.

The "Ballast Undercutting" described by Queensland Rail in its December 2015 submission is highly invasive and reconfigures the ballast layer. In addition it involves reconstruction of the track structure where the track is firstly totally demolished and then rebuilt with recycled ballast of lesser quantity and therefore involving premature life expiry of the surplus ballast.

We therefore remain satisfied that this is a capital expenditure. We also suggest a renaming of the activity because it is Track Reconstruction, not Undercutting. Undercutting is so called because it does not disturb the rail and sleepers. Undercutting is also subject to the classification of capital expenditure if it is highly invasive and effectively repairing the capping or the formation. Some undercutting is localised and minor in nature, but this is not shown here. Therefore there is no change to our estimates.

In short, B&H advised the QCA that, in its opinion, ballast undercutting was capital expenditure not operating expenditure. This section focuses on the cost treatment of the maintenance activity, and does not seek to comment on whether it is prudent or efficient for the maintenance activity to be performed *in-lieu* of capital expenditure to address the underlying root cause of the problem (formation failure). This aspect is covered in the maintenance cost review of the proposed Ballast Undercutting (Track Lowering) expenditure in Queensland Rail's draft DAU2 submission.

7.4.1 Capital expenditure

We consider that for an expense to be treated as capital expenditure with respect to Queensland Rail's West Moreton System, it is subject to Queensland Rail's *Capitalisation of expenditure* – *MD-12-376 and AASB 116,137,138*, and the following criteria must be fulfilled:

i. That the expense relates to new construction or replacement of an existing capital asset; or

ii. That the expense will extend an existing asset component's life beyond its remaining maximum useful life; or

iii. That the expense will increase the performance of an existing asset component above its original as-installed performance.

We consider these criteria appropriate because, in terms of maintenance cost treatment, they define whether an asset is being 'maintained', that is an expense which 'continues' the asset's useful purpose, as opposed to a direct replacement or renewal or refurbishment.

7.4.1.1 New construction or asset replacement

The Track Lowering activity does not relate to the construction or replacement of new track, subgrade formation or other assets. Hence, the activity does not fulfil the criterion of relating to 'new construction'.

7.4.1.2 Remaining maximum useful life

We consider that the remaining maximum useful life of an asset component is that of its constituents with the least remaining useful life providing an indication of overall useful life of the asset. We define an asset component as a unique medium or a set of related parts that form a functional asset component for the below-rail network (such as a sleeper cluster, dual rail lines, top ballast, etc.). For example, the rail asset component consisting of two parallel rails would not have its useful life extended if only one rail is replaced, as its overall useful life is limited to that of the rail that has not been replaced).This is in alignment with the first principles argument that the asset component would not be 'renewed' until the oldest constituent was replaced in its entirety.

Our proposed definition aligns with Queensland Rail's *Capitalisation of Expenditure* specification, for example under which rail line replacement is only capitalised if dual rail lines are replaced and at least for the length of a standard track piece (110 metres of Continuously Welded Rail) in the West Moreton System. This would extend the life of the asset to that of the useful life of the rail (50 years, the maximum useful life of any component as per Queensland Rail's *Specification MD-12-376 Capitalisation of Expenditure*), as both rails comprising the track would be renewed.

7.4.1.3 Original as-installed performance

Original as-installed performance refers to the performance of the asset component as when it was first installed/constructed or the point immediately after construction where peak performance is achieved through a short wear in phase (as would be the case in fresh ballast) or through tuning. For example, the track modulus and the granularity of ballast would deform and decline in performance over time from the point it was first 'installed' as part of the railway track asset, leading to rough track over time.

Resurfacing activities would restore the ballast's performance close to that of its original as-installed performance, to the extent that the ballast maintains its useful properties (e.g. angularity and size). This fits in concisely with Queensland Rail's position that resurfacing activities are clearly defined as maintenance activities as has been accepted by the Queensland Completion Authority in DAU1.

7.4.2 Appropriate cost treatment

Track Lowering is reflected in Queensland Rail's DAU2 submission as ballast undercutting in the absence of a specific MAT code (cost code) for this function (as occurred in DAU1). The activity relates to a removal of ballast, followed by grading and the addition of minimal ballast to the track to maintain top and line; it does not involve any substantive replacement of ballast. It is evident from B&H's comments "*We also suggest a renaming of the activity because it is Track Reconstruction, not Undercutting",* that the fact that the Ballast Undercutting MAT code was being used for the activity resulted in it not being appreciating that the activity was in fact 'Track Lowering'. This is albeit that the activity describes 'track lowering', in the product title and there is no mention of the defined activities which would constitute 'Track Reconstruction' in the description.

Track lowering is required in the West Moreton System due to the poor subgrade 'formation' inherent with a rail system over 150 years old that has been built on fertile black soil with no engineered formation. The presence of poor subgrade causes the sub-ballast to amalgamate unevenly with subgrade formation over time, causing the loss of top and line. This culminates in the 'pumping' of trains as they traverse the infrastructure. This is known as 'pumping failure'.

Due to the resurfacing activities required to maintain the track's top and line and to prevent failure, over time, these activities have raised the top of the trackbed to the point where it is now outside of maintenance tolerance and these symptoms occur more frequently. We reject the B&H's comment that *"it is also astounding that so much "excessive ballast depth" has been created during maintenance (or Capex) activity* *and changes to maintenance methods are required"*, as B&H fails to recognize the characteristics of the subgrade foundation. That is non-engineered porous black soil, characteristics that are not comparable to other regulated rail systems. B&H's position as set out in its comment is also inappropriate as B&H makes no acknowledgement to that fact that only 10 km of track lowering occurs for every 290 km of mechanized resurfacing, a corrective ratio of 1:29 for 'excessive ballast'. We do not consider this activity excessive for a 150 year old track foundation on black soil with no engineered formation.

In addressing B&H's comment that track lowering is "a highly invasive activity involving the cutting of rail, removal of sleepers, grading the ballast and replacement of same. It appears to be a reconstruction of the track", we observe that the individual removal of sleepers does not occur, and that this activity is done by lifting the track structure (in track panels) off the top ballast and placing it to the side (with rails still attached to sleepers, which is sometimes known as track 'slewing'). Inherently, the track structure (as opposed to track foundation), which consists of the rail, track fastenings and sleepers are not 'reconstructed', as no replacement or reconfiguration of parts has occurred in the track structure through this activity (with the exception of incidental damage repair associated with lifting and removing the track panels). Furthermore the removal of sleepers from the track foundation would not necessarily indicate track 'deconstruction'. As such B&H's assertion that this is a defining feature of track reconstruction is inaccurate.

During ballast undercutting (or track lowering) the replacement of the ballast that forms the trackbed does not occur, and new ballast is only added above this existing ballast to maintain top and line, an accepted maintenance cost activity as per the QCA's decision on Queensland Rail's DAU1 submission (Top and Line Sport Resurfacing). As such, Track Lowering cannot be considered capital expenditure under "relation to new construction", nor does the addition of fresh ballast change the asset components' remaining maximum useful life (as the asset component is limited by the life of the shortest remaining maximum useful life of any of its constituents, e.g. the existing ballast is not replaced).

The minimal ballast that is added during a maintenance activity to restore most of the original as-installed performance of the ballast component, would, by definition, not increase the performance of the existing asset component beyond its original as-installed performance. Indeed, if B&H considered that the addition of ballast to the track is capital in nature, than the maintenance activity of 'maintenance ballast' should also be deemed by B&H to be capital expenditure.

In summary, track lowering does not:

- involve new construction or replacement of either track structure or formation; or
- extend the life of the existing asset component (top ballast) beyond the overall asset's remaining maximum useful life; or
- increase the performance of the existing asset component (top ballast) above its original as-installed performance.

We therefore consider that Track Lowering should not be treated as capital expenditure, and consistent with Queensland Rail's *Capitalisation of expenditure* specification, should be treated as maintenance expenditure.

8 Rail renewal

8.1 Background

Rail renewal is the process of replacing rail, provided that less than 2,000 metres of rail (is being replaced or (we have inferred this) if only one side of the rail is being replaced.[14]

Rail renewal can be required for a number of reasons, including:

- Upgrading rail to a higher standard(41kg/m to 50kg/m)
- Damaged rail from wear, fatigue, derailment and wheel burns
- Rail failure due to fracture.

Rail wear, when properly, controlled maximises rail life. Rail wear predominantly occurs as table wear (top of rail), side wear, or a combination of both. Rail profile, wheel profile, rail size, rail manufacturing deformations, track structure and track geometry are some of the factors affect the rate and degree of rail wear. Queensland Rail renews rail when the limits of wear exceed the specifications listed in the Civil Engineering Track Standard. Re-railing, by comparison with rail renewal, is a capital activity that is undertaken when the rail standard is to be upgraded, due to rail failure or when the rail is past its design life.

8.2 Prudency

Given the observations from our site visit, we consider there is a need to undertake rail renewal on the West Moreton network. What might be useful in a future version of Queensland Rail's documentation is the inclusion of decision rules for preferring the use of rail renewals (maintenance) over re-railing (capex).

8.3 Efficiency

In our capex report, we observed that Queensland Rail's proposed re-railing rates for the DAU2 period were [redacted].[15] We consider this rate should extend to the rail renewal program, noting that rail renewal is for re-railing activities that are less than 2,000 metres or for one side of the rail. In the case of rail renewal for one side of the rail, it would be expected the rate should be less than [redacted]. Without knowing what the proposed scopes are for rail renewal during the DAU2 period, we cannot infer what unit rate for rail renewal has been applied. However, we did not observe anything during the site visit or sight any information during our peer review that would indicate that Queensland Rail is undertaking the rail renewal activity inefficiently.

9 Rail joint management

9.1 Background

Rail joint management encompasses several maintenance activities related to the maintenance of rail joints. This includes thermite welding of joints, bolt and fishplate maintenance (including fishplate greasing), glue joint maintenance, joint lifting, top & lining joints and arc welding chipped joints. This product also includes

[14] FY2019 *Capitalisation of expenditure* specification, pp. 36 and 58

[15] GHD peer review of Queensland Rail's proposed capital expenditure for DAU2, p. 20

the thermite welding of 110m continuously welded rail (CWR) lengths into 220-metre lengths through the timber and steel sleeper sections, as part of joint reduction works.

The management of rail joints is required to allow for effective thermal movement between jointed track sections and CWR to reduce rail buckling and rail breaks (particularly in temperature extremes). It is also required for the minimising of joint fatigue and reduction of metal wear on the fishing surfaces at the interface of the fishplate and rail.

Failure to adequately maintain joints results in greater vertical impact loads from wheel loadings at the interface of the fishplate and rail causing dipped joints, frozen joints (bolt holes in the rails out of alignment, preventing the joint opening and closing in response to thermal stress), battered joints and exacerbates deterioration of the immediate track structure and foundation.

9.2 Prudency

Regular 15.75 tonne axle loads and the inherent nature of the West Moreton track foundation will result in regular maintenance being required to address dipped joints and/or frozen joints. This work would be required in addition to spot joint top & lining and joint lifting to correct for localised pumping, which is caused by a combination of the greater impact loadings from increasing joint deflection and poor supporting formation. Noting our observations from the site visit (Figure 6 and Figure 18), including observing several dipped, battered and frozen joints, in addition to joint related pumping, the need for regular joint maintenance is evident.

Figure 18 Battered and frozen joint

9.3 Efficiency

From our analysis of Queensland Rail's settlement data (actual cost data) and defect notification data, we recognise that Queensland Rail has reduced its rail joint management scope and cost per activity hour over the last three financial years' data that we reviewed. The scope of works has reduced from approximately [redacted] activity hours in FY2016 to approximately [redacted] hours in FY2017, followed by a further reduction in FY2018 to approximately [redacted] activity hours. Assuming fixed scopes of work for rail joint management, there is clearly a year-on-year improvement in the efficiency of what is delivering during each activity hours. In addition, we note that the cost per activity hour has reduced from approximately [redacted] in FY2016 to [redacted] in FY2017, and then dipping slightly to [redacted] per activity hour in 2018[16]. Given these observations, we consider Queensland Rail's proposed scopes and costs for rail joint management to be efficient.

10 Sleeper management

10.1 Background

Sleeper management incorporates several maintenance activities, depending on the type of sleeper (interspersed timber and steel, timber only, steel only, concrete only) being used and the characteristic of the track section (gradient, radius and track foundation condition).

[16] These numbers are approximate based on the raw settlement data provided by Queensland Rail to GHD and GHD's interpretation of settlement data.

For the interspersed timber and steel sleeper sections of track predominantly present in straights and wide radius curves, the sleeper-management activities include spot replacement of defective sleepers, reboring, regauging, plating, respacing and defective or missing fastener replacement. Sleeper cluster management (alignment and spacing of sleepers) is the most significant task as part of sleeper management, and requires track closures in order to carry out the works.

In the concrete-only sections of track, particularly in the Toowoomba range section where tight radius curves and steep gradients exist, maintenance activities include replacing worn and rail seat pads, gauge foot spacers and clip fastenings (predominantly PANDROL e-clips) to maintain gauge and toe load. Due to high levels of lateral forces experienced on the outside rail in tight radius curves, rail pads are being replaced at relatively short intervals to maintain toe load and track gauge.

10.2 Prudency

Sleeper management is required to ensure that sleepers are effectively spreading axle loads over a large enough area of ballast to ensure that the sub-ballast and the subgrade are not overstressed. The sleepers need to hold the correct gauge and inclination within specified Civil Engineering Track Standard (CETS) limits, as they restrain the track laterally under either centrifugal or thermal forces, and do not move longitudinally (or skew) under traction or braking forces exerted by rolling stock. Hence, sleeper management is an important maintenance activity for operating the network safely.

As observed in the site visit, the need for sleeper management is clearly present, with several sleepers observed missing fastenings (in all sleeper types present) across the system, damaged pads and biscuits visible throughout the Toowoomba range section, and sleeper skewing in tight radius curves. Queensland Rail's current sleeper management strategy (covering approximately 635,000 sleepers) appears to be prudent, with effective use of its EAMS notification system to prioritise sleeper management maintenance activities, minimising track deterioration related to defective sleepers and reducing the risk of derailments due to wide gauge outside of CETS limits.

10.3 Efficiency

Our review found that expenditure on sleeper management amounts to approximately [redacted] to [redacted] of the minimum sleeper component asset value (the value of all 635,000 sleepers at minimum replacement cost, approximately [redacted] per replacement consisting of a timber sleeper, 4 screw spikes and 2 timber sleeper plates based on Queensland Rail's procurement prices).

Noting [redacted] to [redacted] is the conservative upper bound, and that exact like-for-like sleeper replacement cost would be significantly higher due to the presence of concrete and steel sleepers in the system, relative expenditure in reality would be approaching approximately [redacted] of the sleeper component asset value. Observing that the asset life of a concrete sleeper is 50 years for example, this would suggest that over the long term, the wearing of the asset is at equilibrium with the maintenance expenditure incurred to 'maintain' the asset. This suggests that Queensland Rail's sleeper management strategy is optimal, as an equivalent amount of maintenance is being spent relative to the depreciation of the sleeper component asset each year. Hence, we consider Queensland Rail's sleeper-management practices to be efficient.

11 Maintenance ballast

11.1 Background

Maintenance ballasting includes the purchase, freight and installation of ballast to re-establish the design properties of the track. Specialised machines, known as ballast trains, are used to freight and distribute the maintenance ballast over the track structure.

11.2 Prudency

Regular track use, poor ballast strength, loss of ballast angularity and loss of ballast voids result in loss of vertical geometry and poor ballast drainage. This negatively affects the geometry and stability of track, causing track foundation defects, increasing the risk of derailment and requiring track speed restrictions in order to maintain track safety. We observed some of these issues during our site visit.

Given the observations from our site visit, we consider there is clearly a need to undertake the process of applying maintenance ballast to the track. It is required where ballast is low (sleepers riding above the ballast, reducing longitudinal track stability), ballast shoulders are narrower then CETS limits and/or when or when sleeper ends are exposed through the ballast shoulders (sleepers not secured within the top ballast laterally, reducing the tracks lateral stability). Maintenance ballast is also required where resurfacing activities are planned, to ensure that there is enough ballast of sufficient quality to effectively lift and pack sleepers to bring track geometry back to top & line.

11.3 Efficiency

Queensland Rail uses a ballast train to lay the maintenance ballast on the track; according to Queensland Rail, the use of the ballast train is the largest cost for the maintenance-ballast activity. As noted in our capex report, Queensland Rail secures very competitive rates for the raw cost of ballast (i.e. [redacted] to [redacted], from the firms Boral, Mount Marrow and Quarry Products, compared with [redacted] that our in-house benchmarking process revealed); hence, we consider the cost of ballast to reflect highly efficient procurement outcomes.

As for the efficiency associated with the use of the ballast train, we understand that Queensland Rail achieves more than [redacted] of productive movement when deploying ballast trains to distribute maintenance ballast. We recognise that for mechanised plant in the West Moreton System, [redacted] is related to safety requirements involving PO activities securing the work site, and travel to and from site, with the remaining time spent on track. This high rate of productive movement suggests that it is highly likely that Queensland Rail's maintenance-ballasting costs reflect efficient outcomes.

12 Rail stress adjustment

12.1 Background

Rail stress adjustment relates to any maintenance activities associated with the "standalone product" of rail stress testing and adjustment. Works include rail stress testing, creep marker monitoring, rails stress

[17] [redacted]

adjustment including anchoring and rail length adjustment). Rail stress needs to also be managed at the interface between existing CWR track and jointed track sections.

We understand that, due to the nature of the task, track closure is necessary to carry out the works. The costs included in this product include restressing of sections where track works and modifications have occurred.

12.2 Prudency

Based on our observations from the site visit, we consider that rail stress adjustment work will indeed be required on the network during the DAU2 period. The temperature extremes experienced in the West Moreton System cause significant longitudinal expansion of the rail, causing creep and potential buckling from the compression forces between the ends of the rail (resulting in lateral movement). The main need for rail stress adjustment is driven by the tight curves along the network and the need to manage track-buckling risks and incidents during the summer months. These tight curves have been shown to skew sleepers towards the inside of the track, creating ballast voids on the outer track edge. Major rail stresses are conducive to buckling, and continuous and effective rail stress adjustment minimises this risk.

12.3 Efficiency

As no unit rates have been provided for rail stress adjustment, we cannot assess the efficiency associated with this maintenance activity, also noting that it occurs in response to maintenance activities and capital works. We did not make any observations or sight any information during our peer review that would suggest that Queensland Rail is undertaking the rail stress adjustment activity inefficiently.

13 Fixed/variable split of West Moreton network maintenance costs

Table 4 below sets out the findings of GHD's (our) assessment of the split of fixed and variable costs for Queensland Rail's maintenance MAT codes. The values we present in the assessment have been established with reference to the B&H Review of Queensland Rail's DAU 2015 (B&H,2015), which was undertaken on a maintenance-subcategory rather than MAT-code basis.

In addition, certain MAT codes have also been cross referenced with Wik-Consult's 2015 fixed-variable split assessment of the ARTC Hunter Valley Coal Network (HVCN), so we can provide comparisons with a high haulage line, where such comparisons make sense to draw out. Guidance has also been extracted from the 2000 *QCA Working Paper 2: Usage-related infrastructure maintenance costs in railways*.

13.1 GHD's analysis

Our assessment reveals that the fixed/variable split for maintenance costs is **62%/38%**, in comparison with Queensland Rail's proposed 54.4%/45.6% split. We seek Queensland Rail's feedback on the last two columns of Table 4.

Table 4: GHD's analysis of the fixed/variable split of West Moreton network maintenance costs

MAT code	Tonnage dependent	GHD's recommended fixed-proportion value	GHD's explanations and justifications
Structures and civil	Yes	75%	The driving force behind rail structures and civil maintenance, particularly on a low-tonnage line, is considered to relate to asset aging and exposure to the environment. Examples of this include timber bridges, which have to be repaired as time elapses regardless of throughput levels. Therefore, the fixed cost component can be expected to dominate. However, a small component will relate to network usage, which has the effect of stressing the structures. We agree with the fixed-proportion value of 75% presented by B&H and Queensland Rail, which we note aligns with the value presented by Wik-Consult for the HVCN.
Ballast Undercutting (Track Lowering only)	Yes	35%	This activity primarily relates to removing ballast due to re-surfacing lift. This need arises from deteriorated track geometry. The root cause of this is twofold: formation; and wear (usage-related). Considering that the West Moreton network is a light-tonnage line situated on poor formation, the fixed component of these works will be higher than a typical line with an engineered formation. This value should reflect the same value used by resurfacing (35%, see below), as that activity is the direct driver for this track lowering.
Earthworks—non-formation (including drainage)	No	100%	As the West Moreton network passes through the Toowoomba ranges, there are challenges faced with access, drainage and miscellaneous civil works. This is exacerbated by weather and local environment (e.g. gradient and tight curves). Therefore, the fixed component of these works will dominate this maintenance category completely and that is we consider all costs will be fixed.
Minor Yard Maintenance (component of Repairs)	No	100%	The minor yard maintenance code does not include activities typically associated with tonnage-related track wear as identified by Queensland Rail. The yard maintenance code will include miscellaneous yard-specific activities, which we do not anticipate will have any relationship with network volumes. Hence, we consider it appropriate for all costs to be fixed for this maintenance activity.
Rail Joint Management	Yes	80%	The rail joint maintenance involves fixing battered, frozen and dipped joints, ensuring bolts and fishplates are adequately assembled to specification. This includes also the lubrication of the fishplates (note that rail lubrication is for the rail itself, rather than fishplates). A component of rail joint management can be coupled with other maintenance works, decreasing the proportion of influence from usage. We consider that the proposed fixed-proportion value of 80% by B&H is adequate.
Rail Renewal	Yes	50%	Rail maintenance is typically a mix of wear and tear from use and other factors such as manufacturing defects, environment and age. In comparison with a heavier haulage line such as the ARTC HVCN, a fixed-proportion value of 25% and 10% was proposed by ARTC and Wik-Consult respectively representing a network of high haulage. Due to the low haulage of the West Moreton network, we consider a 50% fixed-proportion value would be reasonable and consistent with the track characteristics of the infrastructure.

MAT code	Tonnage dependent	GHD's recommended fixed-proportion value	GHD's explanations and justifications
Turnout maintenance (component of Repairs)	Yes	50%	We consider that a component of turnouts will wear corresponding to line volume, particularly the curve rail and other turnout components. However, as resurfacing is not a component of these works, the fixed-cost component will be driven up, likely more significantly than the wear component due to the low haulage. Typical values for turnout observed on the ARTC HVCN indicate a range of 25 to 50% fixed. We consider that the West Moreton system would sit on the upper end of this range due to the formation condition and low-haulage volumes of the system. Accordingly, we consider a fixed-proportion value of 50% to be appropriate.
Signage Management	No	100%	Tonnage will not affect the management and maintenance of signage, as signage assets are implemented to facilitate operation of the line and is independent of the line volume. The creep markers serve purely as a reference to manage rail creep, and are assumed not to incur a variable cost with tonnage. Hence, we consider that all costs for this MAT code are fixed.
Maintenance ballasting	Yes	40%	Ballast degrades over time with tonnage forces, induces ground to be forced downwards and causes formation material to migrate up into the ballast layer. Ballast is also contaminated by coal fines, and this is sometimes referred to as coal fouling. These factors drive a component of variable cost. On the other hand, unrelated to usage, the formation condition will also impact the extent to which ballast is contaminated. Poor formation can impact drainage, thereby resulting in the ballast holding water and triggering the creation of 'wet spots'. This process contaminates and degrades the ballast, coupled with environmental contamination over time. These factors drive the share of the fixed component. We consider that due to the significant condition of the formation coupled with low haulage, that the rate should be relatively higher than proposed in other networks. The ARTC HVCN, a high haulage line, has ascribed to it a fixed-proportion value a rate of 25% via a recommendation by Wik-Consult. Given this, we consider a fixed-proportion value of 40% for the West Moreton network to be appropriate.
Sleeper Management	Yes	50%	The West Moreton network is characterised by a blend of timber, steel and concrete sleepers. Typically, concrete is more resilient to degradation than timber. Concrete sleepers do not rot, withstand fire and exhibit more UV resistance. This inclusion of concrete sleepers will increase the fixed-cost component of the line, as higher tonnages does not necessarily translate to more frequent replacement of concrete sleepers. However, the curvature of some segments of the West Moreton network is likely to also impact the deterioration (correlating with volume) of all sleeper types. On balance, we consider a fixed-proportion value of 50% to be appropriate.
Fire & Vegetation Management	No	95%	Fire and vegetation management is required typically due to factors such as the environment and age of the network. As the West Moreton network passes through a significant amount of country and access is challenging, it can be expected that the fixed costs of this work are inherently high. In some instances, we note that the clearing of vegetation may be from the trackbed (caused by volume use and ballast seepage into the formation) rather than the part of the rail corridor outside the rail. To address this, we assume that 5% of costs are variable and that 95% are fixed.

MAT code	Tonnage dependent	GHD's recommended fixed-proportion value	GHD's explanations and justifications
Rail Stress Adjustment	Yes	90%	Rail stress adjustment works include stress tests, creep monitoring, anchor and anchor block installation. These activities are all typically considered independent of tonnage because for the purpose of a low haulage line, stress testing and creep monitoring would be considered consistent fixed rate activities. In comparison, anchor block installation varies with the development of adjustment modules, which is not related to tonnage. The same can be said about the effects of weather on track-buckling risks. The rail stress adjustment process, however, is also implemented as a result of other work that impacts the rail stress. Such work includes the cutting of the rail, and, as such, will have a small variable component that will be influenced by tonnage values. Given this, we consider a 90% fixed-cost component to be appropriate.
Asset Compliance Inspection / Asset Inspections Non Compliance	Yes	80%	Rail defects are generally caused by a spectrum of triggers, including manufacturing defects, defective welds, aging and weathering. These drive a fixed component of compliance-related inspections. However, a small variable component is driven by wear and tear. The influence from wear and tear, correlated with tonnage, permeates through to the frequency of compliance inspections. The QCA value of 80% fixed costs is consistent with this view. Hence, we consider an 80% fixed-proportion value to be appropriate.
Lubrication	Yes	50%	The rail lubrication process coincides with the volume of trains – as more trains traverse the network, the lubrication on the line is dissipated. This will result in more consumption of the lubricating agent, triggering the need for further lubrication to be applied. A component of the applicator maintenance will also be related to this variable rate of use. On balance, and in the absence of further information, we consider a 50% fixed-cost component to reflect the cost structure of this MAT code.
Top & Line Spot Resurfacing	Yes	35%	Top and line resurfacing is essential for maintaining the geometry of the track, which is affected by the extent of use of the track. As the geometry is influenced by the volume of track use, we can expect that the resurfacing task is also related to the volume. The track geometry also deteriorates due to the formation. As the West Moreton network is built on aged, lack of structure formation, we can expect that the non-tonnage related component will be 'high' for this network. We anticipate that a reasonable fixed-proportion value would be 35%.
Rail Repair	Yes	50%	Rail repair is typically a result of defects that comes about through the stresses put on the rail. Some of this will be due to environmental factors such as temperature, whilst others due to the quantity of tonnage run on the network. On balance, and in the absence of further information, we consider a 50% fixed-cost component to be reasonable.
Mechanised Resurfacing	Yes	35%	As with top and line resurfacing, the mechanised-resurfacing activity is primarily influenced by network use. However, a significant fixed component of this work will be contributed to by weather and formation age factors that trigger track misalignment. For the ARTC HVCN, a mechanised resurfacing fixed-cost component of 25% was applied. We consider this to be the lower limit of the fixed rate due to factors of low line haulage and formation condition. Given this, we consider a fixed-proportion value of 35% to be appropriate.
Rail Grinding	Yes	35%	Rail grinding is required to correct rail defects caused by the use of the network. This component of work will be significantly dominated by a variable rate with tonnage. In the case of the ARTC HVCN, Wik-Consult considered a

MAT code	Tonnage dependent	GHD's recommended fixed-proportion value	GHD's explanations and justifications
			fixed-cost component of 25% to be appropriate. When considering the much lower traffic volume of and formation condition on the West Moreton network, it is reasonable to assume the fixed-proportion value might be closer to 35%-40%. We have chosen the lower bound this range to be conservative.
Construction (N11)	No	100%	This category predominantly covers the cost of water, power and lighting facilities in below rail yards and the maintenance of infrastructure depots. Tonnage will not affect these costs (with the exception of a larger work force increasing utility costs, which would be negligible).
Telecommunications	No	100%	The driving force behind telecommunications-systems maintenance is dominated by the age of assets and the nature of the environment in which the assets are located. We anticipate that the fixed component of these works will dominate entirely and, accordingly, we have ascribed a 100% fixed-cost component to this MAT code.
Signalling	No	100%	As with telecommunications, the driving force behind signalling-systems maintenance is dominated by the age of assets and the nature of the environment in which the assets are located. We anticipate that the fixed component of these works will dominate entirely and, accordingly, we have ascribed a 100% fixed-cost component to this MAT code.

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Draft A	Jeremy Williams Curtis Godlonton Vishal Therakam	Stephen Hinchliffe		Hiresh Devaser		16/07/2018
Draft B	Jeremy Williams Curtis Godlonton Vishal Therakam	Hiresh Devaser / John Portwood		Hiresh Devaser		24/07/2018
Draft C	Jeremy Williams Curtis Godlonton	Hiresh Devaser		Hiresh Devaser		26/07/2018
Final	Jeremy Williams	Hiresh Devaser / John Portwood	[redacted]	Hiresh Devaser	[redacted]	27/07/2018

Attachment 7: HoustonKemp's Independent Expert Report on Price Differentiation

HOUSTONKEMP
Economists

DAU2 Price differentiation

A Final report for Queensland Rail

19 July 2018

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Disclaimer

Contents

Executive Summary

Queensland Rail's present, Queensland Competition Authority (QCA) approved Access Undertaking (AU1) expires on 30 June 2020. The QCA has requested Queensland Rail submit a draft access undertaking (DAU2) that, if approved. would become AU2, and replace AU1 from 1 July 2020

In both DAU2 and its separately developed Access Framework,[1] Queensland Rail is proposing to adopt the pricing differentiation framework from ARTC's Interstate Access Undertaking. In the DAU2 and Access Framework approach there are a number of factors to which Queensland Rail can have regard to when setting prices; namely the characteristics of the service plus the commercial and logistical impacts on Queensland Rail business. Adoption of the ARTC pricing principles by Queensland Rail would provide an increased ability for price differentiation than the current AU1.

We have assessed the revised price differentiation approach in DAU2 by reference to whether it promotes the objectives of the QCA Act, being the foundational reference point for decisions made by the QCA. These objectives include the promotion of:

- the three dimensions of economic efficiency – allocative efficiency, productive efficiency and dynamic efficiency;
- competition in upstream and downstream markets; and
- protection of the interests of Queensland Rail, existing access holders, and potential access seekers.

Similar criteria apply to decisions made by the ACCC in its reviews of proposed access undertakings. The ACCC has approved ARTC's approach to price differentiation (being adopted by Queensland Rail) as efficiency enhancing.

In our opinion, the proposed price differentiation arrangements under DAU2 and the Access Framework better promote economic efficiency and the QCA's objectives under the QCA Act than AU1. This is because the proposed arrangements:

- improve allocative efficiency by providing more refined pricing signals;
- allow for a more efficient recovery of fixed costs and potentially for increases in network usage;
- allow Queensland Rail more flexibility in negotiations so that, for example, lower access prices can be offered to encourage modal shift from road; and
- competition concerns around price differentiation are not relevant to Queensland Rail since it is not vertically integrated and the floor and ceiling price controls remain in place.

[1] Queensland Rail, draft Access Framework, 18 June 2018, available at: www.qca.org.au/getattachment/d8f71dec-445d-49ab-986d-33bcc30aa668/Queensland-Rail-Proposed-New-Access-Framework.aspx

1. Introduction

The Queensland Competition Authority (the QCA) regulates third party access to certain infrastructure in Queensland, including Queensland Rail's network. Potential access seekers have the right to seek access to Queensland Rail's network under the terms and conditions approved by the QCA.

The access regime for Queensland Rail's network reflects a negotiate-arbitrate framework, under which Queensland Rail and access seekers are encouraged to negotiate on price and non-price terms, with a third-party arbitrator being used to settle disputes when those terms cannot be agreed.

To facilitate the negotiations, Queensland Rail is required to prepare an access undertaking, which sets out, among other things:

- the process for seeking access;
- the pricing rules for determining access charges;
- reporting obligations and dispute resolution; and
- a standard access agreement.

The QCA is responsible for approving the access undertaking. The current access undertaking, Access Undertaking 1(AU1), expires on 30 June 2020. In light of its scheduled expiry, the QCA has issued Queensland Rail with an initial undertaking notice, requiring Queensland Rail to submit Draft Access Undertaking 2 (DAU2). DAU2 is due for submission by 31 July 2018 and, once approved by the QCA will become AU2 and be effective from 1 July 2020.

Queensland Rail is required to follow the pricing rules set out in the access undertaking when setting access charges. A key provision in the existing AU1 pricing rules is the limitations on price differentiation for users in the 'same market', which can be presumed to encompass commodities that are sourced from the same geographic region. Queensland Rail is required to set the same access charge for users in the 'same market', except when the risks or costs of providing the service are different.

Queensland Rail has proposed changes to the price differentiation approach to apply in DAU2. We have been engaged to prepare an expert report setting out the economic implications of the pricing rule provisions and evaluating Queensland Rail's proposed approach in DAU2.

The remainder of this report is structured as follows:

- section 2 describes the context and outlines the current and proposed price differentiation provisions; and
- section 3 provides an economic assessment of the current and proposed provisions.

2. Background and context

2.1 Queensland Rail's network

Queensland Rail's network extends 6500 kilometres across Queensland. The rail network is diverse both in its task and use, and includes:

- intermodal and general freight on the North Coast Line;
- bulk minerals on the Mount Isa Line;
- coal on the West Moreton Line; and
- passenger services predominantly in south east Queensland.

Figure 1: Rail networks in Queensland

2.2 Characteristics of Queensland Rail's market and access framework

In contrast to other regulated infrastructure sectors, such as electricity and gas networks and water services, Queensland Rail does not receive sufficient revenue from access charges to recover its costs. With the exception of the Mt Isa System, Queensland Rail's entire network is supported by Transport Services Payments from the Queensland government. Without these payments, large parts of Queensland Rail's network would be financially unviable.

One of the reasons that Queensland Rail does not generate sufficient revenue is that it competes with road transport for a material proportion of its freight traffic. In other words, road transport is a viable substitute for rail, particularly for trips involving short to medium distances. It follows that Queensland Rail's ability to set access charges is constrained by the cost of road freight – Queensland Rail cannot charge more than the cost to transport the freight by road, since its users would otherwise switch to road transport.

In contrast to Aurizon, Queensland Rail is not vertically integrated, ie, Queensland Rail does not compete with the freight operators for which it is providing access. This means that concerns inj relation to potential anti-competitive conduct (such as margin squeezes, discriminatory access quality and raising competitors' costs), while potentially relevant for Aurizon, are not a relevant consideration for Queensland Rail.

2.3 Pricing arrangements under AU1

We describe below the existing pricing arrangements applying under AU1.

2.3.1 Reference tariffs on West Moreton and Metropolitan Lines for Coal Traffic

The West Moreton System and the Metropolitan System are the only two rail systems on Queensland Rail's network that have a reference tariff. The reference tariff applies to coal haulage services and acts as price cap for a reference service. It is a two-part tariff, comprising:

- a per train path charge; and
- a GTK-based charge.

The reference tariff is calculated so that Queensland Rail can recover the ceiling revenue limit and is the price that is currently paid by coal services.

2.3.2 Pricing rules that apply to non-coal Traffic

Queensland Rail does not have a reference tariff for non-coal services (and coal services on systems other than West Moreton and Metropolitan). Rather, Queensland Rail is required to comply with a set of pricing principles, which we set out below in their order of precedence:

- limits on price differentiation - the prices for train services in the same geographical area transporting the same commodity can only vary as a result of differences in Queensland Rail's costs or risk of providing access (Appendix 1 sets out the actual clause);
- price limits - access revenue needs to fall within:
  - a ceiling limit, which reflects the efficient cost of providing the service; and
  - a floor limit, which reflects the incremental cost of providing access;
- network utilisation - where Queensland Rail may charge different rates for train services serving different markets to maximise commercial viability; and
- revenue adequacy - access charges and transport service payments should generate revenue that is at least enough to meet efficient cost of providing access, including a return on investment.

The limits on price differentiation are to prevent access providers giving an access seeker or access holder an unfair competitive advantage over its competitors by providing it with preferential treatment in its access agreement, ie, when access seekers and access holders are in the same market. As stated in QCA Act Clause 168c, an access provider:[2]

> must not unfairly differentiate between users of the service in a way that has a material adverse effect on the ability of 1 or more of the users to compete with other users.

However, we noted above that since Queensland Rail is not vertically integrated it has no incentive to differentiate between access seekers and holders in order to favour its own services (because it does not offer any other services that depend on its own access service). Rather, Queensland Rail has an incentive to maximise its profitability or, more correctly, to limit the extent to which it is dependent on government subsidy. Given the fixed cost nature of its rail network, this objective will most readily be achieved by maximising traffic on its network and, more generally, by taking all actions within its power to strengthen competition between its users.

2.4 Proposed approach to price differentiation going forward

In DAU2 Queensland Rail has proposed pricing rules that are the same as those currently adopted in the ARTC's interstate rail access undertaking[3]. Appendix A.1 contains the pricing rules contained in ARTC's access undertaking and the identical terms proposed by Queensland Rail in DAU2.

Queensland Rail has also submitted an Access Framework for assessment in the context of the QCA's declaration review.[4] This sets out the terms and conditions that Queensland Rail will adopt if its network was no longer declared. The approach to price differentiation in the Access Framework is substantially similar to the ARTC's interstate approach, with the detailed drafting contained in Appendix 1.

Under the DAU2 and Access Framework approach, there are a number of factors to which Queensland Rail can have regard to when setting prices; namely characteristics of the service, and commercial and logistical effects on Queensland Rail's business.

The characteristics of the service are defined to include axle load, speed wheel diameter, train length, origin and destination (including the number and length of intermediate stops), departure and arrival times and days of the week.

The commercial effects on Queensland Rail, include:

- the term of the agreement;
- the potential for growth of the business;
- the opportunity cost to Queensland Rail;
- the consumption of Queensland Rail's resources, including capacity;
- the credit risk associated with the business;
- market value of the train path sought;
- the segments of the network for which access is being sought; and
- previously negotiated access charges agreed under the framework, where relevant.

The logistical impact on Queensland Rail, includes:

- the impact on other train services and risk of failure of the relevant operator to perform; and
- reduced capacity and system flexibility.

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[2] Queensland Competition Authority Act 1997, current as at 1 March 2017, s 168c

[3] ARTC Interstate Access Undertaking available here https://www.artc.com.au/uploads/IAU-SSFL-Variation-2013.pdf

[4] Queensland Rail, Queensland Rail's draft Access Framework, 18 June 2018, available at: www.qca.org.au/getattachment/d8f71dec-445d-49ab-986d-33bcc30aa668/Queensland-Rail-Proposed-New-Access-Framework.aspx

The limitation on price discrimination contained in clause 4.2 are subject to the relevant pricing factors identified as train characteristics or commercial or logistical impacts on Queensland Rail.

A number of the factors identified in DAU2 as reasons for differentiation could be contended to fall under the DAU1 provision recognising 'cost or risk' differences to Queensland Rail. However, in our opinion the revised approach provides an increased ability to price differentiate. By way of comparison, Queensland Rail's proposed new approach:

- broadens the relevant costs since it explicitly includes as relevant the opportunity cost to Queensland Rail[5] and costs to other users, eg, logistical impact;
- specifically includes in the definition of risk the credit risk of the business and risk of an operator's failure to perform; and
- specifically incorporates other commercial considerations, such as the duration of the agreement, contributions from the access seeker, and the cost of additional capacity.

[5] Which would by definition include the market value of the train path.

3. Economic assessment of price differentiation

In this section we provide an economic assessment of the effect of different degrees of price differentiation.

3.1 QCA's assessment framework

The QCA Act is thefoundational reference point for decisions made by Queensland Competition Authority.

The act requires that the QCA make decisions in a manner that is consistent with the QCA Act. In relation to the approval of access undertakings, the QCA's assessment criteria are:[6]

(a) promote the economically efficient operation of, use of and investment in, significant infrastructure by which services are provided, with the effect of promoting effective competition in upstream and downstream markets.

(b) the legitimate business interests of the owner or operator of the service

(c) if the owner and operator of the service are different entities – the legitimate business interests of the operator of the service are protected

(d) the public interest, including the public interest in having competition in markets (whether or not in Australia)

(e) the interests of persons who may seek access to the service, including whether adequate provision has been made for compensation if the rights of users of the services are adversely affected

(f) the effect of excluding existing assets for pricing purposes

(g) the pricing principles … that the price should:

a. generate expected revenue for the service that is at least enough to meet the efficient costs of providing access to the service and include a return on investment commensurate with the regulatory and commercial risks involved

b. allow for multi-part pricing and price discrimination where it aids efficiency

c. not allow a related access provider to set terms and conditions that discriminate in favour of the downstream operations of the access provider or a related body corporate of access provider or a related body corporate of the access provider, except to the extent the cost of providing access to other operators is higher; and

d. provide incentives to reduce costs or otherwise improve productivity and

(h) any other issues the authority considers relevant

Efficiency is a key concept underpinning the QCA's assessment criteria. 'Efficiency' is a term of art in economics and is widely accepted by economists as having three distinct dimensions, being: [7]

- **productive efficiency**, ie, production using a least-cost combination of inputs;
- **allocative efficiency**, ie, production of an optimal set of goods and services, which is allocated so as to provide the maximum benefit to society; and

[6] QCA, Queensland Rail's Draft Access Undertaking, June 2016, page vii

[7] For further discussion of the dimensions of efficiency and their relation to public policy see Productivity Commission, *On efficiency and effectiveness – some definitions*, May 2013.

- **dynamic efficiency**, ie achieving productive and allocative efficiency over time, in the face of changes in technology and consumer preferences.

Each of these dimensions of efficiency is reflected in the architecture of the QCA's assessment, particularly criteria (a) and (g). By way of explanation:

- the reference to efficient 'operation of' and 'investment in' significant infrastructure refers to the productive dimension of efficiency, ie, this is promoted if decisions made by the QCA promote the supply of infrastructure services using the least cost combination of both capital and operating inputs;
- the reference to efficient 'use of' significant infrastructure refers to the allocative dimension of efficiency, ie, this is promoted if decisions are made that give rise to a level and structure of prices that both recover the cost of making infrastructure services available and maximise the extent to which infrastructure services are allocated to those consumers that derive the greatest benefit from them without discrimination, so as to maximise the benefit to society; and
- dynamic efficiency is the promotion of productive and allocative efficiency over time, ie, this is promoted if decisions are made that balance the pursuit of productive and allocative efficiencies for current consumers with the requirement to invest for productive and allocative efficiency gains in the long term.

Criterion (a) also makes explicit reference to promoting efficient competition in upstream and downstream markets. QCA decisions should therefore avoid outcomes that may have a detrimental effect on competition outcomes in related upstream and downstream markets.

The final relevant part of QCA's assessment criteria is to protect the interests of the owners and operators, and of potential access seekers. We note that these criteria make no distinction between existing access holders or new access seekers.

3.2 Assessment framework

We have assessed Queensland Rail's proposed revised price differentiation approach by reference to whether it promotes the objectives of the QCA Act identified above, ie, whether it promotes:

- the three dimensions of efficiency;
- competition in upstream and downstream markets; and
- protects the interest of Queensland Rail, existing access holders, and potential access seekers.

3.2.1 ACCC has approved ARTC's price differential approach

We noted above that Queensland Rail's proposed arrangements under DAU2 and the Access Framework are adopted from ARTC's existing access undertaking – where not identical, they are substantially the same. The Australian Competition and Consumer Commission (ACCC) is the relevant regulator for ARTC access arrangements. Queensland Rail and ARTC's market positions are similar in that they are regulated, government owned rail track providers neither of whom are vertically integrated in the rail freight transport market.

The ACCC's assessment framework for ARTC's access undertaking is similar to those used by the QCA, with the ACCC required to take into account:[8]

- the objects of Part IIIA, which are to:

  > promote the economically efficient operation of use of and investment in the infrastructure by which services are provided, thereby promoting effective competition in upstream and downstream markets; and

[8] ACCC, Australian Rail Track Corporation Access Undertaking – Interstate Rail Network Final Decision, July 2008, page 15-16

  - provide a framework and guiding principles to encourage a consistent approach to access regulation in each industry.

- The pricing principles, which are
  - that regulated access prices should:
    - be set so as to generate expected revenue for a regulated service or services that is at least sufficient to meet the efficient costs of providing access to the regulated service or services; and
    - include a return on investment commensurate with the regulatory and commercial risks involved; and
  - that the access price structures should:
    - allow multi-part pricing and price discrimination when it aids efficiency; and
    - not allow a vertically integrated access provider to set terms and conditions that discriminate in favour of its downstream operations, except to the extent that the cost of providing access to other operators is higher; and
  - that access pricing regimes should provide incentives to reduce costs or otherwise improve productivity.
- the legitimate business interests of the service provider;
- the public interest, including the public interest in having competition in markets (whether or not in Australia);
- the interests of the persons who might want access to the service;
- whether the undertaking is in accordance with an access code that applies to the service;
- whether access to the service is already the subject of an access regime that the Commonwealth Minister has decided is an effective regime under s.44N; and
- any other matters that the ACCC thinks relevant.

These requirements are aligned with those the QCA is required to consider under the QCA Act. Given that Queensland Rail has adopted ARTC's pricing principles, it is useful to refer to the ACCC's assessment of ARTC's pricing principles. Appendix A.1 contains the ARTC's pricing principles for setting access charges and limitations on price differentiation.

The ARTC's pricing principles provide ARTC with considerable flexibility on how it can set charges for operators with the same end market and operating in the same region. The ACCC considered that this was appropriate because:[9]

- it allows ARTC to apply different prices for services with different characteristics;
- it is consistent with the pricing principles of allowing price discrimination when it aids efficiency;
- that ARTC could not differentiate between applicants where the services are alike and operating in the same end market; and
- there was no evidence that ARTC has excessive flexibility.

[9] ibid, page 48.

The ACCC considered that ARTC's pricing principle would promote economic efficiency, while still maintaining the appropriate price differentiation limitation controls.

3.2.2 Access prices can become more refined under the proposed changes, and so promotes allocative efficiency

Under the arrangements in AU1, Queensland Rail can only price differentiate based on differences in costs and risks of the proposed train service.

The DAU2 arrangements allow Queensland Rail to differentiate between access seekers who seek a higher quality of service, eg, higher quality train paths, or certain access conditions unrelated to cost, eg departures at a certain time. There is currently no meaningful way for Queensland Rail to identify which access users value these attributes the most, or for access seekers to signal this.

The proposed arrangements also broaden the definition of costs and risks to include the wider implications of providing access, eg, Queensland Rail will be able to consider the logistical impact on other users and adjust its prices accordingly.

The proposed arrangements allow Queensland Rail to adjust its access charge based on the characteristics of the service provided, and broader costs and risks. It follows that Queensland Rail can provide an improved price signal to access holders and access seekers, thereby promoting allocative efficiency because users who value a higher quality train path or certain departure or arrival times will be allocated those paths.

3.2.3 Increased ability to price differentiate increases efficiency

A key challenge for Queensland Rail is its inability to recover sufficient revenue to cover its costs, a substantial proportion of which are fixed.

In the absence of increasing returns to scale, textbook efficient pricing requires setting marginal prices equal to marginal costs.[10] However, in the presence of fixed costs, such a pricing approach will mean the service provider will not be able to recover its costs. Prices need to be above marginal cost so that the service provider can recover its fixed cost associated with providing the service.

A typical problem for infrastructure businesses is the recovery of fixed costs in a manner that least distorts the efficient outcomes that would arise under marginal cost pricing. Economic theory suggests that Ramsey pricing principles[11] can be used to guide the appropriate price mark-up over marginal cost. Ramsey pricing principles suggest that user groups that are less sensitive to price increases are charged a higher amount, also known as the inverse elasticity pricing.

This is considered the least distortive for allocative efficiency, since users that are less sensitive to price increases are also less likely to reduce their consumption of the service. It follows that pricing such that these user groups contribute a higher amount of fixed costs helps Queensland Rail recover its costs, while also limiting the inefficiency associated with deviating from marginal cost pricing.

For example, in the North West Minerals Province centred around Mt Isa and Cloncurry, a number of smaller scale mineral projects are choosing an intermodal logistics solution where products are containerised rather than adopting a traditional bulk logistics solution. Intermodal logistics is more contestable by road freight and in recent years road has been successful in winning concentrate haulage business on the Mount Isa to Townsville transport corridor. Intermodal rail haulage is less efficient than bulk haulage because the net tonne of product transported per gross tonne is less. However, under the limits on price differentiation in AU1, Queensland Rail is prevented from differentiating train services with the same commodities in the same

[10] For example, see Darryl Beggar, *Access Pricing and Competition*, 2001, page 1

[11] ibid, page 2

geographic region, even though the bulk freight users are likely to be able to pay more and would then benefit by getting more freight onto rail.

The proposed new arrangements provide Queensland Rail with a greater ability to differentiate between different users, thereby making Ramsey-type pricing approaches possible. This will:

- encourage uptake of rail services as user groups that are more price sensitive are allocated a lower proportion of fixed cost; and
- help Queensland Rail recover its costs as it can allocate a higher proportion of its fixed cost to user groups that are less price sensitive.

The current under-recovery of efficient costs by Queensland Rail leads to allocative inefficiency and the broadened ability to price differentiate may improve efficiency by reducing the subsidy requirement.

Broadening of the ability for Queensland Rail to engage in price differentiation does not present any economic concerns given other aspects of DAU2. Under the existing amd proposed future regulatory framework, Queensland Rail cannot collect access charges that exceed a ceiling that reflects the efficient cost of providing the rail network, including a return on investment that is commensurate with the regulatory and commercial risks involved. The purpose of the ceiling limit is to ensure that Queensland Rail is not able to exercise any form of monopoly power by earning more than the efficient cost of providing the service.

3.2.4 Incorporating other commercial considerations increases Queensland Rail's flexibility in negotiations, and should promote allocative efficiency

DAU2 includes a wide range of factors relevant to price setting including the duration of the contract, and potential growth. In our opinion, these are valid economic reasons to support the inclusion of these factors. For example, there could be justification in offering a lower access charge to encourage users to switch from road to rail. Under current arrangements, Queensland Rail does not have the flexibility to adjust its access price to incorporate these commercial decisions. It follows that increased flexibility would make it more likely that Queensland Rail and a potential access seeker can reach a mutually beneficial agreement, thereby promoting allocative efficiency.

3.2.5 Competition concerns around price differentiation are not relevant for Queensland Rail

The potential for price discrimination can lead to competition concerns, such as where it aids monopoly pricing or can be used to harm competition in downstream markets. However, in Queensland Rail's case the floor and ceiling limitations prevent it from earning returns that would be above the economically efficient level.

In any event, as noted above, Queensland Rail recovers significantly below its ceiling revenue and a change in the price differential rules will not reverse this situation. Further, Queensland Rail is not vertically integrated, so it has no incentive to discriminate between users in a manner that would harm competition in downstream markets. Rather, its incentive is to take all actions within its power to strengthen competition between access holders and potential access seekers. It follows that the broadened ability for Queensland Rail to price discriminate will not give rise to any anti-competitive concerns, but rather is likely to promote competition in upstream and downstream markets.

3.2.6 Conclusion

In our opinion, the proposed arrangements under DAU2 better promote economic efficiency and the QCA's objectives under the QCA Act than the arrangements under AU1. The proposed arrangements under DAU2:

- improve allocative efficiency by providing for more refined pricing signals;
- allow for a more efficient recovery of fixed costs and potential increases in network use;

- allow Queensland Rail more flexibility in negotiations, such as by offering lower access prices to encourage modal shift from road; and
- do not raise any competition concerns, since Queensland Rail remains subject to the floor and ceiling revenue controls and has not interests in any vertically related market.

Appendix 1: Limitations on price differentiation

A1.1 Limitations on price differentiation in AU1

Clause 3.3 In AU1 sets out limitations on price differentiation Queensland Rail is required to follow. In situations where there is no applicable reference tariff, Queensland Rail to follow clause 3.3(b)(ii), which states that:

> if there is no applicable Reference Tariff, the methodology, rates and other inputs for calculating Access Charges for other Access Seekers or Access Holders in respect of Train Services for the same commodity in the same geographical area, on a unit rate basis to reasonably reflect, over time:
>
> (A) differences or changes in the cost or risk to Queensland Rail of providing Access to that Access Seeker for that Train Service compared to the relevant Train Services for those other Access Seekers or Access Holders; and
>
> (B) material limitations on Available Capacity in accordance with clause 3.1.2(b)

A1.2 Proposed limitations on price differentiation in AU2

Queensland Rail has proposed to adopt the price differentiation criteria as those used in ARTC's undertaking. ARTC's undertaking states that:

> In formulating its Charges, ARTC will have regard to a range of factors which impact on its business including, but not limited to, the following:
>
> (a) in particular, the Indicative Access Charges for Indicative Services set out in clause 4.6;
>
> (b) the particular characteristics of the relevant Service, which without limitation include axle load, speed, wheel diameter, Train length, origin and destination (including number and length of intermediate stops), departure and arrival times and days of the week;
>
> (c) the commercial impact on ARTC's business, which without limitation includes factors such as:
>
> (i) the term of the Access Agreement;
>
> (ii) the potential for growth of the business;
>
> (iii) the opportunity costs to ARTC;
>
> (iv) the consumption of ARTC's resources, including Capacity;
>
> (v) the credit risk associated with the business;
>
> (vi) the market value of the Train Path sought;
>
> (vii) the Segments of the Network relevant to the Access being sought; and
>
> (viii) previously negotiated Charges agreed under the terms of this Undertaking, where relevant, as published by ARTC as set out in clause 2.7(b);
>
> (d) logistical impacts on ARTC's business which without limitation include:
>
> (i) the impact on other Services and risk of failure of the Operator to perform; and
>
> (ii) reduced Capacity and system flexibility;
>
> (e) capital or other contributions by the Applicant to ARTC's costs; and

(f) the cost of any Additional Capacity.

For the purpose of Clause 4.2 (c)(iv), ARTC will have regard to the predominant usage of the Network being for Indicative Services to which Indicative Access Charges apply. ARTC will also recognise that investment in the development of the Network is primarily to improve utilisation and performance of Indicative Services. As such, Capacity consumption in relation to Trains operating with characteristics other than that of Indicative Services will be determined having regard to the Capacity consumption of Indicative Services on a Network utilised by Indicative Services.

Clause 4.3 in ARTC's undertaking sets outs limitations on price differentiation. It states that:

(a) Subject to Clause 4.2 above, in formulating its Charges, and subject to ARTC having an obligation under Clause 2.3 of the Indicative Access Agreement, ARTC will not have regard to:

(i) the identity of the Applicant; and

(ii) whether or not the Applicant is a Government Authority.

(b) Subject to Clause 4.2 above, in formulating its Charges, ARTC will not differentiate between Applicants in circumstances where:

(i) the characteristics of the Services are alike; and

(ii) the Applicants are operating within the same end market.

For the purposes of this clause, ARTC will determine whether the characteristics of two Services are alike having regard to matters including but without limitation location, duration and quality of the Train Path, nature of Train consist, characteristics of the Service, longevity of Access, arrival and departure times of the day and week.

A1.3 Proposed limitations on price differentiation in the national access framework

Clause 3.3.1 sets out the range of factors that Queensland Rail will have regard to when setting access charges. It states that:

In formulating Access Charges, Queensland Rail will have regard to a range of factors which impact on its business, including the following:

(i) the initial estimate of the Access Charges for the requested Access Rights as included in an Indicative Access Proposal;

(ii) the particular characteristics of the relevant Train Service which include axle load, speed, wheel diameter, Train length, origin and destination (including number and length of intermediate stops), departure and arrival times and days of the week;

(iii) the commercial impact on Queensland Rail's business, which includes factors such as:

(A) the terms of the Access Agreement;

(B) the potential for growth of the business;

(C) the opportunity costs to Queensland Rail;

(D) the consumption of Queensland Rail's resources, including Capacity;

(E) the credit risk associated with the business;

(F) the market value of the Train Path sought;

(G) the part of the Network relevant to the Access being sought; and

(H) previously negotiated Access Charges agreed under the Framework, where relevant;

(iv) logistical impacts on Queensland Rail's business, including:

(A) the impact on other Train Services and risk of failure of the relevant Rolling Stock Operator to perform; and

(B) reduced Capacity and system flexibility;

(v) capital or other contributions by the Access Seeker to Queensland Rail's costs; and

(vi) the cost of any Additional Capacity

Clause 3.3.2 in the draft access framework sets out Queensland Rail's proposed approach to limitations on price differentiation. It states that

(a) Subject to clause 3.3.1 and Queensland Rail's Passenger Priority Obligations, in formulating Access Charges Queensland Rail will not have regard to the identity of the Access Seeker

(b) Subject to clause 3.3.1, in formulating Access Charges Queensland Rail will not differentiate between Access Seekers in circumstances where:

(i) the characteristics of the Train Services are alike; and

(ii) the Access Seekers are operating in the same end market.

(c) For the purpose of clause 3.3.2(b), Queensland Rail will determine whether the characteristics of the Train Services are alike having regard to matters including:

(i) location;

(ii) duration and quality of the Train Path;

(iii) nature of Train consist;

(iv) characteristics of the Train Service;

(v) longevity of Access; and

(vi) arrival and departure times of the day and week.

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Attachment 8: HoustonKemp's Independent Expert Report on Contract Renewal Rights

HOUSTONKEMP
Economists

DAU2 Renewal rights

A Final report for Queensland Rail

19 July 2018

HoustonKemp.com

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Disclaimer

Contents

Executive Summary

Queensland Rail's present, Queensland Competition Authority (QCA) approved Access Undertaking (AU1) expires on 30 June 2020. The QCA has requested Queensland Rail submit a draft access undertaking (DAU2) that, if approved. would become AU2, and replace AU1 from 1 July 2020.

AU1 provides for 'renewal rights' for access holders. Queensland Rail is proposing to alter these renewal rights in DAU2 and in the Access Framework submitted as part of the QCA's declaration review.

A summary of the existing renewal clauses and Queensland Rail's proposed changes under AU2 and the Access Framework is summarised in Table 1 below.

Table 1: Summary of existing renewal clauses and proposed changes

	Arrangements under AU1	Proposed under AU2	Access Framework
Definition of Renewals	Access for the same origin destination, same or fewer train paths, and with access rights that are otherwise substantially equivalent	As AU1	As AU1
Right to Renew	One-off rights for all users that fit the definition of renewals .	One off right for Bulk and Coal Traffics. Where renewal rights have been exercised in AU1, the user will have deemed to have already exercised its one-off renewal right	Access holder is informed of competing application, but capacity is allocated based on the value to Queensland Rail.
Limits of Renewal Pricing	For all traffic not subject to a reference price, price changes are limited to changes in risk and cost. Limited to one renewal per undertaking.	For bulk minerals and coal traffic without a reference price, price changes are limited to changes in risk and cost. Limited to one renewal.	No restriction
Duration of renewed contract	No restriction	Maximum 5 years	No restriction

We have assessed the existing renewal rights by reference to whether they promote the objectives of the QCA Act, being the foundational reference point for decisions made by the QCA. These objectives include the promotion of:

- the three dimensions of economic efficiency – allocative efficiency, productive efficiency and dynamic efficiency;
- competition in upstream and downstream markets; and
- protection of the interests of Queensland Rail, existing access holders, and potential access seekers.

The renewal rights under existing AU1 arrangements are broadly defined, and place significant limitations on the ability to vary access charges for renewed contracts. In our opinion, these arrangements have the potential:

- to increase the losses Queensland Rail incurs from providing rail services, ie, allocative inefficiency, because access holders are only likely to renew an existing contract if they believe that the existing terms and conditions would be more favourable than those available under a renegotiation; and
- to have a detrimental effect on upstream or downstream competition, since renewal rights provide existing access holders with an advantage over new access seekers – this may create unnecessary barriers to entry and cause capacity not to be allocated to those who value it highest, thereby leading to allocative inefficiency.

In our opinion, the arrangements proposed for DAU2 better promote economic efficiency and the QCA's objectives than those applying under AU1. The proposed arrangements limit the impact of renewal rights by making it clear they are a one-off right that only applies to coal and bulk mineral freight. DAU2 also limits the length of the renewal contract. These changes will all improve allocative efficiency since they allow Queensland Rail to recover closer to its efficient costs (limiting the extent of government subsidy) and limit the barriers to entry that renewals can create. Further, the proposal in the Access Framework will provide additional benefit over DAU2 since the renewal rights are further reduced, thereby delivering greater efficiency benefits.

The move away from existing arrangements will alter the balance of access seekers' and holders' rights; however, the negotiate-arbitrate framework allows sufficient flexibility for access holders and Queensland Rail to agree a mutually acceptable contract length and appropriate renewal clauses. In other words, access holders or seekers that need long term certainty can seek terms that facilitate such outcomes, while Queensland Rail has the incentive to accept such terms where they improve its financial viability.

In our opinion, the economically preferred approach under DAU2 would be to remove the renewals process completely, as envisaged in Queensland Rail's separately developed Access Framework[1] – since this reduces the risk of increasing allocative inefficiency and barriers to entry. Queensland Rail's recommended approach in DAU2, whilst not going as far as that contemplated in the Access Framework, balances the meeting stakeholders' expectations with achieving greater economic efficiency. DAU2 reduces the negative impacts of the renewals process by limiting renewal rights to being one-off rather than one per undertaking, limiting the traffics to which it applies (coal and bulk minerals) and limiting the renewal term to five years. We believe this is a reasonable approach given the stakeholder context.

[1] Queensland Rail, draft Access Framework, 18 June 2018, available at: www.qca.org.au/getattachment/d8f71dec-445d-49ab-986d-33bcc30aa668/Queensland-Rail-Proposed-New-Access-Framework.aspx

1. Introduction

The Queensland Competition Authority (the QCA) regulates third party access to certain infrastructure in Queensland, including Queensland Rail's network. Potential access seekers have the right to seek access to Queensland Rail's network under the terms and conditions approved by the QCA.

The access regime for Queensland Rail's network reflects a negotiate-arbitrate framework, under which Queensland Rail and access seekers are encouraged to negotiate on price and non-price terms, with a third-party arbitrator being used to settle disputes where those terms cannot be agreed.

To facilitate the negotiations, Queensland Rail is required to prepare an access undertaking, which sets out, among other things:

- the process for seeking access;
- the pricing rules for determining access charges;
- reporting obligations and dispute resolution; and
- a standard access agreement.

The QCA is responsible for approving the access undertaking. The current access undertaking, Access Undertaking 1(AU1), expires on 30 June 2020. In light of its scheduled expiry, the QCA has issued Queensland Rail with an initial undertaking notice, requiring Queensland Rail to submit Draft Access Undertaking 2 (DAU2). DAU2 is due for submission by 31 July 2018 and, once approved by the QCA, will become AU2 and be effective from 1 July 2020.

Under AU1, certain users have a right to the renewal of the arrangements under which they obtain access under certain conditions. We have been engaged to prepare an expert report setting out the economic impact of the existing renewals provisions and evaluating Queensland Rail's proposed approach in DAU2.

The remainder of this report is structured as follows:

- section 2 describes the context and outlines the current and proposed renewal provisions; and
- section 3 provides an economic assessment of the current and proposed provisions.

2. Background and context

2.1 Queensland Rail's network

Queensland Rail's network extends 6500 kilometres across Queensland. The rail network is diverse both in its task and use, and includes:

- intermodal and general freight on the North Coast Line;
- bulk minerals on the Mount Isa Line;
- coal on the West Moreton line; and
- passenger services predominantly in south east Queensland.

Figure 1: Rail networks in Queensland

2.2 Characteristics of Queensland Rail's market and access framework

In contrast to other regulated infrastructure sectors, such as electricity and gas networks and water services, Queensland Rail does not recover sufficient revenue from access charges to recover its costs. With the exception of the Mt Isa System, Queensland Rail's entire network is supported by Transport Services Payments from the Queensland government. Without these payments, large parts of Queensland Rail's network would be financially unviable.

One of the reasons that Queensland Rail does not generate sufficient revenue is that it competes with road transport for a material proportion of its freight traffic. In other words, road transport is a viable substitute for rail, particularly for trips involving short to medium distances. It follows that Queensland Rail's ability to set access charges is constrained by the cost of road freight – Queensland Rail cannot charge more than the cost to transport the freight by road, since its users would otherwise switch to road transport.

2.3 Renewal rights in AU1

The renewal rights encapsulated in AU1 are complex and given effect by a number of different provisions. Appendix 1 contains the relevant clauses from AU1. The definition of renewals, the right to renew, and the price paid under a renewed contract are briefly summarised below.

2.3.1 The definition of renewal and right to renew a contract

Through the definition of renewals in AU1 (section 7.1), an access holder with an expiring access agreement is considered to be renewing its existing agreement if the new access application is for:

- the same origin and destination;
- the same or fewer train paths; and
- for access rights that are otherwise substantially equivalent to the expiring access agreement.

If these criteria are met, an access application from an existing access holder with an expiring agreement would be considered to be a renewal.

In AU1, certain access holders have the right to renew a contract under certain conditions, even if another access seeker has submitted an access application for the same capacity. The rights only apply in certain conditions, which are:

- the renewal application is for at least the term sought by the access seeker or ten years, whichever is smaller, or for the life of the relevant mine; and
- there have been no previous renewal applications for the relevant capacity.

We have been advised that the one off renewal right applies to all users, and not just to coal and bulk mineral services.

Queuing rights do not apply for renewal applications. Queensland Rail can only executive an access agreement with another access seeker if the existing access holder has not submitted an access application within the appropriate timeframe or negotiation with the existing access holder for renewal have ended.

2.3.2 The price paid when renewing a contract

AU1 also sets out how pricing for renewal applications should be determined – clause 3.3 of DAU1. If there has not been a renewal application submitted within the term of the current undertaking and if no reference tariffs apply, then clause 3.3 states that:

> the methodology, rates and other inputs for calculating access charges for the renewed access will be the same as the methodology, rates and other inputs for calculating access charges in the

expiring Access Agreement (existing inputs) other than to reasonably reflect differences in the cost or risk to Queensland Rail.

In short, Queensland Rail can only adjust the applicable charge where it can demonstrate there is a change in cost or risk, and in areas where a reference tariff does not apply.

QCA's rationale for supporting renewal rights and specific renewal pricing is to recognise the sunk cost that access seekers have incurred to use Queensland Rail's network. [2] In other words, some users need certainty in terms of access rights and access price, so that they can recoup their upfront, sunk investment.

Notwithstanding, we have been advised that the way that AU1 is drafted means that the renewal price framework applies to all contract renewals, rather than for users with a high proportion of sunk costs, ie, coal and bulk mineral users.

2.4 Queensland Rail's proposal

Queensland Rail has expressed its future preferred approaches to renewals in two separate contexts, as described below.

2.4.1 Proposed approach in the New Access Framework

Queensland Rail has submitted a draft Access Framework[3] in the separate context of the QCA's declaration review.

The approach taken in the Access Framework is to remove limits on the pricing of renewal services. Queensland Rail will inform an access holder if another access seeker is applying to contract for the capacity it holds, upon expiry of its access agreement. In that circumstance, Queensland Rail will allocate the capacity on the basis of the user that will deliver the highest present value of risk adjusted future returns to Queensland Rail.

The rationale for this approach is that it assists in allocating capacity to the access seeker with the highest willingness to pay and would help Queensland Rail to recover its efficient costs, both of which are likely to improve economic efficiency.

2.4.2 Proposed approach in DAU 2

Queensland Rail's proposed approach in DAU2 is that:

- renewals apply only to coal and minerals traffic, whereas the existing renewals provisions apply to all traffics;
- there is a one-off renewal only, rather than one per undertaking (as noted above the pricing renewal provisions apply once each undertaking period); and
- there will be a maximum renewal period of five years.

These arrangements mean renewals will be only a one-off right, applying only to coal and minerals traffic and then for a limited duration.

Similar to the approach under the Access Framework, this approach means that Queensland Rail will be able to reallocate capacity to non- coal and mineral users that place a higher value on the access and would help Queensland Rail recover its efficient costs. The key difference is that DAU2 continues to provide coal and mineral traffic with rights to renewal, and so is more closely aligned to the existing AU1 arrangements.

[2] QCA, Queensland Rail's Draft Access Undertaking, June 2016, page 43

[3] Queensland Rail, Queensland Rail's Access Framework, 18 June 2018, available at www.qca.org.au/getattachment/d8f71dec-445d-49ab-986d-33bcc30aa668/Queensland-Rail-Proposed-New-Access-Framework.aspx

3. Economic assessment of renewal rights

In this section we provide an economic assessment of the effect of renewal rights.

3.1 QCA's assessment framework

The QCA Act is the foundational reference point for decisions made by Queensland Competition Authority.

The act requires that the QCA make decisions in a manner that is consistent with the QCA Act. In relation to the approval of access undertakings, the QCA's assessment criteria are:[5]

(a) promote the economically efficient operation of, use of and investment in, significant infrastructure by which services are provided, with the effect of promoting effective competition in upstream and downstream markets

(b) the legitimate business interests of the owner or operator of the service

(c) if the owner and operator of the service are different entities – the legitimate business interests of the operator of the service are protected

(d) the public interest, including the public interest in having competition in markets (whether or not in Australia)

(e) the interests of persons who may seek access to the service, including whether adequate provision has been made for compensation if the rights of users of the services are adversely affected

(f) the effect of excluding existing assets for pricing purposes

(g) the pricing principles … that the price should:

  a. generate expected revenue for the service that is at least enough to meet the efficient costs of providing access to the service and include a return on investment commensurate with the regulatory and commercial risks involved

  b. allow for multi-part pricing and price discrimination where it aids efficiency

  c. not allow a related access provider to set terms and conditions that discriminate in favour of the downstream operations of the access provider or a related body corporate of access provider or a related body corporate of the access provider, except to the extent the cost of providing access to other operators is higher; and

  d. provide incentives to reduce costs or otherwise improve productivity and

(h) any other issues the authority considers relevant

Efficiency is a key concept underpinning the QCA's assessment criteria. 'Efficiency' is a term of art in economics and is widely accepted by economists as having three distinct dimensions, being: [6]

- **productive efficiency**, ie, production using a least-cost combination of inputs;
- **allocative efficiency**, ie, production of an optimal set of goods and services, which is allocated so as to provide the maximum benefit to society; and

[5] QCA, Queensland Rail's Draft Access Undertaking, June 2016, page vii

[6] For further discussion of the dimensions of efficiency and their relation to public policy see Productivity Commission, *On efficiency and effectiveness – some definitions*, May 2013.

- **dynamic efficiency**, ie achieving productive and allocative efficiency over time, in the face of changes in technology and consumer preferences.[7]

Each of these dimensions of efficiency is reflected in the architecture of the QCA's assessment, particularly criteria (a) and (g). By way of explanation:

- the reference to efficient 'operation of' and 'investment in' significant infrastructure refers to the productive dimension of efficiency, ie, this is promoted if decisions made by the QCA promote the supply of infrastructure services using the least cost combination of both capital and operating inputs;
- the reference to efficient 'use of' significant infrastructure refers to the allocative dimension of efficiency, ie, this is promoted if decisions are made that give rise to a level and structure of prices that both recover the cost of making infrastructure services available and maximise the extent to which infrastructure services are allocated to those consumers that derive the greatest benefit from them without discrimination, so as to maximise the benefit to society; and
- dynamic efficiency is the promotion of productive and allocative efficiency over time, ie, this is promoted if decisions are made that balance the pursuit of productive and allocative efficiencies for current consumers with the requirement to invest for productive and allocative efficiency gains in the long term.

Criterion (a) also makes explicit reference to promoting efficient competition in upstream and downstream markets. QCA decisions should therefore avoid outcomes that may have a detrimental effect on competition outcomes in related upstream and downstream markets.

The final relevant part of QCA's assessment criteria is to protect the interests of the owners and operators, and of potential access seekers. We note that these criteria make no distinction between existing access holders or new access seekers.

3.2 Assessment framework

We have assessed the existing renewal rights by reference to whether they promote the objectives of the QCA Act identified above, ie, whether they promote:

- the three dimensions of efficiency;
- competition in upstream and downstream markets; and
- protect the interest of Queensland Rail, existing access holders, and potential access seekers.

3.2.1 Renewal rights reduce Queensland Rail's ability to recover its efficient costs, and so lead to allocative inefficiency

Renewal rights provide access holders with the option of seeking to maintain their existing pricing terms. However, access holders also have the option of renegotiating the access price. It follows that access holders are only likely to invoke their right to renew the contract if they believe that the existing terms and conditions would be better than those available under a renegotiation.

The asymmetrical nature of this approach – if renegotiated access prices are lower than those that would apply under a renewal, the contract will not be renewed, but if the reverse was true a contract would be renewed – limits Queensland Rail's ability to achieve a reasonable return on its network without subsidy. The under-recovery of Queensland Rail's efficient costs (and so the need for a larger, ongoing subsidy than would otherwise be the case) leads to allocative inefficiency

Removal of the constraints applying to Queensland Rail in relation to renewal rights does not present any economic concerns given other aspects of DAU2. Under the existing and proposed future regulatory

[7] Transitional cost is also captured in the three dimensions of efficiency. Unnecessarily high, inefficient transaction cost could result in productive inefficiency, as it adds to the cost of production, or allocative inefficiency, as it could distort the allocation of goods and services and the combination of goods and services that is produced.

framework, Queensland rail cannot collect access charges that exceed a ceiling that reflects the efficient cost of providing the rail network, including a return on investment that is commensurate with the regulatory and commercial risks involved. The purpose of the ceiling limit is to ensure that Queensland Rail is not able to exercise any form of monopoly power by earning more than the efficient cost of providing the service.

3.2.2 Renewal rights advantage incumbents and reduce allocative efficiency

Another implication of current renewal rights is that they provide certain existing access holders with preferential treatment, as compared with those seeking access. Put another way, where existing capacity is either fully contracted or otherwise limited, existing access holders do not need to compete with other access seekers for the allocation of that capacity upon renewal of its contract. It follows that access is not necessarily allocated to the access seeker with the highest willingness to pay, even if these access seekers compete in the same end market. Such circumstances risk causing allocative inefficiency.

Whenever there are multiple access seekers seeking to utilise the same rail capacity, allocative efficiency will be promoted when that capacity is allocated to the access seeker with the highest willingness to pay. This is also consistent with ACCC's position, which acknowledged that:[8]

> resolving conflicting applications on the basis of highest present value of future returns would generally have the effect of allocating capacity to access seekers with the highest willingness to pay, and therefore should be efficient

3.2.3 Renewal rights may raise barriers to entry

New customers, such as a mine developer, will find it more difficult to acquire rail haulage in capacity constrained networks if there are renewal provisions. The renewal provisions have the effect of preventing a new entrant from competing for rail capacity that has already been allocated, giving the incumbent a significant advantage. Such conditions are present in the West Moreton System, ie, a combination of constrained capacity and the presence of renewal rights. It follows that the presence of renewal rights can only have a negative impact on downstream competition, such as in markets encapsulating coal mining activity, since they raise barriers to entry.

3.2.4 Access seekers and Queensland Rail can negotiate renewal rights when required

Some access seekers - such as coal producers and bulk freight service providers, may need long term certainty regarding access rights and price before undertaking new investments or expansions. In these circumstances, the use of long term contracts may be mutually beneficial to both Queensland Rail and the access seeker. [redacted]

Similarly, the rights to renew a contract could also be subject to negotiation between access seekers and Queensland Rail. This would be consistent with the negotiate-arbitrate framework, which is designed to encourage such negotiations to achieve commercial outcomes. In our opinion, the ability to enter into long term access contracts can accommodate the QCA's concern in relation to the protection of access seeker's sunk costs.

We note that Queensland Rail operates above rail passenger trains but not above rail freight trains. Given this, Queensland Rail's incentives in relation to rail freight are to maximise its profitability through increasing freight volume on its network. It has the incentive to engage with mining companies to ensure that each party has sufficient certainty to invest, thereby increasing freight volume on Queensland Rail's network.

[8] ACCC, Position Paper in relation to the Australian Rail Track Corporation's proposed Hunter Valley Rail Network Access Undertaking (December 2010), page 187; ACCC, Australian Rail Track Corporation Limited Hunter Valley Coal Network Access Undertaking - Draft Decision (March 2010), page 658.

3.2.5 Link between costs and access prices is unclear, so there is no clear basis for adjusting prices over time

AU1 allows Queensland Rail to adjust its access charge for contract renewals to reflect changes in costs or risks. However, we note that the access charges that Queensland Rail collects are often significantly below the total efficient cost of providing the service (the ceiling). In other words, Queensland Rail's access charges are not explicitly linked to the cost of providing its services, with the exception of the West Moreton line reference tariffs calculated to recover costs.

It follows that it is extremely is difficult to link changes to costs and risks in the rail network to any methodology for the setting of access charges. Rather, the principal constraints on access charges are the price of road transport alternatives and/or an access seeker's ability to pay. Although Queensland Rail can in theory adjust access charges, it is far from clear how this would occur in practice. It follows that even in a situation where the costs of operating the network are increasing, it may not be possible to pass these costs onto access holders that have renewed their contract. In circumstances where the price of alternative road transport options is increasing, it would never be possible for Queensland Rail to seek higher access charges for its service.

Further, renewal rights may be sought for contracts that have been in place for a long period of time [redacted]

3.2.6 Conclusion

In our opinion, the current form of renewal rights under existing AU1 arrangements is the least preferred option from an economic perspective. It involves a broad definition of renewals and limits the extent to which Queensland Rail can alter its charge for renewed contracts. The existing arrangements therefore have the highest potential:

- to reduce Queensland Rail's ability to recover its costs, particularly given the uncertainty of how to link changes in costs to adjustments to access charges for renewed agreements; and
- to distort downstream or upstream competition and represent a barrier to entry, since existing access holders are provided with the option to renew their contract under certain conditions, which are not available to new access seekers.

The arrangements proposed under DAU2 seek to narrow the definition of renewals by making clear it is a one-off right that applies only to coal and bulk mineral freight. DAU2 has also limits the length of the renewal contract. Extending these reforms, the Access Framework effectively proposes the complete removal of any default renewal right.

In our opinion, the proposed arrangements under DAU2 would better promote economic efficiency and the QCA's objective under the QCA Act than those applying under AU1. This is because DAU2 limits the renewal rights to being a one-off, limits the renewal pricing constraints to bulk and coal traffic, and limits the term of the renewal to five years. Taken together, these changes will improve allocative efficiency as they allow Queensland Rail to recover a greater proportion of its efficient costs (thereby limiting the extent of future government subsidy) and limit the barriers to entry that renewals can create. Separately, the proposal in the Access Framework would provide additional benefit over DAU2, since those renewal rights would be further reduced, delivering yet greater efficiency benefits.

The move away from the existing arrangements will alter access seekers and holders' rights. However, the negotiate-arbitrate framework allows sufficient flexibility for access holders and Queensland Rail to agree a mutually acceptable contract length and appropriate renewal clauses. In other words, access holders or seekers that need the long term certainty can seek to negotiate this and Queensland Rail has every incentive to accept such arrangements since where they improve the long term certainty of its own investment decisions as well as the financial viability of Queensland Rail.

In our view the economically preferred approach would be to remove the renewals process as envisaged in the Access Framework since this reduces the risk of sustained allocative inefficiency and unnecessary barriers to entry. Queensland Rail's recommended approach in DAU2, whilst not going that far, seeks to balance stakeholder's expectations with economic efficiency. DAU2 strikes this balance by reducing the negative impacts of the renewals process on incumbent users by limiting the renewal right to being oneoff in nature rather than one per undertaking, limiting the traffics to which it applies (coal and bulk minerals) and limiting the renewal term to five years. We believe this is a reasonable approach given the objective of managing the process of changing stakeholder expectations.

Appendix 1: Renewal Clauses from DAU1

Renewals are defined in 7.1 as:

> **Renewals** means , in relation to an Access Holder's Rights that are to expire, the Renewal Access Seeker entering into an Access Agreement to hold or continue to hold Access Rights for a further term commencing immediately after the expiry of the relevant Access Rights that have the same origin and destination, require the same or less Train Path requirements and otherwise are substantially equivalent to the relevant Access Holder's Rights Access Rights immediately prior to their expiry, subject to any variation referred to in clause 3.3(f);

Renewal Access Seeker is defined in 7.1 of DAU1 as

> Renewal Access Seeker means, in relation to an Access Holder's Access Rights that are to expire:
>
> (a) The Access Holder;
>
> (b) An Access Holder's Rolling Stock Operator; or
>
> (c) Another Rolling Stock Operator competing for the relevant Access Rights

The renewal rights are given effect by 2.9.3 Renewals, which states that:

(a) Where an Access Seeker (who is not a Renewal Access Seeker) submits an Access Application for Access Rights concerning the Available capacity that will arise when an existing Access Agreement expires, Queensland Rail will notify:

(i) the Access Holder for that Access Agreement;

(ii) that Access Holder's Customer (if any); and

(iii) the relevant Renewal Access Seeker (if any)

Of Queensland Rail's receipt of that Access Application, as soon as reasonably practicable after receiving it.

(b) Despite any other provision in this Undertaking to the contrary and subject to clause 2.9.3 (c) Queensland Rail will not execute an Access Agreement with the Access Seeker referred to in clause 2.9.3(a) until the earlier of:

(i) Renewal Access Seeker fails to, or cannot, submit a relevant Renewal Application to Queensland Rail in respect of the relevant renewal within the Renewal Timeframe; or

(ii) where a Renewal Application has been submitted within the Renewal Timeframe:

(A) The negotiations with the Renewal Access Seeker have ended in accordance with clause 2.7.1(b) (subject to any extension of time agreed in accordance with clause 2.7.1(b)(ii)(C) (which will apply))

(c) Clause 2.9.3(b) only applies where

(i) the relevant existing Access Agreement concerns coal carrying Train Services or bulk mineral carrying Train Services

(ii) the Relevant Renewal Application is for a term of

(A) At least the lessor of the period for which the Access Seeker referred to in clause 2.9.3(a) is seeking Access Rights and ten years; or

(B) The remaining life of the relevant mine as notified in writing to Queensland Rail by the Renewal Access Seeker (where it has no Customer) or otherwise the relevant Customer; and

(iii) clause 2.9.3(c)(ii)(B) has not previously applied for any past Renewal Application in connection with the relevant Access Rights, unless Queensland Rail agrees otherwise

(d) Nothing in this clause 2.9.3 obliges Queensland Rail to enter into an Access Agreement with a Renewal Access Seeker or to do so on the same terms as the relevant existing Access Agreement for the relevant existing Access Rights.

(e) For the avoidance of doubt, when a Renewal Application is submitted the queuing provision (clause 2.9.2) does not apply.

In Clause 3.3 Limits on price differentiation, 3.3 e to g apply to Renewal Applications

(e) Subject to clauses 3.3(f) and (g), if in respect of a Renewal Application:

(i) there has not already been a renewal Application submitted in relation to the proposed Renewal after the Approval Date of this Undertaking; and

(ii) No Reference Tariff applies to the setting of Access Charges for the proposed Train Services under the Renewal Application,

then the methodology, rates and other inputs for calculating Access Charges for the proposed Train Services in the renewed Access Agreement (renewed inputs) will be the same as the methodology, rates and other inputs for calculating Access Charges in the expiring Access Agreement (existing inputs) other than to reasonably reflect, on a unit rate basis, over the term of the renewed Access Agreement, differences in the nature of, or actual changes in, the cost or risk to Queensland Rail of providing Access to the proposed Train Service under the renewed Access Agreement compared to the expiring Access Agreement.

(f) If the proposed Renewal Application would be for a Renewal except for a variation due to operational or supply chain improvement, clause 3.3 (e) will be applied in relation to setting the Access Charges in relation to the proposed Train Service under the Renewal Application but a contribution to Common Costs as a renewed input to reflect those operation or supply chain improvements will also be provided such that it does not result in Queensland Rail being any financially worse off relative to the contribution to Common Costs from the existing inputs.

(g) Clauses 3.3(e) and (f) do not apply to the extent that the expiring Access Agreement is inconsistent with those clauses.

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