



Review of QR Capital Expenditure

Queensland Competition Authority

March 2010

Original

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1 INTRODUCTION

QR Network provides "below rail" services to the coal industry in the Central Queensland Coal Region (CQCR). These services consist of the rail infrastructure to allow an "above rail" operator to transport coal. QR Network recovers the cost of infrastructure projects by achieving Queensland Competition Authority, QCA (the Authority) approval for the capital expenditure to be included in the Regulatory Asset Base (RAB). The RAB is a consideration in determining the tariffs used to recover the cost of the infrastructure. The process for achieving QCA approval is described in Schedule FB of the QR Network Access Undertaking 2008. The process for approval requires QR Network to submit documents to QCA that allow an assessment of the capital expenditure in terms of prudence of scope, standard and cost of the works.

Infrastructure projects are classified into one of three types: system enhancement, asset renewal, or customer specific projects. Each project type has a different QR Network internal approval process. These processes are outlined in flowcharts included in Appendix A. QR Network's Coal Rail Infrastructure Master Plan (CRIMP) is a key document used in the approval process for system enhancement and customer specific projects. This document forms the basis of customer pre-approval for the suite of projects recommended by QR Network to meet QR Network's assessment of Reasonable Demand. The CRIMP provides indicative costing, excluding escalation or financing costs. The QR Network 2008 Access Undertaking refers to the CRIMP as the Coal System Master Plan (CSMP). For the purpose of clarity, this report will refer to the document as the CRIMP. The CRIMP used in this assessment by Evans & Peck is the 2006 version with a September 2007 addendum.

2 BRIEF

In November 2009, the Authority commissioned Evans & Peck to provide technical advice to assist the Authority to determine whether the:

- work undertaken with respect to customer pre-approved projects was consistent with the scope of works approved by customers;
- scope of projects not pre-approved by customers, mostly asset replacement, was prudent;
- standard of all projects was prudent; and
- cost of all projects was prudent.

QR Network's total 2008/2009 RAB Submission is valued at \$400.977 million; the Authority requested Evans & Peck to adopt a risk based approach to assess the most significant of these projects totalling \$394.189 million. The projects assessed by Evans & Peck are predominantly on the Blackwater and Goonyella Systems. The scope included a review of key contracts, tenders and other related agreements.

The brief also required preparation of a self-assessment questionnaire to improve and streamline the review of QR Network's capital expenditure.

A list of reference documents used by Evans & Peck is included at Appendix B.

3 METHODOLOGY

The Evans & Peck's methodology to assess these projects consisted of the following steps:

- Obtaining and reviewing project documentation;
- Interviewing QR Network staff;
- Assessing the project scope against the CRIMP;
- Assessing the project standard by a review of design standards, construction methodology and commissioning documents;
- Assessing the project cost against the estimate in the CRIMP and QR Network's internal budgeting documents; and
- Reviewing project procurement processes.

Evans & Peck have adopted a risk based approach to the project's assessment of prudence. The level of risk and consequent level of detail of review was based upon a particular project's relative contribution to the RAB Submission. A site visit was conducted on selected projects. The site visit inspected elements of seven projects that are included in the 2008/2009 RAB Submission, which included:

- A01574 Westwood-Wycarbah Duplication;
- A01732 Stanwell-Wycarbah Duplication;
- A01933 Callemondah 3rd Spur;
- A02575 ViziRail Coal Network Paths;
- A02471 Callemondah Yard Upgrade;
- A02117 Switch Rollers; and
- A01427 RG Tanna 3rd Loop.

Fundamental to this assessment is an understanding of the requirement for "prudence" and a valid test for "prudence". QR Network is required by the QR Network Access Undertaking October 2008 to maintain a RAB. The RAB is adjusted annually for various reasons and one of the adjustments is the addition of prudent capital expenditure¹. Schedule FB of the QR Network Access Undertaking October 2008 identifies three aspects of prudence:

- prudence of scope;
- prudence of standard; and
- prudence of cost.

Table 1 lists the key elements from Schedule FB and the Authority's Terms of Reference that Evans & Peck considered in assessing prudence of scope, standard and cost.

¹ QR Network Access Undertaking October 2008, Schedule FB p247

Table 1: Key elements in assessing prudence of scope, standard and cost²

Aspect	Schedule FB
Scope	<ul style="list-style-type: none"> ▪ The projects are: <ul style="list-style-type: none"> – “below rail” infrastructure; – commissioned in 2008/2009; – capital expenditure and not maintenance; – approved by 60% of the relevant Customer Group (weighted by Reference Tonnes³); – not excessive to Reasonable Demand; and – consistent with the Network Asset Management Plan. ▪ The projects were funded by QR Network, or the proportion funded by QR Network is clearly stated. ▪ QR Network had reasonable grounds to proceed given the circumstances relevant at the time of the decision⁴. ▪ An assessment of the appropriateness of processes used to evaluate alternatives. ▪ The asset replacement expenditure is consistent with asset age and composition. ▪ Customer specific capital expenditure has been approved by the customer concerned.
Standard	<ul style="list-style-type: none"> ▪ The projects are: <ul style="list-style-type: none"> – of a reasonable standard to meet the scope and not overdesigned; and – consistent with existing standard and configuration of adjacent infrastructure (to the extent that the existing infrastructure has been accepted as reasonable⁵). ▪ In circumstances where there is a departure from existing standards other considerations need to be assessed⁶.
Cost	<ul style="list-style-type: none"> ▪ The project costs are reasonable for the scope and standard considering: <ul style="list-style-type: none"> – scale, nature and complexity; – market conditions; – procurement policies; and – project management aspects.

² Derived from QR Network access Undertaking 2008 Schedule FB and the Authority's terms of reference to Evans & Peck

³ QR Network Access Undertaking October 2008, Schedule FB Clause 2.1 (e)

⁴ QR Network Access Undertaking October 2008, Schedule FB Clause 2.3.2 (b)(ii)

⁵ QR Network Access Undertaking October 2008, Schedule FB Clause 2.3.3 (b)(ii)

⁶ QR Network Access Undertaking October 2008, Schedule FB Clause 2.3.3 (c)

4 DEFINITIONS

Above Rail

*"Above rail operators provide rolling stock, crewing and consumables including fuel. They also obtain access (train paths) from QR Network Access in exchange for the payment of access charges. Access charges are calculated on distance travelled and tonnage railed."*⁷

Below Rail

Below rail *"means the activities associated with the provision and management of rail infrastructure, including the construction, maintenance and renewal of rail infrastructure assets, and the network management services required for the safe operation of train services on the Rail Infrastructure, including train control services and the implementation of safe working procedures."*⁸

Blackwater System

A schematic of the Blackwater System is included at Appendix C. This schematic also summarises the major work area costs, tonnage capacity and contracted tonnage for 2011/2012. Contracted tonnages for the Blackwater System for 2009/2010 and 2011/2012 are included at Appendix D. It should be noted that the actual tonnages for the Blackwater System are currently exceeding the initial contracted tonnages; for example for the period July 2009 to December 2009 29.5mt was transported with a forecast for the full 2009/2010 year of 60.6 mt. This exceeds the initial contracted tonnage for 2009/2010 of 50.8 mt by 9.8 mt or approximately 12%.

Cargo Assembly Mode Supply Chain

A cargo assembly mode supply chain is restricted by the storage capacity at the point of embarkation. In the case of the Goonyella System scheduling of rail traffic is impacted by the limited coal storage at Hay Point and Dalrymple Bay; consequently the flexibility of scheduling rail movements is reduced and is driven by the storage and loading operations of the ports. The Blackwater System does not have the same constraint as the RG Tanna loading facility has ample storage capacity. The key consideration with a cargo assembly mode is that it places additional constraints on scheduling rail traffic that reduce the "above rail" operator's flexibility.

Classes of Expenditure

Schedule FB describes the following classes of expenditure:

- System enhancement is referred to in Schedule FB as "General Expansion Capital Expenditure" and is defined as *"expenditure on capital projects required to expand the existing capacity of the Rail Infrastructure where that Rail Infrastructure is utilised for the benefit of more than one customer or more than one Access Holder"*⁹.
- Asset Replacement expenditure is defined by Schedule FB as *"expenditure on capital projects required to maintain the existing capacity of the Rail Infrastructure (for example, the replacement of life expired or obsolete assets"*¹⁰)".
- Customer Specific projects are projects requested by a coal producer through direct negotiation with QR Network.
-

⁷ 2006 CRIMP p11

⁸ QR Network Access Undertaking 2008 p102

⁹ QR Network Access Undertaking 2008 Schedule FB p259

¹⁰ QR Network Access Undertaking 2008 Schedule FB p259

Central Queensland Coal Region (CQCR)¹¹

The CQCR includes the rail corridors:

- from the ports at Hay Point and Dalrymple Bay to Blair Athol mine, North Goonyella mine, Hail Creek mine and the junction with the Gladstone to Gregory mine corridor;
- from the port of Gladstone (including domestic coal terminals in the vicinity of Gladstone) to Gregory mine and Rolleston mine;
- from the port of Gladstone (including domestic coal terminals in the vicinity of Gladstone) to Moura mine;
- from the port of Abbot Point to Newlands mine; and
- all branch lines directly connecting coal mine loading facilities to the abovementioned corridors.

Coal Rail Infrastructure Management Plan (CRIMP) or Coal System Master Plan (CSMP)

The Coal System Master Plan (CSMP) is *"the central framework to facilitate regulatory review of QR Network Access's expansion capital expenditure plans"*¹². The CRIMP does not include escalation or financing costs (referred to as Interest During Construction (IDC)) in project cost estimates. The CRIMP is referred to in the Access Undertaking as the CSMP; they are the same document.

Goonyella System

A schematic of the Goonyella System is included at Appendix E. This schematic also summarises the major work area costs, tonnage capacity and contracted tonnage for 2011/2012. Contracted tonnages for the Goonyella System for 2009/2010 and 2011/2012 are included at Appendix F.

Interest During Construction (IDC)

QR Network incurs interest cost on funds used for capital works until the works can be recovered through the QR Network Access Undertaking October 2008.

LTIFR

Lost Time Injury Frequency Rate is the ratio of lost time injuries per 1,000,000 manhours worked.

Pre-approval

Regulatory pre-approval of scope can be requested by QR Network from the Authority for system enhancement projects. Pre-approval of the scope of a project will occur under the following circumstances:

- the capital expenditure is asset replacement expenditure and the total amount to be spent over the regulatory period is consistent with asset age and the composition of the assets in the CQCR and is in accordance with QR Network's network asset management plan;
- the capital expenditure is general expansion expenditure and has been accepted by 60% of customers; or
- the expenditure is customer specific (such as a spur line to a mine) and the customer has accepted the scope of the project.

¹¹ This definition in the Access Undertaking will have to be amended to include the GAPE "Northern missing Link" Project.

¹² 2006 CRIMP page 6

The Authority will consider pre-approving the scope of a capital expenditure project that has been accepted by 60% of customers if requested by QR Network. The Authority will also consider the pre-approval of the scope of a project where the project has not been accepted by customers.

QR Network Access Undertaking

The first QR Network Access Undertaking was agreed in 2005. The document was updated in 2008, and a further revised document is currently under review.

The purpose of this document is to clearly state the conditions under which the "below rail" operator (QR Network) provides access to "above rail" operators.

Reasonable Demand

Reasonable demand is "*current contracted demand or likely future demand within a reasonable timeframe*"¹³ and any spare capacity considered appropriate.

Regulatory Asset Base (RAB)

RAB is the asset value accepted by the Authority for the CQCR¹⁴.

5 FINDINGS

5.1 Summary

In Evans & Peck's opinion, the projects submitted by QR Network for inclusion in the RAB were generally found to be prudent in scope, standard and cost.

During the review a number of projects were referred to QR Network for clarification. QR Network promptly provided clarification and in some cases adjusted the submission.

At a system level, QR Network has managed capital enhancement projects to effectively achieve a Just In Time (JIT) provision of capacity to the "above rail" operators. Projects have been designed and completed to a consistent standard and QR Network has taken opportunities to use reduced standards without compromising system capacity where possible. An example of a reduced standard is using recycled 53 kg/m rail at locations where the anticipated rail traffic is less than the main line traffic which may require 60 kg/m new rail; consequently the system capacity is not impacted and the project costs less.

The projects as a whole were completed at a reasonably close total cost to that forecast in the 2006 CRIMP and the 2007 CRIMP Addendum; with some individual projects experiencing overruns and some underruns. Proactive value engineering has been demonstrated in a number of projects.

Table 2 below summarises the findings of this assessment in terms of scope, standard and cost. A number of projects warrant some comment and these are discussed in Section 5.5 and in further detail later in the report.

¹³ QR Network Access Undertaking October 2008 Schedule FB p248

¹⁴ QR Network Access Undertaking October 2008 p115.

Table 2: Summary of Review – QR Network 2008-2009 RAB Submission

(✓ – prudence demonstrated, C– refer to Section 5.5 for comment)

Project ID	Project Name	Value (\$,000)	Prudence Assessment		
			Scope	Standard	Cost
System Enhancement		315,089			
A02262	System Wide – Coal Dust Environmental Evaluation	949	C	✓	✓
A02416	System Wide – Coal Fouling Investigation	763	C	✓	✓
A01574	Blackwater – Westwood-Wycarbah Duplication	28,805	✓	✓	✓
A01732	Blackwater – Stanwell-Wycarbah Duplication	68,528	✓	✓	✓
A01933	Blackwater – Callemondah 3 rd Spur	36,945	✓	✓	C
A01689	Goonyella – Broadlea-Mallawa-Wotonga Duplication	71,344	✓	✓	✓
A02099	Goonyella – Bolingbroke Feeder Station	28,887	✓	✓	C
A01422	Goonyella – Mindi 132kv/50kv Substation	16,782	✓	✓	C
A01907	Goonyella – Harrow Passing Loop (Peak Downs-Saraji)	14,036	✓	✓	C
A02243	Goonyella – Stephens Passing Loop (Dysart-Norwich Park)	13,137	✓	✓	C
	Goonyella to Abbott Point Expansion Early Works	34,913	C	C	C
Asset Replacement		14,432			
A01980	System Wide – COCR Formation Strengthening	3,934	✓	✓	✓
A02575	System Wide – ViziRail Coal Network Paths	554	✓	✓	✓
A02223	Blackwater – Rangal Feeder Station Reconfiguration	218	✓	✓	✓
A02471	Blackwater – Callemondah Yard Upgrade (Arrival Roads)	3,030	✓	✓	✓
A02073	Goonyella – Oaky Creek Balloon Loop Upgrade	4,314	✓	✓	✓
A02117	Goonyella – Switch Rollers	819	✓	✓	✓
A00993	Goonyella – Rail Upgrade	680	✓	✓	✓
A02074	Goonyella – Norwich Park Balloon Loop Upgrade	616	✓	✓	✓
A02072	Goonyella – Goonyella Mine Balloon Loop Upgrade	267	✓	✓	✓
Customer Specific		55,507			
A02395	Vermont Spur and Balloon Loop	55,507	✓	✓	✓
Post Commissioning		7,078			
A01630	Blackwater – Blackwater-Burngrove Duplication	1,764	✓	✓	C
A01427	Blackwater – RG Tanna 3 rd Loop	132	✓	✓	C
A01640	Goonyella – Coppabella Yard Upgrade	2,900	✓	✓	C
A01505	Goonyella – DBCT 3 rd Loop	2,282	C	✓	C
Telecommunications		1,967			
A02706	System Wide – Statewide Data Network Upgrade	1,026	✓	✓	✓
A02389	Statewide Video Conference Upgrade	30	C	C	C
A02708	Blackwater – Blair Athol DMR Upgrade	605	✓	✓	✓
A02588	Moura – DMR Tower Replacement	306	✓	✓	✓
System Wide		1,791			
A02529	QR Network Billing	272	✓	✓	C
A02478	QR Network Internet Revamp	31	✓	✓	✓
A02182	Asset Information Management Improvement Program (AIM)	436	✓	✓	C
A01561	Business Intelligence Platform	364	✓	✓	✓
A00825	SCADA System Replacement	688	✓	✓	C

5.2 Scope

QR Network effectively plan at system and project delivery levels based on the information that is available at the time including consultation with stakeholders. A number of projects clearly show that QR Network is identifying project scope to maximise the capacities of the combined Newlands, Goonyella and Blackwater Systems.

The Broadlea-Mallawa-Wotonga Duplication project highlights the value of the proposed link between the Goonyella System and the Newlands System. This proposed link is known as the Goonyella to Abbot Point Expansion (GAPE) project and the initiation of this project addresses confirmed capacity constraints on the Goonyella System by diverting traffic north to the Newlands System.

The construction of the Harrow and Stephens Passing Loops on the Oaky Creek Branch connecting the Blackwater and Goonyella Systems provides more flexibility in managing the cargo assembly mode constraints of the Goonyella System. The increase in capacity of the Oaky Creek Branch will also on completion of the GAPE project allow diesel trains from the Blackwater and Moura Systems to travel north to the Newlands System; as QR Network for efficiency purposes restricts the Goonyella System to only electric traction powered trains.

A project generally takes a minimum of two years from identification in the CRIMP to construction start. Consequently QR Network must make decisions to progress projects based on information that may be subject to change. In the case of this RAB Submission, recognition of the unanticipated reduction in coal demand in 2008 balanced with the lead time from project identification to project completion must be acknowledged.

Evans & Peck consider the projects were scheduled to meet Reasonable Demand at a system level.

5.3 Standard

The projects under assessment were generally consistent with construction standards adopted across each system. Formation designs were site specific and do not appear overdesigned. In cases where a formation construction could be value engineered to reduce cost, these opportunities were taken up and are reflected in the expended project costs.

5.4 Cost

Generally the cost of projects under assessment was prudent. A number of projects warrant specific comment and these have been described in Section 5.5.

QR Network utilises a system of Memorandums of Understanding (MOU) with contractors for civil, signalling and overhead traction works. There is flexibility for QR Network to contract outside an MOU if QR Network deems the price or conditions proposed do not provide value for money and there are examples where this has occurred¹⁵. There is widespread use of QR Services to deliver specialist services where appropriate. Procurement practices are covered in Section 8 in greater detail.

¹⁵ QR Network took this action for the Broadlea-Mallawa-Wotonga Duplication Project by contracting the civil works outside the current MOU incumbent and realising a significant saving.

5.5 Specific Comments on Selected Projects

Projects that warrant specific comment are listed below:

- System Enhancement:
 - A02262 Coal Dust Environmental Evaluation and A02416 Coal Fouling Investigation;
 - A01933 Callemondah 3rd Spur;
 - A02099 Bolingbroke Feeder Station;
 - A01422 Mindi 132kV/50kV Substation;
 - A01907 Harrow Passing Loop;
 - A02243 Stephens Passing Loop; and
 - Goonyella to Abbott Point Early Works.
- Asset Replacement:
 - A01980 CQCR Formation Strengthening.
- Post Commissioning Projects:
 - A01630 Blackwater-Burngrove Duplication;
 - A01427 RG Tanna 3rd Loop;
 - A01640 Coppabella Yard Upgrade; and
 - A01505 Dalrymple Bay Coal Terminal (DBCT) 3rd Loop.
- Telecommunications:
 - A02389 Statewide Video Conference Upgrade.
- System Wide:
 - A02529 QR Network Billing;
 - A02478 QR Network Internet Revamp;
 - A02182 Asset Information Management Improvement Program;; and
 - A00825 SCADA System Replacement.

5.5.1 Coal Loss Projects

The Coal Dust Environmental Evaluation and Coal Fouling Investigation projects address a problem that is not solely a “below rail” issue. The consequences of ballast fouling and the subsequent reduced asset life directly impact “below rail” assets. However, the implementation and consistent application of procedures to mitigate the occurrence and impact of the fugitive coal dust will probably be with the “above rail” operators or the ports. It is Evans & Peck’s view that effective control can only be achieved through mechanisms that are implemented by the “above rail” operators; however this may require infrastructure that could be classified “below rail” and, if the control and mitigation system fails the “below rail” asset owner may have the greatest exposure to a cost impact. These studies are the first step in addressing the issue and QR Network has explained that QR Limited is addressing the issue with all stakeholders¹⁶.

¹⁶ Discussion with QR Network Manager Program Delivery on 15 December 2009

5.5.2 CRIMP Estimates

The estimates in the 2006 CRIMP for the Callemondah 3rd Spur, Mindi 132kv/50kv Substation, Bolingbroke Feeder Station, Harrow Passing Loop and Stephens Passing Loop are significantly different from their respective final costs. In cases where the costs were significantly greater (Mindi and Bolingbroke) than the CRIMP estimates, QR Network acted promptly and proactively to manage the overruns. The cost underrun on the Callemondah 3rd Spur is attributed to innovative value engineering.

Overall the total final cost of the system enhancement projects in the RAB Submission (\$315.1m), including \$ 34.9m for the GAPE project, was marginally higher than the total estimate in the CRIMP (\$300.5m). It should be acknowledged that estimates at CRIMP stage are concept stage estimates and it is realistic to expect some individual projects to overrun and others to underrun. However, the cumulative result for the projects indicates that QR Network is successfully achieving a P50¹⁷ result from estimate at concept stage to project final delivery cost. It is Evans & Peck's view that in the RAB Submission process P50 estimating is appropriate and QR Network are achieving this when the projects are viewed as a group.

5.5.3 GAPE Early Works

The initial submission for the Goonyella to Abbott Point Expansion (GAPE) Early Works could not be assessed for prudence of cost as it required an assessment of the partially completed civil works for this project. This would require an earned value analysis at a particular point in time matching work completed with actual costs expended. This type of assessment requires a detailed review of cost records matched to the detailed measurements of partially completed works in the field (including survey data).

The revised submission was consistent with the pre-approved scope and it is reasonable to isolate the design components of the early works and approve them for inclusion in the RAB based on the history of the project and the supporting letter from the coal industry representatives.

5.5.4 Post Commissioning Projects

The RG Tanna Works 3rd Loop project is now 18 months beyond post commissioning, which appears to be an unusually long time for a project to continue to incur costs. The other three post commissioned projects have forecast costs extending into 2010/2011 which will need to be addressed in future RAB Submissions.

QR Network has not provided sufficient details for the DBCT post commissioning RAB Submission of what deliverables comprise this submission and consequently Evans & Peck is unable to assess prudence of scope and cost for this project. Scope approved in Table 2.

5.5.5 System Wide and Telecommunications Projects

QR Network have not provided sufficient detail of the state wide Video Conference Upgrade project to allow assessment of scope, standard and cost.

¹⁷ P50 cost estimating describes the situation where half of estimated projects are delivered for under the estimate and the other half over the estimate leading to a net zero gain/loss over all projects.

The 2008/2009 Business Case forecast expenditure for the Asset Information Management Improvement Program was the full phase 1 budget of \$ 3.087m. The 2008/2009 claim of \$258,840 indicates that this project is not making the planned progress. The first test of prudence will be the cost of the project measured against the forecast cost when Phase 1 is complete. Phase 1 is the completion of Business Definition and was planned to occur in 2008/2009. In addition, QR Network have not provided information in regards to procurement methodology for consulting services for this project. From the information provided, Evans & Peck assess the scope and standard as prudent but is unable to assess prudence of cost.

The SCADA System Replacement project is assessed as prudent in scope, standard and cost. The project exceeded the forecast budget, however Evans & Peck assess that the original budget estimate was low and that the final project cost was reasonable.

6 SAFETY, ENVIRONMENT AND DISRUPTION TO SERVICES

6.1 Overview

Evans & Peck are required to have regard to the manner in which QR Network has balanced prudence with the needs of:

- safety during construction and operations;
- compliance with environmental requirements during construction and operation; and
- minimising disruption to the operation of train services.

These factors can be considered at system level, project level or both. QR Network track and report Lost Time Injuries (LTI) and Lost Time Injury Frequency Rates (LTFR) at Network Capital Programme Level (the branch of QR Network responsible for capital delivery).

6.2 Safety

In 2007 QR implemented a safety initiative called "Zero Harm". The initiative has five fundamental principles¹⁸:

- all workplace fatalities, injuries and diseases are preventable;
- no task is so important that it cannot be done in a safe manner;
- we seek to identify all foreseeable hazards and manage the risk associated with them;
- everyone has a personal responsibility for the health and safety of themselves and others; and
- our health and safety performance can always improve.

The target LTFR determined by the QR Board for FY 2008/2009 was 8.5, a 30% reduction on the previous year's result of 12.1. Network Capital Programme had no LTIs in 2008/2009 for 41,870 manhours worked. These figures do not include LTIs and manhours for contractors.

¹⁸ 2007/08 Statement of Corporate Intent

6.3 Environment

There were no major environmental incidents in QR Network's area of operations in 2008/2009¹⁹. The QR Annual Report states that, "*legislative assessment and compliance planning have ensured no significant non-compliances have occurred.*"²⁰ The Coal Dust Environmental Evaluation project addresses an earlier EPA direction. This direction was effectively addressed and closed out to EPA's satisfaction.

6.4 Disruption to Services

QR Network proactively sought to minimise disruption to services by:

- scheduling possessions to coincide with mine and port shutdowns;
- developing comprehensive staging and commissioning plans²¹;
- adopting the zone control system to allow some rail traffic safely through worksites; and
- constructing alternative temporary train paths²².

The only major incident in 2008/2009 identified during this assessment was the derailment at the Harrow Passing Loop during construction. A southbound empty train was derailed by a turnout that had recently been installed. No injuries were recorded in the incident. This derailment blocked the line for three consecutive days and equipment, particularly rolling stock, was damaged.

7 OVERVIEW OF 2008-2009 QR NETWORK REGULATORY ASSET BASE (RAB) SUBMISSION

The QR Network RAB Submission for 2008-2009 totals \$400.977; of which \$395.015m is to be assessed by Evans & Peck for prudency. The Authority did not require Evans & Peck to assess a number of smaller projects submitted by QR Network for approval²³, which accounts for the difference. The majority of QR Network's RAB Submission is system enhancement projects and relates to specific capacity constraints on both the Blackwater (refer Appendix C) and Goonyella Systems (refer Appendix E) as follows:

- Blackwater System:
 - Westwood to Stanwell Duplication (two projects); and
 - Callemondah 3rd Spur.
- Goonyella System:
 - power supplies at Mindi and Bolingbroke;
 - Mallowa-Broadlea-Wotonga Duplication; and
 - Harrow and Stephens Passing Loops.
- GAPE Early Works.

A summary of key project data and construction standards of the project is included at Appendix G.

¹⁹ QR Annual Report 2008/2009 p52

²⁰ QR Annual Report 2008/2009 p54

²¹ An example is the Bolingbroke Feeder Station project.

²² An example is the Callemondah 3rd Spur project.

²³ Evans & Peck were not provided details of these projects. The value of these projects is assumed to account for the difference between the Evans & Peck review figure and the QR Network RAB Submission Total.

Care should be taken in using benchmarks, given the different nature of individual projects. Notwithstanding this the cost to construct a kilometre of rail, including signalling and overhead traction for the projects reviewed ranges from \$4.193m per kilometre to \$ 7.003m per kilometre. The reasons for the variation in rates are addressed in the discussion of each individual project. Evans & Peck consider this range reasonable and consistent with other projects reviewed given that the following factors, among others, will lead to a more expensive per kilometre cost:

- working around operating rail traffic;
- topography (requirement for bridges and culverts);
- constrained areas;
- geotechnical conditions;
- smaller projects; and
- project location.

A summary of capital expenditure to be assessed by Evans & Peck by type of expenditure is listed in Table 3 below.

Table 3: Summary of Capital Expenditure Assessed by Evans & Peck

Project Group	QR RAB Submission	E&P Assessment
System Enhancement		\$315,089
Asset Replacement	\$386,823	\$14,011
Customer Specific		\$55,134
Post Commissioning	\$9,712	\$7,078
Telecommunications	\$2,733	\$1,936
System Wide	\$1,709	\$942
Total	\$410,806	\$395,015

In terms of contracted tonnages the Blackwater System has achieved spare capacity after completion of the system enhancement works described. The Blackwater System is shown schematically in Appendix C (project locations are shown in red) and the contracted tonnages are shown in Appendix D.

QR Network has contract obligations on the Goonyella System to the above rail operators of 111.5 mt/a in 2009/2010 increasing to 127.2 mt/a in 2011/2012. The system enhancement works submitted in the 2008/2009 RAB Submission are required to meet this contracted tonnage. The Goonyella System is shown schematically at Appendix E (project locations are shown in red) and the contracted coal tonnages for 2009/2010 and 2011/2012 are shown in Appendix F. The proposed system enhancements will not completely achieve the required tonnages; consequently the GAPE Early Works are required to absorb the shortfall.

The GAPE Early Works are part of the overall GAPE project which must be operational for 2011/2012 to cater for the contracted tonnages on the Goonyella System that are required to be redirected north to the Newlands System as the Goonyella System will be over capacity.

8 PROCUREMENT

A summary of the procurement methodologies utilised for individual projects is included at Appendix H. This summary shows that in all areas except track construction QR Network used a range of contracting methodologies and external providers to achieve value for money. Tracklaying was completed by QR Services and is addressed in Section 8.7

QR Network maintains a number of long term procurement and service contracts. These contract services include:

- rail supply(contract administered by QR Services);
- concrete sleeper supply(contract administered by QR Services);
- ballast supply (contract administered by QR Services);
- civil construction contractors;
- signalling contractors;
- overhead traction contractors (contract administered by QR Services); and
- specialist rail capabilities by QR Services.

QR Network maintains flexibility with these contracts, in particular on large projects with the option to procure outside these established contracts.

These contracts were reviewed by the Authority in 2007/2008 and found to be prudent.

8.1 Rail Supply

In 2004, QR Services commenced a tender process for a three year steel rail supply agreement to commence in 2006 and expire in 2009 with an option to extend for a further two years. An extensive process of selection was undertaken for the prequalification phase which included direct invitations to seven companies. Four pre-qualification submissions were received and the tender was awarded on the basis of:

- greater confidence in quality;
- better logistics from domestic supplier;
- lower cost; and
- good existing relationship.

8.2 Concrete Sleeper Supply

Prior to 2006 QR Services had obtained concrete sleepers from an established supplier since 1984. In 2005/2006 QR Services held discussions with two other Australian based concrete sleeper manufacturers and both indicated a reluctance to enter the Queensland market. As a result, QR Services renegotiated the existing contract with the existing supplier under an alliance framework. QR Services entered into an alliance style arrangement for the supply of sleepers from 31 March 2006 for 5 years duration. The alliance appears to benefit both parties, with the supplier passing on savings in overheads generated from economies of scale and QR Network's forecasting allowing production efficiency.

8.3 Ballast Supply

The ballast contract provides ballast for maintenance works and minor projects only. Ballast for major projects is handled as part of an individual project's scope and generally as a competitive tender.

8.3.1 Blackwater and Moura Systems

In 2006, QR Network invited tenders for the supply of 50,000 m³ of ballast at a loading site to be nominated by the supplier. Three conforming tenders were received, each with different loading sites. QR Network then adjusted each of the prices to include for loading charges and freight from their respective loading sites. The successful supplier was awarded at the lowest freight adjusted cost. QR Network undertook a reasonable tender process and assessment and selected the supplier which provided the greatest value for money.

8.3.2 Goonyella and Newlands Systems

In 2006, QR Network invited tenders for the supply, delivery and loading of 60,000m³ of ballast delivered to Hatfield. Only one conforming tender was received. QR Network awarded the contract to this supplier following negotiations relating to quantity and rate.

8.4 Civil Construction Contractors

QR Network maintains civil works MOUs with a number of mid-tier contractors. These contractors were selected via an open tender and shortlist process.

QR Network selects a shortlisted contractor to price a particular project and QR Network Engineering Capital Delivery (ECD) reviews the submitted price for competitiveness. The contractor is awarded the project subject to providing a competitive price. In circumstances where QR Network ECD determines that the price is non-competitive, QR Network can approach other shortlisted contractors or alternatively pursue an open tender process.

The process of procurement used by QR Network appears effective. It provides certainty of resources with the flexibility to move outside or cancel an MOU if the contractor is not competitive.

8.5 Signalling Contractors

QR Network maintains MOUs with two signalling contractors. QR Network has the flexibility to use:

- the most competitive of the two MOU contractors;
- QR Services resources;
- an open tender process; and/or
- a combination of the above.²⁴

This arrangement offers certainty of resources and also provides QR Network commercial leverage to achieve the most competitive result.

²⁴ For example on the Stanwell- Wycarbah Project the signalling was installed by QR Services supplemented by a private contractor's resources on day hire during peak periods

8.6 Overhead Traction Contractors

QR Network has two options for overhead traction works: a private sector contractor under an MOU or QR Services. QR Network has limited flexibility for overhead traction power works given the high cost of the equipment and the constraint of the narrow gauge of the CQCR systems. QR Network achieves value for money with QR Services providing competition with the MOU contractor, if required.

8.7 Specialist Rail Capabilities – QR Services

"QR Network procures QR Services Infrastructure Projects (IP) to supply and construct track work (rail, sleepers and ballast) and in some cases signalling, overhead and associated construction works."²⁵

QR Services IP complete all track construction works for QR Network and augments the signalling and overhead traction construction contractors. QR Services have a number of characteristics that QR Network consider when determining what aspects of a project to allocate to them. These characteristics are:

- the ability to provide the complete range of rail construction capabilities;
- specialised equipment for narrow gauge (1067 mm) railways;
- rail safety resources and experience;
- major depots at Mackay and Rockhampton;
- stable experienced staff;
- technical capability; and
- flexibility in resourcing.

"For the 2008/09 year (and prior) QR Services was a cost only service business to QR, that is it was not a profit centre. As a result all costs booked to the project in this report are material and payroll costs only. No operator costs or margin are included."²⁶ To address the lack of a margin or ROA recovery QR Network recover an extra charge from each project for QR Service work completed. Details of this fee relevant to the projects assessed are included at Appendix I. It is reasonable to recover for these costs; however the mechanism for calculating the recovery amount is not clear.

The arrangements above provide evidence of competitive procurement methodology for the construction areas of signalling and overhead traction construction. However, QR Network have identified that these arrangements have limitations, particularly benchmarking track work. As of 1 July 2009 QR Network have implemented revised arrangements with QR Services via an alliance agreement for maintenance and a Product Delivery Agreement for capital works which allows project delivery by alliance, fixed price, schedule of rates or cost plus mechanisms. These new arrangements will assist benchmarking of the track work aspect of QR Services work for QR Network.

In regard to the 2008/2009 RAB Submission, Evans & Peck consider the construction costs achieved by QR Network, refer to Appendix G, as reasonable.

²⁵ QR Network 2008/09 Capex Submission QR Services Infrastructure Projects

²⁶ QR Network 2008/09 Capex Submission QR Services Infrastructure Projects

9 SYSTEM ENHANCEMENT

9.1 General

System enhancement projects increase the capacity of "below rail" infrastructure in terms of net tonnage of coal that can be transported. They are determined by supply chain analysis and must consider, among other factors, the following:

- contracted tonnages;
- forecast tonnages; and
- the lag between project scoping (in the CRIMP) and project commencement.

Based on the 2009/2010 contracted tonnages the Blackwater System at Wycarbah has approximately 17 mt/a (or 33%) spare capacity²⁷ and for contracted tonnages in 2011/2012 will still have 10 mt/a (or 17%) spare capacity²⁸. However as stated earlier the actual tonnages for the Blackwater System are exceeding the initial contracted tonnages by approximately 12% and consequently this spare capacity will be required.

The Goonyella System over the Broadlea-Mallawa-Wotonga section for 2009/2010 contracted tonnages has approximately 10.6 mt/a spare capacity (or approximately 20%)²⁹ and this is forecast to be absorbed by 2011/2012³⁰ when the contracted tonnages exceed the current capacity by 4 mt/a (or 7%). QR Network's plan to address this shortfall is to have the link to the Newlands System operational by this time to allow diversion of some traffic north.

At a high level, the final total project value is \$9.9m over the \$300.5m submitted to the coal user groups in the 2006 CRIMP and 2007 Addenda³¹; approximately a 3.3 % over run. It should also be noted that in the 2007 Addenda QR Network advised the coal user groups that the GAPE costs would range between \$27m and \$34m; if we compare the final result using \$34m as the CRIMP figure for GAPE (Table 4 uses \$27m) then the overrun reduces to \$2.9m, or approximately 1%. This comparative result indicates that the CRIMP was effective in advising the coal users of the capital expenditure intended by QR Network to deliver these projects. A list of relevant customer pre-approved budgets is included in Appendix J.

It is Evans & Peck's opinion that QR Network has been prudent with their system level planning of project delivery.

QR Network has requested that the projects listed below in Table 4 be included in the RAB Submission for 2008-2009.

²⁷ Section capacity is 68 mt/a with contracted tonnages at 50.8 mt/a.

²⁸ Contracted tonnages for 2011/2012 are 58.6 mt/a.

²⁹ Section capacity is 58 mt/a with contracted tonnages at 47.4 mt/a.

³⁰ Contracted tonnages for 2011/2012 are 61.1 mt/a.

³¹ These figures do not allow for the additional cost of the IDC which is valued at \$14,730,432.

Table 4: System Enhancement projects in the 2008/2009 RAB Submission

Project ID	Project Name	Value 2006 CRIMP or 2007 Addendum (\$,000)	Total Actual Forecast Project Cost ³² (excluding IDC)
A02262	System Wide – Coal Dust Environmental Evaluation	\$3,000	\$880
A02416	System Wide – Coal Fouling Investigation		\$708
A01574	Blackwater – Westwood-Wycarbah Duplication	\$34,000	\$26,485
A01732	Blackwater – Stanwell-Wycarbah Duplication	\$71,500	\$70,259
A01933	Blackwater – Callemondah 3 rd Spur	\$48,000 ³³	\$36,572
A01689	Goonyella – Broadlea-Mallawa-Wotonga Duplication	\$67,000	\$68,157
A02099	Goonyella – Bolingbroke Feeder Station	\$16,000	\$31,461
A01422	Goonyella – Mindi 132kv/50kv Substation	\$14,000	\$18,263
A01907	Goonyella – Harrow Passing Loop (Peak Downs-Saraji)	\$10,000	\$14,298
A02243	Goonyella – Stephens Passing Loop (Dysart-Norwich Park)	\$10,000	\$14,159
	Goonyella to Abbott Point Early Works	\$27,000	\$31,855
	Total	\$300,500	\$313,097

9.2 A02262 Coal Dust Environmental Evaluation and A02416 Coal Fouling Investigation

The Coal Dust Environmental Evaluation and Coal Fouling Investigation projects were initiated to address a notice from EPA to QR Limited to conduct an Environmental Evaluation (EE) to assess the impact of coal dust from trains which leads to dust emissions and fouling of ballast. The former can trigger community complaints and negative media and the latter impacts the structural performance and service life of the ballast. The objective of the projects were *“to determine the current activities and the position of QR Network as relates to coal loss, and recommend a strategy going forward.”*³⁴

The chronology of the projects is summarised as follows:

- 2 July 2007 – EPA issues notice to conduct EE to QR Limited;
- 31 March 2008 – EE completed;
- 26 February 2009 – the Authority defers pre-approval³⁵;
- 28 March 2009 – QR Network provides additional supporting paper; and
- 23 April 2009 – the Authority pre-approves project³⁶.

³² Total project value is the 2008/2009 RAB Submission plus costs to December 2009 plus forecast future costs.

³³ The CRIMP separated the 3rd Spur Expansion, \$25m and Callemondah to RG Tanna Holding Roads, \$23m. QR subsequently delivered these as one project with a Business Case of \$40.5m and a corresponding budget of \$48m.

³⁴ QR Network 2008/2009 Capital Expenditure Claim Coal Dust Environmental Evaluation.

³⁵ The Authority deferred approval on the basis that it was not evident that these were capacity enhancement projects.

³⁶ The Authority acknowledge that QR had sought and received the required 60% endorsement from the CQCR customer group.

The Authority's pre-approval quotes a budget of \$3m. This RAB Submission requests:

- \$880,000 for the Coal Dust Environmental Evaluation (Project A02262); and
- \$708,000 for the Coal Fouling Investigation (Project A02416).

QR Network anticipates no future costs as both projects have reached financial close; however the pre-approved scope includes development of a strategy to deal with fugitive coal dust. Evans & Peck's view from the information provided is that this strategy is yet to be developed and this will require further expenditure.

9.2.1 Prudency of Scope

The projects:

- are not clearly "below rail" infrastructure;
- were completed in 2008/2009;
- were approved by the relevant customer group and the Authority;
- were consistent with the Network Asset Management Plan where coal contamination was identified as having a significant impact on the required frequency of ballast cleaning; and
- were funded by QR Network (that is QR Network financed the full project with the intent of recovering the costs through the mechanism of the Access Undertaking and that no other party contributed funds to the project).

The notice from EPA was issued to QR Limited. QR Limited tasked QR Network to address the issue on the basis that QR Network was the only organisation that covered the whole network. The scope of this project was pre-approved by the customer group and the Authority.

The EE identifies a number of mitigation options, including:

- veneering of coal surface of wagons;
- load profiling;
- wagon washing;
- wagon unloading; and
- wagon lids.

These mitigation options are substantially within the control of the "above rail" operators. Effective implementation of any mitigation measure will require a mechanism that encourages the above rail operators to address coal loss.

Although not solely a "below rail" issue, QR Network had reasonable grounds to proceed with the initial investigation because QR Network assets are directly impacted and the QR Limited rationale that QR Network can address the whole network is considered by Evans & Peck to be valid. QR Network used appropriate processes to evaluate alternatives and a rigorous tender process to select the consultant. However future implementation of measures to address the issue of fugitive coal dust will require a system perspective as opposed to "below rail" only.

9.2.2 Prudency of Standard

The EPA acknowledged in April 2008 that the EE satisfied the requirements of the notice issued to QR Limited in July 2007. From the information available and assessed by Evans & Peck, the project is of a reasonable standard to meet the scope, not overdesigned and in Evans & Peck's opinion the standard is considered prudent.

9.2.3 Prudency of Cost

In Evans & Peck's opinion, the costs are reasonable for the scope and standard considering:

- scale, nature and complexity;
- market conditions;
- procurement policies; and
- project management aspects.

Projects such as this are generally "one offs" and no benchmarking is readily available. QR Network applied a sound tendering and consultant management strategy and the consultants were chosen through a competitive tender process. Variation or change management processes through the consulting period were implemented. From the information available, Evans & Peck's opinion is that the costs are assessed as prudent.

9.3 A01574 Westwood to Wycarbah Duplication

The objective of the Westwood to Wycarbah Duplication project is *"to provide additional capacity on the Blackwater System in order to cater for planned increases in coal traffic."*³⁷ The duplication increased capacity from 61-66 mt/a to 62-68 mt/a.

The project was part of a series of duplications called the Blackwater Capacity Enhancement (BCE) program which incrementally increased the below rail capacity of the Blackwater System. This series of duplications consisted of:

- Wallaroo to Dingo 45-47 mt/a (completed);
- Windah to Grantleigh 50-54 mt/a (completed);
- Bluff to Blackwater 55-58 mt/a (completed);
- Aroona to Duaringa 57-60 mt/a (completed);
- Blackwater to Burngrove 61-66 mt/a (completed); and
- Westwood to Wycarbah (Ch 38.570 km to 45.495 km) 62-68 mt/a (this submission).

³⁷ QR Network QCA Submission Westwood to Wycarbah



Figure 1: Westwood-Wycarbah Duplication

An additional section was included in the 2007 Addendum to the CRIMP; the Stanwell to Wycarbah Duplication. This project provides greater certainty to the 68 mt/a capacity and is addressed in Section 9.4. There will be further capacity expansion required on this section when the Southern Missing Link and the Wiggins Island Coal Terminal (WICT) projects are initiated.

The Westwood to Wycarbah project scope consisted of:

- land acquisition;
- 6.925 km of track;
- civil works;
- electrification works;
- signalling works; and
- telecommunications.

The chronology and costs of the project are included in Table 5 below.

Table 5: Chronology and Costs – Westwood to Wycarbah Duplication

Stage	Date	Project Cost or Estimate	Comments
CRIMP	September 2006	\$34,000,000	
Business Case	October 2006	\$32,000,000	
Project Plan	November 2006	\$32,000,000	
Completion Report Forecast	November 2008	\$32,000,000	
Actual cost to date	December 2009	\$25,832,989	
RAB Submission 2008/2009	October 2008	\$25,788,304	Excludes IDC
RAB Submission IDC		\$2,554,809	
RAB Submission QR Services		\$461,809	
Future Claim	RAB 09/10	\$234,746	
Forecast Final Cost (Excluding IDC and QR Services)		\$26,023,050	
Total Forecast Final Cost		\$29,039,668	

9.3.1 Prudency of Scope

The project:

- is “below rail” infrastructure;
- was completed in 2008/2009;
- was approved by the relevant Customer Group and the Authority;
- was identified in the Network Asset Management Plan and valued at \$23m; and
- was funded by QR Network.

This project is the second last section of the Blackwater Capacity Enhancement (BCE) program to be commissioned, as planned in the 2006 CRIMP and 2007 Addendum³⁸.

The rationale behind the Blackwater Capacity Enhancement program is that forecast tonnages on the Blackwater System were to increase from 48 mt/a in 2006/2007 to 68 mt/a in 2008. This additional forecast requirement led to two additional enhancements becoming necessary but not identified in the 2006 CRIMP. These were addressed in the September 2007 addendum to the CRIMP and subsequently approved by the Customer Group and pre-approved by the Authority.

From the information assessed by Evans & Peck, the scope is considered as prudent.

9.3.2 Prudency of Standard

The standards used in this project are consistent with that of mainline track for the Blackwater System, except for the train operating speed. The duplication uses the following standards:

- 60 kg/m rail;

³⁸ Additional duplications will be required for Wiggins Island Coal Terminal (WICT) and will be incorporated into the 2009 CRIMP

- 28 tonne axle load concrete sleepers;
- 300 mm depth of ballast;
- formation design of 300mm of CBR 50 on 300mm of CBR 15; and
- 100 km/h train speed.

The Blackwater System typically allows for trains travelling at 80 km/h, the Westwood to Wycarbah duplication will allow for 100 km/h (refer Figure 2). This allowance for increased speed is inconsistent with the mainline track speed but is not judged to be significant as the particular section of track is flat with some horizontal curves and there would be minimal cost impact to design and rate the section to 100 km/h as opposed to 80 km/h. The 100 km/h speed limit provides more flexibility for scheduling traffic.



Figure 2: 100 km/h speed limits on Westwood to Wycarbah Duplication

From the information available and assessed by Evans & Peck the project is of a reasonable standard to meet the scope, not overdesigned and in Evans & Peck's opinion the standard is considered prudent.

9.3.3 Prudence of Cost

In Evans & Peck's opinion the costs are reasonable for the scope and standard considering:

- scale, nature and complexity;
- market conditions;
- procurement policies; and
- project management aspects.

QR Network used the incumbent civil construction and signalling contractors. The overhead power was constructed by QR Services with some assistance from the incumbent MOU contractor. The cost of the project was approximately \$4.193m per kilometre of track which is reasonable for a project of this type in flat country with no bridges.

An amount of \$28,804,922 has been included in QR's 2007/08 RAB Submission. The project's forecast cost at completion is \$29,039,668. The project was commissioned in August 2008. The project was operational during the site visit. The forecast final cost falls within the 2006 CRIMP budget of \$34,000,000.

From the information assessed by Evans & Peck, the costs are considered as prudent.

9.4 A01732 Stanwell to Wycarbah Duplication

The Stanwell to Wycarbah Duplication is the final part of the current BCE program. The objective of this project was *"to provide an additional 2mt/a system capacity using 28 consists resulting in a total Blackwater System capacity of 68 mt/a."*³⁹ Effectively, this project provides more certainty to the 68 mt/a capacity of this section of the Blackwater System.

The Stanwell to Wycarbah component of the Blackwater System is immediately to the east of a series of single track sections that have been sequentially duplicated as described in section 9.3. The project scope consisted of:

- land acquisition;
- 10.920 km of track;
- civil works;
- three bridges, with a total length of 157 m;
- electrification;
- signalling; and
- telecommunications.

³⁹ QR Network Funding Submission 1 October 2007



Figure 3: Bridge on the Stanwell to Wycarbah Duplication

The chronology and cost details of the project are included in Table 6 below.

Table 6: Chronology and Costs – Stanwell to Wycarbah Duplication

Stage	Date	Project Cost or Estimate	Comments
CRIMP Addendum	September 2007	\$71,500,000	
Business Case	October 2007	\$71,500,000	
Project Plan	September 2007	\$71,500,000	
Completion Report	September 2009	\$69,500,000	
Actual cost to date	December 2009	\$66,537,619	
RAB Submission 2008/2009	October 2008	\$65,630,663	Excludes IDC
RAB Submission IDC		\$1,721,784	
RAB Submission QR Services		\$1,175,295	
Future Claim	RAB 09/10	\$3,453,000	
Forecast Final Cost (Excluding IDC and QR Services)		\$69,083,663	
Total Forecast Final Cost		\$71,980,742	

9.4.1 Prudence of Scope

The project:

- is “below rail” infrastructure;
- was completed in 2008/2009;
- was approved by the relevant Customer Group and the Authority;

- was not identified in the Network Asset Management Plan; and
- was funded by QR Network.

In early 2007, the forecast tonnages on the Blackwater System predicted an increase from 48 mt/a in 2006/2007 to 68 mt/a in 2007/2008. This capacity increase required two additional enhancements not identified in the 2006 CRIMP; the Stanwell to Wycarbah Duplication and the Grangeley Tunnel Duplication. These duplications were subsequently addressed in the September 2007 Addendum and pre-approved by the Customer Group and the Authority. Although the forecast tonnages⁴⁰ did not eventuate at the time, the scope of work is considered and assessed as reasonable given the information available at the time of preparing the September 2007 Addendum; immediately prior to the Global Financial Crisis (GFC).

From the information assessed by Evans & Peck, the scope is considered as prudent.

9.4.2 Prudency of Standard

The standards used in this project are consistent with that of mainline track for the Blackwater System.

The project used the following standards for trackwork:

- 60 kg/m rail;
- 28 tonne axle load concrete sleepers;
- 300 mm depth of ballast;
- formation design of 300mm of CBR 50 on 300mm of CBR 15; and
- 80 km/h train speed.

The Bushley Road Overpass which is part of the Capricorn Highway and part of this project was constructed to Department of Main Roads (DMR) standards. This overpass consisted of a three span road bridge with reinforced earth approaches.

From the information available and assessed by Evans & Peck the project is of a reasonable standard to meet the scope, not overdesigned and in Evans & Peck's opinion the standard is considered prudent.

9.4.3 Prudency of Cost

In Evans & Peck's opinion the costs are reasonable for the scope and standard considering:

- scale, nature and complexity;
- market conditions;
- procurement policies; and
- project management aspects.

The forecast cost at completion in the RAB submission is \$67,800,000, and the submission for 2008/2009 is \$68,527,742. There is approximately \$3,453,000 in post commissioning costs that QR Network has stated it will be submitting in the 2009/2010 RAB giving a total forecast cost of

⁴⁰ Contracted tonnages for this section of track for 2011/2012 are 62.1 mt/a.

\$71,980,742. The project costs will be completed close to the CRIMP estimate of \$71,500,000 (excluding IDC); although the forecast cost in the RAB submission is low.

QR Network used the incumbent civil construction and signalling contractors. The overhead power was constructed by QR Services with some assistance from the incumbent MOU contractor. The cost of the project was approximately \$6.592m per kilometre of track which appears high; however if the Bushley overpass (\$14.4m) and bridges (approximately \$6m) are excluded the rate per kilometre of track is approximately \$4.723m; which is reasonable.

There were no major environmental or safety issues on this project. This project was the first to implement zonal controls, which greatly increased efficiency and minimised disruption to trains by allowing strictly controlled rail traffic through work sites. There were also no impacts on rail services outside of planned possessions. Improved productivity was gained by replacing the weekly 12 hour maintenance shutdowns with a monthly 48 hour shutdown.

From the information assessed by Evans & Peck, the costs are considered prudent.

9.5 A01933 Callemondah 3rd Spur

The Callemondah 3rd Spur project scope includes:

- the 3rd spur (2,800 m);
- an extension of N^o 2 Arrival Road (1,100 m);
- modification to cable troughs; and
- an upgrade of the yard power systems.

In July 2009 the length of trains from Moura increased from 61 wagons to 86 wagons and the existing N^o 2 arrival road at the Callemondah Yard was consequently too short for this new configuration impacting the overall capacity of the yard.



Figure 4: Callemondah 3rd Spur

The chronology and costs for the project are shown in Table 7 below.

Table 7: Chronology and Costs – Callemondah 3rd Spur

Stage	Date	Project Cost or Estimate	Comments
CRIMP	September 2006	\$25,000,000 \$23,000,000	This project combined two CRIMP projects ⁴¹
Business Case	February 2007	\$40,500,000	
Project Plan	September 2007	\$40,505,000	
Completion Report Forecast	July 2009	\$35,350,000	
Actual cost to date	December 2009	\$33,845,714	
RAB Submission 2008/2009	October 2008	\$33,845,329	Excludes IDC
RAB Submission IDC		\$2,493,641	
RAB Submission QR Services		\$606,092	
Future Claim	RAB 2009/10	\$2,120,700	
Forecast Final Cost (Excluding IDC and QR Services)		\$35,966,029	
Total Forecast Final Cost		\$39,065,762	

9.5.1 Prudence of Scope

The project:

- is "below rail" infrastructure;
- was completed in 2008/2009;
- was approved by the relevant Customer Group and the Authority;
- was identified in the Network Asset Management Plan but not costed; and
- was funded by QR Network.

The initial scope of work detailed in the 2006 CRIMP was approved by Customer Group vote and Authority notification in February 2007.

"As well as providing additional capacity into the Callemondah area, the development of the 3rd Spur also provides an increase in system reliability and robustness which will be a key factor in the success of the systems being able to meet contractual commitments. The primary business objective of this project was to meet the projected coal haulage requirements of the coal mines in the Blackwater System and to provide rail capacity to match the upgraded storage and ship loading capacity of the Port of Gladstone."⁴²

From the information assessed by Evans & Peck, the scope is considered prudent.

⁴¹ The CRIMP separated the 3rd Spur Expansion, \$25m, and Callemondah to RG Tanna holding roads, \$23m. QR Network subsequently delivered these as one project with a Business Case of \$40.5m.

⁴² QR Network QCA submission

9.5.2 Prudency of Standard

The standards used in this project are consistent with that of mainline track for the Blackwater System.

The project used the following standards for trackwork:

- 60kg/m rail;
- 28 tonne axle load concrete sleepers;
- 300mm depth of ballast;
- formation repairs where required; and
- 25km/h train speed.

From the information available and assessed by Evans & Peck, the project is of a reasonable standard to meet the scope, not overdesigned and in Evans & Peck's opinion the standard is considered prudent.

9.5.3 Prudency of Cost

In Evans & Peck's opinion, the costs are reasonable for the scope and standard considering:

- scale, nature and complexity;
- market conditions;
- procurement policies; and
- project management aspects.

The combined budget from the original two projects in the 2006 CRIMP was \$48,000,000. After options analysis, QR Network provided a business case for the two projects combined at \$40,500,000. By combining the projects QR Network could reduce cost by combining possessions and removing some mobilisation and demobilisation costs. The forecast completion cost in July 2009 was \$33,350,000; this appears low and will more likely be approximately \$39,000,000, which is still within the CRIMP estimate.

It is difficult to benchmark a construction rate for this project because of the mix of various types of projects, the constrained site and the additional cost impact of construction in an operating yard. Adjusting the project cost by removing the electrical costs and the cable troughs gives a rate of \$7.003m per kilometre which appears high. Considering the nature of the site and construction conditions Evans & Peck consider the costs reasonable.

No significant safety issues were recorded on the project. There were also no significant environmental issues recorded during the project. Potential Acid Sulphate Soil (PASS) considerations were identified during the concept stage with planned management during the construction phase. The project implemented a significant innovation by extending an existing road to become a "run around" road which allowed diesel Moura and Blackwater services to continue while the project possessed track during shutdowns. There were no disruptions or lost time outside of planned possessions.

From the information assessed by Evans & Peck, the costs are considered prudent.

9.6 A01689 Broadlea-Mallawa-Wotonga Duplication

The objective of the Broadlea-Mallawa-Wotonga Duplication was "to duplicate the rail infrastructure between Broadlea and Wotonga to increase the available train paths within the Goonyella System."⁴³ The Broadlea-Mallawa-Wotonga section of the Goonyella Line is immediately to the east of the junction of the West Goonyella and North Goonyella sections at Wotonga. East of Broadlea the line is already duplicated. This non-duplicated part of the line created a constraint on the capacity of the supply chain. The duplication increased capacity from 40mt/a to 57mt/a. The Broadlea Mallawa Wotonga project scope consisted of:

- 13.7km of track (approximate);
- civil works;
- electrification works;
- signalling works; and
- telecommunications.

The chronology and costs of the project are shown in Table 8 below.

Table 8: Chronology and Costs – Broadlea-Mallawa-Wotonga Duplication

Stage	Date	Project Cost or Estimate	Comments
CRIMP	September 2006	\$67,000,000	
Business Case	October 2006	\$88,000,000	
Project Plan	September 2006	\$88,000,000	
Completion Report	May 2009	\$67,000,000	
Actual Costs to Date	December 2009	\$66,218,841	
RAB Submission 2008/2009	October 2008	\$65,411,808	Excludes IDC
RAB Submission IDC		\$4,761,165	
RAB Submission QR Services		\$1,171,375	
Future Claim	RAB 2009/2010	\$1,573,522	
Forecast Final Cost (Excluding IDC and QR Services)		\$66,985,330	
Total Forecast Final Cost		\$72,917,870	

9.6.1 Prudency of Scope

The project:

- is "below rail" infrastructure;
- was completed in 2008/2009;
- was approved by the relevant Customer Group and the Authority;
- was identified in the Network Asset Management Plan and estimated at \$57.8m; and
- was funded by QR Network.

⁴³ Business Case Internal October 2006

The project had customer approval for \$67,000,000 based on the Coal Rail Infrastructure Master Plan 2006. The scope of the project was also consistent with the Network Asset Management Plan and CRIMP. The trigger for investment was when the contracted tonnage for 2006 of 42.6 mt/a⁴⁴ exceeded the rail capacity at that time of 38 mt/a. The duplication increases capacity to 57 mt/a. It is worth noting that the contracted tonnages for 2009/2010 are 47.4 mt/a and for 2011/2012 are 61.1 mt/a; therefore the line will be at capacity before 2011. This fits the criteria for Reasonable Demand of likely future demand within a reasonable timeframe.

From the information assessed by Evans & Peck, the scope is considered as prudent.

9.6.2 Prudency of Standard

The standards used in this project are consistent with that of mainline track for the Goonyella System:

- 60 kg/m rail;
- 28 tonne axle load concrete sleepers;
- 300 mm depth of ballast;
- formation construction designed as 300 mm CBR 45 on 300 mm of lime stabilised subgrade (the lime stabilisation was deleted after inspection of in situ subgrade found better conditions than anticipated);
- 80 km/h train speed;
- track centres of 4.3 m;
- access road at formation level;
- 1:25 SNX turnouts; and
- curves less than R1000 to be head hardened.

From the information available and assessed by Evans & Peck the project is of a reasonable standard to meet the scope, not overdesigned and in Evans & Peck's opinion the standard is considered prudent.

9.6.3 Prudency of Cost

In Evans & Peck's opinion the costs are reasonable for the scope and standard considering:

- scale, nature and complexity;
- market conditions;
- procurement policies; and
- project management aspects.

The project was delivered for a value consistent with the 2006 CRIMP and budgeted allocations. The CRIMP value did not allow for escalation or interest during construction. The forecast completion cost was estimated at \$67m in May 2009, which is the same as the target in the 2006 CRIMP. The business case and project plan were submitted at \$88m, however, this cost was not realised due to the lime stabilised base not being required. Based on information provided to Evans & Peck the final cost will be approximately \$73m, which is a rate per kilometre of \$5.329m;

⁴⁴ QRB Meeting 23 October 2006 p14

this is a reasonable rate as this particular section of track required the additional cost of bidirectional signalling to allow trains to run in both an up and down direction. The bidirectional signalling was required to allow trains travelling east to DBCT to cross over one another to suit port sequencing and to allow loaded trains heading west onto the South Goonyella Branch/Oaky Creek Branch for destination to Gladstone via the Blackwater System.

The civil work for this project was originally quoted at approximately \$30m by the civil works MOU incumbent. QR Network negotiated with the MOU incumbent to approximately \$24m however QR Network was still not confident the price was competitive. In March 2007, QR Network called an open tender for this project. The final civil works price achieved was approximately \$17m. This example illustrates the flexibility of QR Network's MOU arrangements.

No significant environmental or safety issues occurred on the project and there were minimal disruptions to the network outside of planned possessions. It should be noted that the high level of traffic on this section impacted the availability of closures.

From the information assessed by Evans & Peck, the costs are considered prudent.

9.7 A02099 Bolingbroke Feeder Station

9.7.1 Goonyella System Electrification

The original Goonyella Electrification was constructed in the early to mid 1980's. The original system consisted of seven feeder stations fed from the Powerlink 132kV transmission system. Each station supplies two electrical sections which are up to 40km long each. Under normal operating conditions, each electrical section is required to be isolated from the neighbouring sections as they are fed from different phases of the 132kV system. The isolation points are known as Track Sectioning Cubicles (TSC's). Under emergency feeding conditions the TSC's may be configured to feed through from one section to another. This may be required in the case of a failed feeder station. In this case the electrical section lengths become much longer, which restricts the traffic density due to voltage drop and transformer loading.

Each feeder station consists of two 132/50kV transformers and associated harmonic filters. The harmonic filters are required due to the distorted load current, which the locomotives draw from the power supply. The harmonic filters act to smooth the distorted currents and are a requirement to meet the power quality restrictions imposed by the National Electricity Rules. In addition to harmonic filters, many feeder stations have a Load Balancing Static VAR Compensator (SVC) to minimise unbalanced voltages caused by the unbalanced loading imposed by the railway traffic. An electrified railway is inherently unbalanced due to load being drawn from only two phases. The third phase is unloaded and the other two phases do not equal loads. The SVC is essentially a voltage control device which can regulate each phase independently. Therefore it removes the effect of unbalanced load, which is another requirement of the National Electricity Rules.

At the feeder stations and TSC's, there is a requirement for switchgear so that the sections can be remotely switched and configured to address different operational and contingency requirements. The switchgear is also essential to provide a protective function in the event of faults in the electrical section. Traditionally, QR has used Air Insulated Switchgear (AIS). However, in the new Bolingbroke Feeder Station the more recent technology of Gas Insulated Switchgear (GIS) is being introduced.

The lifetime of the assets varies across the equipment type. In the case of the AIS it has been reported to have been reliable in the past, however, some will need to be replaced in the medium term. The transformers are 25 to 30 years old. This is not considered old for medium size transformers. However, the load profile is highly cyclical and these transformers may not be as long lived as units with a more stable operating environment. Nevertheless, it would be expected the remaining life will be at least a further 10 years.

Harmonic filters have to date not showed any signs of age related failures. The existing Static VAR compensators have recently been refurbished with new control systems being implemented. The major passive elements, power capacitors and reactors were not replaced. Evans & Peck estimate the lifetime of this equipment will be extended by 15 to 20 years.

9.7.2 Bolingbroke Scope

The new feeder station at Bolingbroke was installed to increase the capacity of the Goonyella System to 140 mt/a by reducing the separation time between trains from 30 minutes to 20 minutes.

The components of the Bolingbroke Feeder Station are summarised as follows:

- 2 supply transformers (converts 132kV AC to 50kV DC);
- 12 auto transformers (converts the 50kV DC to 25kV DC);
- 2 harmonic filter (smoothes the current delivered from the Power Network);
- switch station;
- backup power supply;
- earthing mat;
- a new Track Section Cabin(TSC) at Balook; and
- a new Track Section Cabin(TSC) at Black Mountain.



Figure 5: Example of a Track Sectioning Cabin (TSC)

The costs and chronology of the Bolingbroke Feeder Station project are included at Table 9.

Table 9: Chronology and Costs – A02099 Bolingbroke Feeder Station

Stage	Date	Project Cost or Estimate	Comments
CRIMP	September 2006	\$16,000,000	
Business Case	November 2007	\$29,900,000	
Project Plan	July 2007	\$29,900,000	
Completion Report Forecast	-	-	
Actual cost to date	December 2009	\$29,726,002	
RAB Submission 2008/2009	October 2008	\$27,829,918	Excludes IDC
RAB Submission IDC		\$555,892	
RAB Submission QR Services		\$498,370	
Forecast Final Cost (Excluding IDC and QR Services)		\$66,985,330	
		\$30,962,563	
Future Claim	RAB 09/10	\$3,132,645	
Total Forecast Final Cost		\$32,016,825	

9.7.3 Prudency of Scope

The project:

- is "below rail" infrastructure;
- was completed in 2008/2009;
- was approved by the relevant Customer Group and the Authority;
- was identified in the Network Asset Management Plan and estimated at \$11.75m; and
- was funded by QR Network.

The Bolingbroke Feeder Station was required to increase power supply capacity to allow throughput tonnages of 140 mt/a⁴⁵ by accommodating a train separation of between 20 and 24 minutes.⁴⁶ A throughput of 140 mt/a requires an average of 40 services over the belt per day⁴⁷ and based on historical fluctuations in traffic flow this equates to a peak of up to 57 services over the belt per day⁴⁸; at approximately 25 minutes separation. The QR target is slightly lower than 25 minutes and would allow for a moderate increase beyond 140 mt/a or some contingency.

The Connor's Range section of the Goonyella System between Jilalan and Bolingbroke creates a system constraint because of the time required to negotiate the range for loaded and unloaded trains⁴⁹. QR Network has a speed restriction of 50 km/h and a policy of no more than two trains on the Connor's Range section simultaneously due to braking considerations. This constraint is reasonable as a major derailment occurred in 2001⁵⁰ and having more than two trains on the range increases the risk exposure. Designing the power system to cope with a 20 minute separation aligns the power supply, the signalling and the system constraint.

The modelling result presented in the "Goonyella System (Coppabella to the Ports) Power Systems Capacity Analysis" report indicates that a 21 minute separation would be possible, however, *"overloading will occur occasionally due to random traffic patterns"*⁵¹. In this report, the extra feeder station at Bolingbroke is justified based on contingency events. However, the report also states QR Network was already having problems with overloading in the Goonyella System at Coppabella and Wandoo and QR Network controlled these problems by enforcing the 30 minute separation. This minimum separation solved the overloading problem but restricted the throughput to below 122 mt/a; therefore action was required as the capacity would be exceeded by the contract tonnages for 2011/2012 (125 mt/a).

Evans & Peck has simulated the train traffic with a 22 +/-2 minute separation distributed by a random variable using a Railplan Model. The result of this simulation indicates that, without a Bolingbroke Feeder Station, the Oonooie Feeder Station would be substantially overloaded on a frequent basis. Evans & Peck also simulated the system with a 32 +/-2 minute separation; under this scenario the Oonooie Feeder Station was not overloaded. The Evans & Peck power capacity analysis is included in Appendix K.

⁴⁵ Goonyella System (Coppabella to the Ports) Power Systems Capacity Analysis, QR, May 2007, Best Value Report Section 2.2

⁴⁶ Goonyella System (Coppabella to the Ports) Power Systems Capacity Analysis, QR, May 2007, Best Value Report Section 2.3

⁴⁷ 40 services of 9,600 tonne (net) for 365 days = 140 mt/a.

⁴⁸ CRIMP Section 4.3.2.5

⁴⁹ CRIMP Section 4.3.2.2

⁵⁰ On 1 July 2001 at Black Mountain.

⁵¹ Goonyella System (Coppabella to the Ports) Power Systems Capacity Analysis

The two options QR Network had available to deal with the overloading at Oonooie were to:

- build a new larger feeder station at Oonooie; or
- construct a new feeder station at Bolingbroke.

It was considered unlikely that QR Network would be permitted to avoid implementation of a new larger SVC at a proposed larger feeder station at Oonooie due to concerns over power quality issues⁵² for any future customers sharing the same transmission line. Therefore it was considered likely that if a new larger feeder station was constructed at Oonooie, the cost would have been in the same range as Bolingbroke plus an additional requirement for an SVC at an additional cost of approximately \$20m. This solution would have solved the overloading problem in the Oonooie to Bolingbroke section however there would be no improvement in security of supply. A failure of the Oonooie 132kv feeder would essentially cripple the system. Power would need to feed from DBCT through to Bolingbroke TSC a distance of 55 km. In Evans & Peck's view, this would force an unacceptable 50 to 60 minute separation and therefore at least a 50% reduction in throughput.

From the information assessed by Evans & Peck, the scope is considered prudent.

9.7.4 Prudence of Standard

The Bolingbroke Feeder Station in principle was the same design as Mindi and was in accordance with the Standard QR Network requirements. A departure from the Mindi design was the introduction of Gas Insulated Switchgear (GIS). Previous feeder stations, including Mindi had used the Air Insulated Switchgear (AIS). QR reviewed the benefits of GIS over AIS at the time of going to tender and determined that this would be the preferred option due to its compactness and superior protection from environmental stressors. It was projected that there would be reliability gains and a reduction in whole of life costs. Traditionally GIS had been a more expensive option and was only preferred where there were space limitations. However in recent times the costs have reduced to the point where GIS is now competitive with AIS. Therefore in this application, where environmental factors are significant, the GIS option represents a good choice.

Both the Mindi and Bolingbroke Feeder Stations utilised enhanced harmonic filters in comparison to what had previously been implemented. The original feeder stations were designed and built in the early to middle 1980's. At this time, limitations on power quality in the supply network were not as stringent as current times. During the last decade the National Electricity Rules have come into existence and the associated standards in terms of power quality are significantly more stringent. An important aspect of power quality is harmonic current emissions which are controlled by harmonic filters. These filters have become larger, more complex and more expensive due to the more stringent regulations. The filter supplier as part of the contract was required to conduct an extensive study to ensure that the most appropriate solution was delivered.

From the information available and assessed by Evans & Peck, the project is of a reasonable standard to meet the scope, not overdesigned and in Evans & Peck's opinion, the standard is considered prudent.

⁵² Unbalanced loading causes negative phase sequence voltages dangerous to other electricity consumers.

9.7.5 Prudency of Cost

In Evans & Peck's opinion, the costs are reasonable for the scope and standard considering:

- scale, nature and complexity;
- market conditions;
- procurement policies; and
- project management aspects.

The Bolingbroke Feeder Station project was significantly over the CRIMP estimate on completion. The original estimate for Bolingbroke which was put to the Coal Industry in 2006 was \$16m. Prior to project commencement the cost was revised to \$29m⁵³. The current estimates have the project complete at approximately \$32m (including IDC).

In the Best Value Report this cost escalation has been attributed to:

- an additional TSC;
- increased Civil Construction Rates;
- geographical factors; and
- outsourcing of Engineering Design Services due to resource limitations within QR Network.

QR Network advised that when the initial Bolingbroke and Mindi Feeder Station estimates were prepared for the CRIMP they had not constructed a similar facility for a considerable time and this inexperience contributed to an overly optimistic estimate. The Mindi Feeder Station was constructed before the Bolingbroke Feeder Station; as QR Network became aware of cost over runs at the Mindi Feeder Station, they commissioned⁵⁴ a review to quantify the impact on the Bolingbroke Feeder Station and Mindi Feeder Station estimates. This review resulted in budgets for both projects being significantly revised upwards. QR Network's management of this issue was prompt and proactive and the final cost for both projects is close to the revised estimate resulting from the 2007 review.

QR Network has implemented a number of value engineering/value management initiatives at the Bolingbroke Feeder station to reduce the costs. These initiatives include:

- the use of GIS in terms of lower whole of life costs;
- relocation of the facility to minimise earthworks and siteworks; and
- negotiation with Powerlink for a connection agreement which avoided the installation of an SVC at the Bolingbroke site.

This latter initiative provided a capital saving of approximately \$20m. This initiative is not mentioned in the Best Value Report, however, it should be classified as a very significant cost saving initiative achieved early at the project option and scoping stage..

From the information assessed by Evans & Peck, the costs are considered prudent.

⁵³ Goonyella Power System Capacity Study Report

⁵⁴ Cost Comparison Mindi Feeder Station v Bolingbroke Feeder Station 11 September 2007

9.8 A01422 Mindi 132 kV/50 kV Substation

The purpose of the project is to enhance the capacity of the power system installed in the Goonyella System to support the forecast traffic. The QR Network document refers to an Evans & Peck Capacity Study 2007. This study refers to the Hale Creek Capacitor bank which is not commissioned or considered relevant to this assessment. The scope of the project includes the following:

- construction of a new feeder station at Mindi;
- relocation of the Track Sectioning Cabin (TSC) to Braeside; and
- relocation of an auto transformer site.

The costs and chronology of the Mindi Substation are included in Table 10.

Table 10: Chronology and Costs – A10422 Mindi 132kV/50kV Substation

Stage	Date	Project Cost or Estimate	Comments
CRIMP	September 2006	\$14,000,000	
Business Case	September 2006	\$13,500,000	
Project Plan	April 2007	\$17,100,000	
Further Funding Request	April 2007	\$3,600,000	
Actual cost to date	December 2009	\$11,425,240	
RAB Submission 2008/2009	October 2008	\$14,683,607	Excludes IDC
RAB Submission IDC		\$1,835,611	
RAB Submission QR Services		\$262,950	
Future Claim	RAB 09/10	\$3,316,533	
Forecast Final Cost (Excluding IDC and QR Services)		\$18,000,140	
Total Forecast Final Cost		\$20,098,701	

9.8.1 Prudency of Scope

The project:

- is "below rail" infrastructure;
- was completed in 2008/2009;
- was approved by the relevant Customer Group and the Authority;
- was identified in the Network Asset Management Plan and estimated at \$13.5m; and
- was funded by QR Network.

The project scope was preapproved by the Customer Group on the basis of the 2006 CRIMP and pre approved by the Authority in February 2007.

QR Network assessed that any increase above 83mt/a on this section of track would require increased electrical capacity⁵⁵. In particular, the Coppabella Feeder Station would become overloaded as the Coppabella to Mindi section is relatively long (nearly 37km) and has significant grades for both loaded and particularly unloaded trains. The Wandoo to Mindi section is shorter (20 km) and does not display the same problem. Evans & Peck modelled a repositioning of the Mindi TSC however this option created further overloading problems at Wandoo. The only solutions considered are to:

- increase the size of the Coppabella Feeder Station including a new and larger SVC; or
- construct a new feeder station at Mindi replacing the TSC, which would be relocated to Braeside.

QR Network would not have avoided installing a larger SVC at Coppabella to accommodate the increased tonnages. This is due to the high probability that other customers (e.g. mines) will want to connect to this 132kV Feeder. Therefore if the Coppabella Feeder Station was replaced with a larger rated unit, including a new larger SVC, the capital cost would have essentially been the same as Mindi plus the addition of an SVC. The SVC cost would have been an additional \$20m. Also, the robustness of the system in terms of contingency events would have been less than that provided by construction of a new feeder station at Mindi.

The Mindi Feeder Station project option was considered superior due to the fact that Powerlink allowed QR Network to construct this without an SVC. Load balancing is achieved by the central SVC located at Nebo which is a large unit and accommodates the Mindi, Wandoo and Bolingbroke Feeder Stations.

The contract tonnages for 2009/2010 is 86 mt/a and for 2011/2012 is 114 mt/a. Therefore this upgrade had to be completed before 2009/2010. This project satisfies the requirements for Reasonable Demand.

From the information assessed by Evans & Peck, the scope is considered prudent.

9.8.2 Prudency of Standard

The Mindi Feeder Station Project was designed and constructed in accordance with the standard QR Network requirements. It differs from Bolingbroke in that AIS switchgear was utilised because of the reuse of the pre-existing TSC at Mindi, which was fitted with AIS switchgear.

From the information available and assessed by Evans & Peck the project is of a reasonable standard to meet the scope, not overdesigned and in Evans & Peck's opinion the standard is considered prudent.

⁵⁵ QR QCA submission

9.8.3 Prudency of Cost

In Evans & Peck's opinion the costs are reasonable for the scope and standard considering:

- scale, nature and complexity;
- market conditions;
- procurement policies; and
- project management aspects.

The Mindi Feeder Station project was delivered for a cost significantly higher than the initial CRIMP estimate. This has been discussed in some detail in Section 9.7. Evans & Peck have reviewed the procurement methodology and high level cost report.

From the information assessed by Evans & Peck, the costs are considered prudent.

9.9 A01907 Harrow Passing Loop

The Harrow Passing Loop is situated between Peak Downs and Saraji on the Oaky Creek branch of the Goonyella System. This branch provides a cross system capability between the Goonyella and Blackwater Systems. As the Goonyella System operates under a cargo assembly mode the added flexibility provided by improving the cross system link will inevitably lead to greater flexibility and efficiencies in the rail operation. The primary objective of this project is to deliver increased *"system capability to adapt to demand variability and deliver increasing Goonyella tonnages."*⁵⁶ Furthermore, *"The Harrow Passing Loop will work in conjunction with duplications and passing loops to the west of Coppabella Yard to facilitate the robustness required for cargo assembly and the sequencing of trains to port."*⁵⁷

The project scope includes the following:

- land studies and procurement;
- 2.35 km of new track and formation;
- two 1:16 turnout installations;
- electrification works; and
- signalling works.

The costs and chronology of the Harrow Passing Loop are included at Table 11.

⁵⁶ QR Network Capital Expenditure Claim Harrow Passing Loop.

⁵⁷ QR Network Capital Expenditure Claim Harrow Passing Loop

Table 11: Costs and Chronology for Harrow Passing Loop

Stage	Date	Project Cost or Estimate	Comments
CRIMP	September 2006	\$10,000,000	
Business Case	November 2007	\$15,900,000	Environment/Market Conditions
Project Plan	February 2008	\$15,900,000	
Completion Report Forecast	March 2009	\$12,504,000	
Actual cost to date	December 2009	\$13,556,504	
RAB Submission 2008/2009	October 2008	\$13,174,827	Excludes IDC
RAB Submission IDC		\$625,198	
RAB Submission QR Services		\$235,931	
Future Claim	RAB 09/10	\$887,178	\$120,000 in 2010/11
Forecast Final Cost (Excluding IDC and QR Services)		\$14,062,005	
Total Forecast Final Cost		\$14,923,134	

9.9.1 Prudency of Scope

The project:

- is "below rail" infrastructure;
- was completed in 2008/2009;
- was approved by the relevant Customer Group and the Authority;
- was identified in the Network Asset Management Plan and estimated at \$8m; and
- was funded by QR Network.

The scope was approved in the CRIMP in 2006, and the project plan is consistent with the User Requirements Brief. In addition the scope is assessed as prudent because:

- the contracted tonnages required it; and
- it will add flexibility to the Goonyella System by allowing increased cross system traffic.

From the information assessed by Evans & Peck, the scope is considered prudent.

9.9.2 Prudency of Standard

The standards used in this project are consistent with that of mainline track for the Goonyella System and include:

- 60 kg/m rail;
- 28 tonne axle load concrete sleepers;
- 300 mm depth of ballast;
- formation construction designed as 250 mm CBR 50 on 300 mm of CBR 20 in bank cross sections of CBR 5 subgrade; and

- 80 km/h train speed.

From the information available and assessed by Evans & Peck the project is of a reasonable standard to meet the scope, not overdesigned and in Evans & Peck's opinion the standard is considered prudent.

9.9.3 Prudence of Cost

In Evans & Peck's opinion the costs are reasonable for the scope and standard considering:

- scale, nature and complexity;
- market conditions;
- procurement policies; and
- project management aspects

The Harrow Passing Loop project was included in the Coal Rail Infrastructure Master Plan in 2006 at a value of \$10,000,000. This estimate was optimistic and did not consider the potential of encountering difficult conditions, including reactive clays (black soil). The Project Plan and Business Case had an estimate value of \$15,900,000.

A derailment of a southbound empty coal train occurred at the site during construction. The incident was attributed to the project works; in particular an incorrect turnout installation. The cost was incurred on QR maintenance as an insurance excess and is not part of the RAB Submission.

The value included for the RAB Submission is \$14,035,956. The project was commissioned in October 2008, documentation has been provided to support this date. QR Network has indicated that they intend to claim further post commissioning expenses in their 2009/10 CAPEX claim. It is worth noting that there is \$ 120,000 of forecast expenditure in FY 2010/2011; this appears to be greater than eighteen months post commissioning which seems excessive and should be explained in the relevant RAB Submission.

From the information assessed by Evans & Peck, the costs are considered prudent.

9.10 A02243 Stephens Passing Loop

"The primary business objective of this project is to provide additional capacity within the Goonyella System in order to meet forecast traffic demand." In particular "It will enable QR Network to sustain the 13% increase in tonnage on the Oaky Creek..."⁵⁸

The project was required to prevent the Dysart to Norwich Park track section becoming a constraint on the Goonyella and Blackwater Systems. The project is, like the Harrow Passing Loop, on the Oaky Creek Branch and has many similar characteristics.

The costs and chronology for the Stephens Passing Loop are included in Table 12 below.

⁵⁸ QR Network Capital Expenditure Claim Stephens Passing Loop

Table 12: Costs and Chronology for Stephens Passing Loop

Stage	Date	Project Cost or Estimate	Comments
CRIMP	September 2006	\$10,000,000	
Business Case	March 2008	\$16,160,000	
Project Plan	July 2008	\$16,160,000	
Completion Report Forecast	June 2009	\$12,377,768	
Actual cost to date	December 2009	\$12,989,217	
RAB Submission 2008/2009	October 2008	\$12,822,893	Excludes IDC
RAB Submission IDC		\$84,252	
RAB Submission QR Services		\$229,629	
Future Claim	RAB 09/10	\$1,106,869	\$497,000 in 2010/11
Forecast Final Cost (Excluding IDC and QR Services)		\$13,929,762	
Total Forecast Final Cost		\$14,243,643	

9.10.1 Prudency of Scope

The project:

- is "below rail" infrastructure;
- was completed in 2008/2009;
- was approved by the relevant Customer Group and the Authority;
- was identified in the Network Asset Management Plan and estimated at \$8m; and
- was funded by QR Network.

The project scope was approved in the CRIMP in 2006, and the Project Plan is consistent with the User Requirements Brief. In addition, the scope is assessed as prudent because it will add flexibility to the Goonyella System by allowing increased cross system traffic.

From the information assessed by Evans & Peck, the scope is considered as prudent.

9.10.2 Prudency of Standard

The standards used in this project are consistent with that of mainline track for the Goonyella System and includes:

- 60 kg/m rail;
- 28 tonne axle load concrete sleepers;
- 300 mm depth of ballast;
- formation construction designed as 300 mm CBR 50 on 150 mm of CBR 20 in bank cross sections of CBR 3 subgrade; and
- 80 km/h train speed.

The User Requirements Brief, the Project Plan, the Completion Report and all commissioning documents provided appear in order.

From the information available and assessed by Evans & Peck, the project is of a reasonable standard to meet the scope, not overdesigned and in Evans & Peck's opinion the standard is considered prudent.

9.10.3 Prudence of Cost

In Evans & Peck's opinion, the costs are reasonable for the scope and standard considering:

- scale, nature and complexity;
- market conditions;
- procurement policies; and
- project management aspects.

The Stephens Passing Loop project was in the Coal Rail Infrastructure Master Plan at an estimated value of \$10,000,000 in 2006. This estimate was optimistic and did not consider the potential of encountering difficult conditions, including reactive clays (black soil). The Business Case and Project Plan have estimated values of \$16,160,000. The value included for the RAB Submission is \$13,136,774.

The project was commissioned in February 2009 and documentation has been provided supporting this date. QR Network has indicated that they intend to make a further claim in 2009/10 for further post commissioning works. It is worth noting that there is \$ 497,000 of forecast expenditure in FY 2010/2011; this appears to be greater than eighteen months after commissioning which seems excessive and should be explained in the relevant RAB Submission.

From the information assessed by Evans & Peck, the costs are considered prudent.

9.11 Goonyella to Abbott Point Expansion (GAPE) Early Works

QR Network initially included in their RAB Submission \$40,858,220 (not including (IDC) in capital expenditure) for the GAPE Early Works project. The GAPE Early Works project does not feature in the 2006 CRIMP but is included in the September 2007 Addendum to the CRIMP to the value of \$27m (not including pre-feasibility study and land acquisition costs of \$19m). The Addendum does note that the early works package could increase from the \$27m to \$33-38m depending on *"changes in the expected origin of the demand for export capacity through this corridor"* resulting in *"the bringing forward of the works required"*⁵⁹.

This initial submission was problematic because:

- the early period of the project was impacted by acceleration and changes of scope;
- the costs should be matched to the costs referred to in the pre-approval letter from the coal producers of 10 July 2007;
- the costs needed to be measured against deliverables via an earned value analysis; and
- the costs may relate to other costs for the GAPE project (costs for land acquisition and the remaining work on the GAPE project approved by the Queensland Government on 23 October 2009).

⁵⁹ Addendum to the CRIMP p3.

The actual work and costs claimed in the initial and revised submissions are summarised in Table 13 below.

Table 13: Cost Components of GAPE Early Works RAB Submission

Element	Sub Element	Initial Submission Cost (\$,000)	Revised Submission Cost (\$,000)
Civil Engineering	Geotechnical	\$2,847	\$2,847
	Detail Design CoalConnect	\$18,077	\$18,077
	Detail Design Coal Stream	\$2,900	\$2,900
	Civil Survey	\$1,493	\$1,493
	Civil standards/design/track	\$1,017	\$1,017
	SUB TOTAL	\$26,334	\$26,334
Signalling and Telecommunications	Signalling	\$400	\$400
	Telecommunications	\$650	\$650
	SUB TOTAL	\$1,050	\$1,050
Pre Construction Works	NML Clear/Grub	\$800	\$ 0
	Fencing	\$1,100	\$ 0
	Formation Strengthening	\$1,413	\$ 0
	LSPI	\$567	\$ 0
	X25 Earthworks at Abbot Point	\$2,300	\$ 0
	Track Replacement	\$2,823	\$ 0
	SUB TOTAL	\$9,003	\$ 0
Management	Project Management	\$2,555	\$2,555
	Civil Verification	\$1,499	\$1,499
	Area Manager	\$417	\$417
	SUB TOTAL	\$4,471	\$4,471
GAPE Early Works	TOTAL	\$40,858	\$31,855
IDC		\$3,511	\$3,057
Total		\$44,369	\$34,912

9.11.1 Prudence of Scope

On 10 July 2007, a letter representing the majority of coal producers in the Goonyella Coal Chain was sent to the Authority. This letter describes the coal producer's support for GAPE Early Works totalling \$27,120,000 to be included in the RAB at "the earliest opportunity"⁶⁰. This letter is exceptional in that the coal users explicitly document their support for a project and for inclusion in the RAB additional to the CRIMP review process.

Evans & Peck consider that the aim of the GAPE Early Works in design terms was to produce a reference design that would allow the project to proceed to the stage where Expressions of Interest

⁶⁰ Letter from Macarthur Coal dated 10 July 2007.

could be called. The Authority should be aware that there will be further design costs during project delivery.

Evans & Peck assess that from the information provided QR Network was justified in proceeding with the GAPE Early Works with a reasonable expectation that it would be a valid inclusion in the RAB Submission.

From the information assessed by Evans & Peck, the scope is considered as prudent.

9.11.2 Prudence of Standard

The RAB Submission consists mainly of investigation and design costs.

From the information available Evans & Peck assess that the geotechnical and design work is of a prudent standard.

9.11.3 Prudence of Cost

As discussed earlier there were a number of difficulties in assessing the prudence of cost in the initial submission for this project. The assessment of the early works costs of the partially completed civil works required an earned value assessment; which is a detailed review of cost records matched with detailed measurement of partially completed work in the field. QR Network accepted this was not practical and subsequently revised its submission by removing the partially completed civil works and resubmitting its claim.

It is reasonable to assess that QR Network proceeded in good faith in incurring costs with investigation and design work following endorsement by the coal industry. The CRIMP indicated a project cost of \$27m to \$34m and was to cover detailed design, pre award works and legal costs. The project was initially estimated at \$ 1.6 billion⁶¹. These site investigation, detailed design and legal costs represent approximately 2% of project value. It is not possible to benchmark this percentage with other projects given the history of this project, however, the cost incurred for this early work is in accordance with the estimate provided by QR Network and the endorsement provided by the coal users group in the letter of 10 July 2007.

From the information provided, Evans & Peck assess that the costs associated with the revised QR Network submission for the GAPE Early Works is prudent.

10 ASSET REPLACEMENT

10.1 General

Asset replacement projects maintain the capacity of "below rail" infrastructure in terms of net tonnage of coal that can be transported. Asset replacement projects do not feature in the CRIMP and are not subject to customer pre-approval. They are managed by a 30 year asset renewal plan based on asset life, agreed with the Authority, and more detailed 5 year delivery plans. Asset renewals are either triggered by life expiry or safety and reliability requirements. QR Network has asked that the projects listed below in Table 14 be included in the RAB Submission for 2008-2009.

⁶¹ QR Network 2008/09 Capital Expenditure Claim GAPE Early Works dated 30 October 2009

Table 14: Asset Replacement Projects in the 2008/2009 RAB Submission

Project ID	Project Name	RAB Submission
A01980	System Wide – CQCR Formation Strengthening	\$3,934,087
A02575	System Wide – ViziRail Coal Network Paths	\$554,343
A02223	Blackwater – Rangal Feeder Station Reconfiguration	\$218,246
A02471	Blackwater – Callemondah Yard Upgrade (Arrival Roads)	\$3,029,720
A02073	Goonyella – Oaky Creek Balloon Loop Upgrade	\$4,313,476
A02117	Goonyella – Switch Rollers	\$819,144
A00993	Goonyella – Rail Upgrade	\$680,195
A02074	Goonyella – Norwich Park Balloon Loop Upgrade	\$615,567
A02072	Goonyella – Goonyella Mine Balloon Loop Upgrade	\$267,384
	Total	\$14,432,162

10.2 A01980 CQCR Formation Strengthening

The objective of the CQCR Formation Strengthening program of works is to *“strengthen formations on a priority basis in the four Central Queensland (CQ) Coal systems to ensure the systems can cope with current and increased future capacity requirements.”*⁶²

The program has amalgamated projects across the four central Queensland systems to gain greater flexibility in sequencing works with shut down periods, and economies of scale with the intent being to minimise the impact of throughput through the systems. The works can be further sub-divided into the following components:

- Blackwater System – 11.8 km of formation strengthening at a total cost of \$6.064m;
- Goonyella System – 15 km of formation strengthening at a total cost of \$9.558m;
- Moura System – 5 km of formation strengthening at a total cost of \$2.574m; and
- Newlands System – 4.8 km of formation strengthening at a total cost of \$2.342m.

The formation in these areas will be strengthened either through the re-laying or re-packing of existing formation and ballast, or the injection of a lime slurry.

10.2.1 Prudence of Scope

QR Network has reported increased formation failures in the Central Queensland Coal systems as the basis of this project. The failures have been caused by significant growth in traffic, and the widespread reactive clays in the Bowen Basin. Formation failures result in speed restrictions, or failures, can increase reactive maintenance and cause derailments. The actual locations requiring formation strengthening are estimated using historical data and geotechnical testing. The actual scope and extent of work is not known until the site is actually excavated. A high risk of additional work due to latent conditions exists with this type of project.

From the information assessed by Evans & Peck, the current scope is considered prudent. The nature of the scope for this work is uncertain and will vary.

⁶² Project Plan “Central Queensland Coal Formation Strengthening” dated 23 July 2007

10.2.2 Prudency of Standard

Lime slurry pressure injection into the formation is considered to be a satisfactory and accepted option for formation strengthening in areas where medium risk of formation failure exists. In areas where high risk of formation failure exists, it is considered reasonable to undertake full formation reconstruction.

From the information available and assessed by Evans & Peck, the project is of a reasonable standard to meet the scope, not overdesigned and in Evans & Peck's opinion the standard is considered prudent.

10.2.3 Prudency of Cost

The Project Plan states there is an estimated 10.54 km of track reconstruction and 22.70 km of lime slurry pressure injection required with a total budget of \$18.5m. Table 15 below shows the estimated comparative costs for the two methods under consideration in the Project Plan. To date 22.33 km has been strengthened at a cost of \$9.4m.

Table 15: Project Plan Unit Rates

Formation Strengthening Method	Length	Cost	Cost per metre
Reconstruction	10.54 km	\$10,349,000	\$983
Lime Slurry Pressure Injection	22.70 km	\$8,235,000	\$363

The nature of this work can be uncertain in scope, and hence cost, and can only be performed in periods where the rail line is closed during a possession or shut down. In Evans & Peck's experience these planned rates are reasonable and the reconstruction rate is consistent with other projects. The actual rates being achieved in the field⁶³ indicate that the planned rates are being achieved or bettered.

Table 16: Actual Field Unit Rates

Year	Length	Cost	Cost Per Metre
2005/2006	2.382 km	\$810,509	\$340.26
2006/2007	3.562 km	\$914,019	\$256.60
2007/2008	9.968 km	\$3,840,302	\$385.26
2008/2009	6.418 km	\$3,832,934	\$597.22

From the information provided Evans & Peck assess that the costs are prudent.

10.3 A02575 ViziRail Coal Network Paths

*"ViziRail is an integrated suite of software modules covering the train operating business cycle from long term scheduling through to historical reporting on actual train performance."*⁶⁴

⁶³ Email from QR Network "Coal Formation Investigation – Review of Costs to Date" 22 January 2010.

⁶⁴ ViziRail website, www.vizirail.com.au

The ViziRail Coal Network Paths Project's scope was to "enhance⁶⁵ the QR Network version of ViziRail to support the concept of Network Paths (sometimes referred to as 'slots') to better manage the allocation of train service entitlements for coal cyclic traffic."⁶⁶

The upgrades to the ViziRail System includes the functionality to:

- utilise one or more network paths when calculating an actual schedule;
- allocate a network path once it has been utilised;
- allow available network paths to be visually distinguished from unavailable network paths; and
- de-allocate network paths if a train is cancelled or amended.

10.3.1 Prudency of Scope

The ViziRail Coal Network Paths Project (NPP) is part of a larger program being the Coal Yards Network Management (CYNM) Project.

The NPP has been assessed as providing a number of benefits including⁶⁷:

- long term rail capacity management;
- yard management and reporting; and
- reduction in coal cycle variance timing.

From the information assessed by Evans & Peck, the scope is considered prudent.

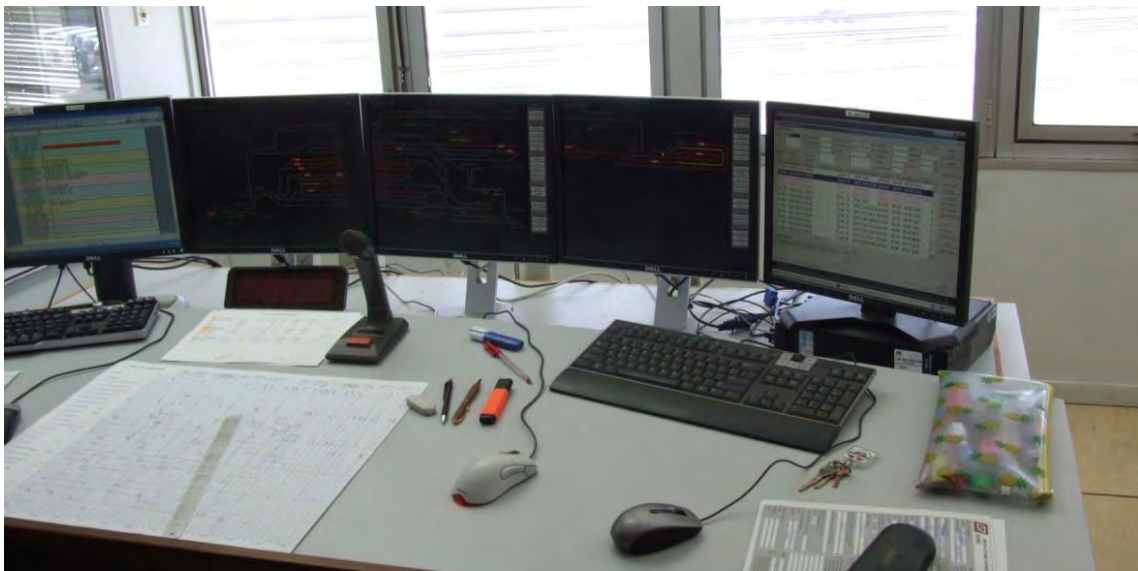


Figure 6: ViziRail system (screen on the right) operating at the Callemondah Yard.

⁶⁵ This project has a System Enhancement aspect to it as well as asset Renewal. This project is referred to as an enhancement here. QR Network classify it as Asset Replacement as it is replacing manual systems.

⁶⁶ Minor Capital Project Funding Request dated 16 May 2008.

⁶⁷ QR Information Services Division Cycle 1 Program - Program Plan dated 26 May 2009

10.3.2 Prudency of Standard

The contractor for the project, ICG Transport Systems, is ISO 9001 certified and supports ViziRail in use by ARTC and Railcorp as well as QR Network.

From the information available and assessed by Evans & Peck the project is of a reasonable standard to meet the scope, not overdesigned and in Evans & Peck's opinion the standard is considered prudent.

10.3.3 Prudency of Cost

The project is being managed through a standing offer contract.

From the information assessed by Evans & Peck, the cost is considered prudent.

10.4 A02223 Rangal Feeder Station Reconfiguration

The objective of this component of the Rangal Feeder Station Reconfiguration is to, *"review the current feeder station capacity and to identify items for replacement or upgrade."*⁶⁸

10.4.1 Prudency of Scope

Evans & Peck assess that it was prudent to review the Rangal Feeder Station capacity in the light of the other power systems upgrade works on the Blackwater Line.

From the information assessed by Evans & Peck, the scope is considered prudent.

10.4.2 Prudency of Standard

QR Network utilised a consultant with a sound track record and ISO 9001 certification.

From the information available and assessed by Evans & Peck the project is of a reasonable standard to meet the scope and in Evans & Peck's opinion the standard is considered prudent.

10.4.3 Prudency of Cost

The cost of the review, \$215,942, was in line with the funding request of \$400,000 and is considered reasonable.

From the information assessed and reviewed by Evans & Peck, the costs are considered prudent.

10.5 A02471 Callemondah Yard Upgrade (Arrival Roads)

The objective of the Callemondah Yard Upgrade project was *"to replace the existing life-expired assets with long life low maintenance assets to reduce future maintenance and asset failure leading to disruption to revenue services."*⁶⁹

The upgrade consisted of the:

- replacement of 4.7 km of track on Arrival Roads N^o 2 through N^o 5;
- replacement of sleepers on the Powerhouse balloon loop;

⁶⁸ 2008/2009 Capital Expenditure Claim – Rangal Feeder Station Reconfiguration

⁶⁹ QR Network submission to QCA

- installation of conduits;
- installation of new circuit breakers; and
- upgrade of lighting towers.

10.5.1 Prudency of Scope

The project was triggered by two incidents occurring within the yards as a result of expired asset lifetimes, which included:

- 24 June 2007 – derailment on N^o 5 arrival road, which also impacted N^o 3 and N^o 4 arrival roads; and
- 14 April 2008 – lighting failure at the northern end of the yard, shunters were subsequently banned and 5 trains cancelled due to congestion.

From the information assessed by Evans & Peck, the scope is considered prudent.

10.5.2 Prudency of Standard

The Callemondah Yard is designed for 25 km/h traffic and the replacement of expired 47 kg/m with 53 kg/m part worn reclaimed rail is considered reasonable. The use of concrete sleepers is consistent with the majority of the Blackwater System. Repairs and upgrades to the lighting are considered reasonable to return to full operation. The formation was inspected during the reconstruction and where evidence of failure existed was repaired.



Figure 7: Reused partly worn 53 kg/m rail for the Callemondah Yard upgrade

(note fishplate boltholes indicating recycled rail)

From the information available and assessed by Evans & Peck the project is of a reasonable standard to meet the scope, not oversized and in Evans & Peck's opinion the standard is considered prudent.

10.5.3 Prudence of Cost

The RAB 2008/2009 Submission includes \$3,029,720 for this project. The Project Plan included \$4,400,000. The forecast total cost stands at \$3,910,000 (including a submission for the 2009/2010 RAB for approximately \$880,000). The project estimate was derived from first principles and subjected to QR Network internal review. The project value engineered the solution of using recovered partly worn 53 kg/m rail instead of new rail and is forecasting a cost saving on completion.

From the information assessed by Evans & Peck, the costs are considered prudent.

10.6 A02073 Oaky Creek Balloon Loop Upgrade

The objective of the Oaky Creek Balloon Loop Upgrade was to recondition *"a total of 4.535 kilometres of track, recondition the Coppabella/Gregory angle roads and conduct associated earthworks and turnout replacements."*⁷⁰

The project scope included the following activities:

- the widening of the cut;
- the removal of contaminated ballast;
- the replacement of timber sleepers with concrete;
- the upgrade of three turnouts;
- repositioning of the bad order siding; and
- ballast replacement.

10.6.1 Prudence of Scope

QR Network states that the turn outs and timber sleepers were nearing the end of their serviceable life, with costs for unplanned maintenance increasing.

From the information assessed by Evans & Peck, the scope is considered prudent.

10.6.2 Prudence of Standard

The timber sleepers were replaced with 28 tonne axle load concrete sleepers, however, the 47 kg/m rail was retained. The surrounding system uses 28 tonne axle load concrete sleepers with 60 kg/m rail. As a result of lower operating speeds within the balloon loop, the retaining of the 47 kg/m rail is reasonable. QR Network provided commissioning documents for the project.

From the information assessed by Evans & Peck, the standard is considered prudent.

10.6.3 Prudence of Cost

An amount of \$4,313,476 was included in the 2008/2009 RAB Submission. The cost plan for the project was \$5,535,000. This project was commissioned in January 2009 and documentation has been provided supporting this date. QR Network has indicated that there will be a further claim for this project in 2009/2010 for post commissioning work.

From the information assessed by Evans & Peck, the costs are considered prudent.

⁷⁰ QCA Submission 2008/2009 Capital Expenditure Claim Oaky Creek Balloon Loop Upgrade

10.7 A02117 Goonyella Switch Rollers

The Goonyella Switch Roller project's objective was the installation of switchrollers on turnouts and swing nose crossings in the Goonyella System not already fitted with switchrollers. The project progressively replaces the obsolete graphite pads system which required significant maintenance (for example each site generally required lubrication after heavy rain). The graphite pads could also cause wear on the points motors. The project is intended to eliminate the regular maintenance tasks of lubricating the graphite pads, remove occupational health and safety risks of accessing the sites and to reduce train delays.

10.7.1 Prudence of Scope

The project is consistent with similar projects previously assessed as prudent by the Authority. Considering this previous assessment and also the objective to replace older technology to reduce the risk and maintenance effort for this aspect of the system, Evans & Peck considers that the scope of the project is prudent.

10.7.2 Prudence of Standard

The upgrade is consistent with the Blackwater System and other rail systems and as such is considered prudent.



Figure 8: Siemens switch motor fitted with switch rollers



Figure 9: Switch Rollers

10.7.3 Prudence of Cost

The 2007/08 RAB Submission includes a value of \$819,144. Any salvaged components are reused at lower priority sites where possible. Procurement of the switch rollers is via a fixed price contract with "Teksol".

From the information assessed by Evans & Peck, the cost is considered prudent.

10.8 A00993 Goonyella Rail Upgrade

The Goonyella Rail Upgrade project scope of work is the replacement of approximately 36.4 km⁷¹ of 53 kg/m rail with 60 kg/m rail.

This project is currently ongoing, and has been running since the 2005/2006 financial period.

10.8.1 Prudence of Scope

The project was triggered by gauge face cracking being observed and head flow at welds, with increasing maintenance costs, as is consistent with life expired assets.

From the information assessed by Evans & Peck, the scope is considered prudent.

10.8.2 Prudence of Standard

The existing rail in use was 53 kg/m, which is now no longer available. The use of 60 kg/m rail is consistent with the remainder of the Goonyella System as well as the Blackwater System.

From the information assessed by Evans & Peck, the standard is considered prudent.

⁷¹ Project Plan

10.8.3 Prudence of Cost

The 2008/2009 RAB Submission includes \$680,195. The project required the upgrading of 36.4 km of 53 kg/m rail to 60 kg/m rail. QR Network states that a further claim in 2009/2010 will be submitted. A total of 8.323 km of rail was replaced. Recovered 53kg/m rail that has remaining life is reused at locations of lighter traffic where possible.

From the information assessed by Evans & Peck, the cost is considered prudent.

10.9 A02074 Norwich Park Balloon Loop Upgrade

The Norwich Park Balloon Loop Upgrade project objective is to *"upgrade a total of 5.293 km of track and associated works on the Norwich Park Balloon Loop Entry road, Exit road and Common Entry road."*⁷²

The specific objectives of the project were to:

- reduce track maintenance costs associated with this portion of the coal network;
- increase the capacity of the system to cater for future increased coal haulage demands; and
- reduce the potential for derailments.

The scope of work included the following:

- replacement of timber sleepers with 28 tonne axle load concrete sleepers – 7.432 km;
- replacement of 47 kg/m track with 53 kg/m track – 5.338 km;
- removal of contaminated ballast – 4300 m³;
- widening of the cut in the siding;
- ballast replacement;
- 1:10 turnout replaced with 1:12;
- overhead power to be installed; and
- the magnetite (Fe₃O₄) siding to be removed.

The project timeline is summarised as follows:

- October 2007 – bad order siding relocation;
- November 2007 – track relay;
- May 2008 – bad order siding turnout upgrade; and
- June 2008 – new bad order siding overhead installation.

10.9.1 Prudence of Scope

The project was triggered by increasing maintenance costs on this section of the track, suggesting that the asset was reaching the end of its' service life. The project works were commissioned in October 2008.

From the information assessed by Evans & Peck, the scope is considered prudent.

⁷² Norwich Park Balloon Loop Project Plan

10.9.2 Prudency of Standard

The use of concrete sleepers is consistent with standards for the rest of the Goonyella System. The surrounding system is 28 tonne axle load concrete sleepers with 60 kg/m rail. Considering the lower operating speeds within the balloon loop, the retaining of the 47 kg/m rail and the use of part worn 53 kg/m rail is considered reasonable.

From the information assessed by Evans & Peck, the standard is considered prudent.

10.9.3 Prudency of Cost

The 2008/2009 RAB Submission includes \$615,567. QR Network has stated that this will be the final claim for this project. The total cost for this project is \$3,305,233.

From the information assessed by Evans & Peck, the costs are considered prudent.

10.10 A02072 Goonyella Mine Balloon Loop Upgrade

The project objective is to *"upgrade a 340 metre section of track, remove a redundant siding and associated works on the Goonyella Mine Balloon Loop exit road and mainline tie in."*⁷³

The project is intended to achieve the following specific objectives:

- reduced track maintenance costs;
- increase system capacity; and
- reduce the risk of derailment.

The Goonyella Mine Balloon Loop Upgrade has been triggered as a result of the timber turnouts and sleepers approaching the end of their service lives. The scope of work includes:

- replacing the exit road with 53 kg/m part worn rail on concrete sleepers;
- removing a turnout and siding;
- shortening the bad order siding; and
- replacing 1:12 Rail Bound Manganese (RBM) with a 1:12 spring wing left hand turnout.

10.10.1 Prudency of Scope

The original track was installed in 1978 with 47 kg/m rail on timber sleepers and the current configuration is approaching the end of its service life.

From the information assessed by Evans & Peck, the scope is considered prudent.

10.10.2 Prudency of Standard

The use of concrete sleepers is consistent with the standards of the Goonyella System. The surrounding system is 28 tonne axle load concrete sleepers with 60 kg/m rail. Due to the lower operating speeds within the loop the use of part worn 53 kg/m rail is considered reasonable.

From the information assessed by Evans & Peck, the standard is considered prudent.

⁷³ QR Network 2008/09 Capital Expenditure Claim Goonyella Mine Balloon Loop Upgrade.

10.10.3 Prudence of Cost

The 2008/2009 RAB Submission includes \$267,384. The project was budgeted at \$350,000. The major savings were in labour costs, which were forecast during a time of high demand.

From the information assessed by Evans & Peck, the costs are considered prudent.

11 CUSTOMER SPECIFIC

11.1 A02395 Vermont Spur and Balloon Loop

The Vermont Spur and Balloon Loop project connected to the Oaky Creek branch of the Blackwater System was constructed at the request of Lake Vermont Resources (LVR) to service a new mine approximately 16 km northeast of Dysart. This spur and balloon loop is planned to transport 4mt/a for 15 years. The spur and balloon loop also has the option of transporting coal north to the Goonyella or Newlands Systems. The long term objective is to rail coal north via the GAPE project to the Newlands System and Abbot Point.

This project was below rail, endorsed by the customer and fully funded by QR Network (noting that the civil works were paid for by LVR and reimbursed by QR Network).

The cost and chronology of this project is shown in Table 17 below.

Table 17: Chronology and Costs A02395 Vermont Spur and Balloon Loop

Stage	Date	Project Cost or Estimate	Comments
Business Case	March 2008	\$70,000,000	
Project Plan	March 2008	\$60,000,000	
Completion Report Forecast	December 2009	\$62,000,000	
Actual cost to date	December 2009	\$34,148,292	Does not include civil works performed by Thiess for LVR to be reimbursed (\$23.6m ex GST)
RAB Submission 08/09	October 2008	\$54,955,504	Excludes IDC
RAB Submission IDC		-\$805,186	
RAB Submission QR Services		\$984,127	
Future Claims		\$9,000,000	\$6.5m in 2009/10 and \$2.5m in 2010/11.
Total Forecast Final Cost		\$64,134,445	

11.1.1 Prudence of Scope

The project was requested by LVR and accepted as prudent.

This project meets the requirements of Schedule FB paragraph 2.2 (iii) (a) where for a Customer Specific project the scope has been accepted by the customer concerned.

From the information assessed by Evans & Peck, the scope is considered prudent.

11.1.2 Prudency of Standard

The Vermont Spur and Balloon Loop is designed to accommodate the 2.1 km Goonyella Length Train (GLT) as this mine can move coal north to the Newlands System or south to the Goonyella System.

The track is consistent with existing standard and track configurations for the Goonyella and Blackwater Lines (60 kg/m rail, 80 km/h speed and 300 mm ballast). Quality assurance requirements have been implemented as listed below:

- civil construction as per Manager Civil Engineering (MCE) sign off;
- signalling as per Manager Signals and Operational Systems (MSAOS) sign off;
- telecommunications as per General Manager Telecommunications (GMT) sign off; and
- overhead works as per Manager Traction Distribution (MTD) sign off.

From the information assessed by Evans & Peck, the standard is considered prudent.

11.1.3 Prudency of Cost

The civil works for the project were completed by Thiess Pty Ltd for LVR and invoiced to QR Network.

The project required construction of 17.690 km of new track. The RAB Submission is \$54,955,504 not including civil works by LVR to be reimbursed, QR Services costs and IDC. Assuming the project will achieve the forecast post commissioning budget of \$9m, gives a final cost of \$64m, which generates a rate of approximately \$3.62m per kilometre of track which is considered reasonable. This project has achieved a less expensive rate than similar projects due to the large size of the project and the nature of the terrain.

From the information assessed by Evans & Peck, the costs are considered prudent.

12 POST COMMISSIONING

12.1 General

Post commissioning costs are the remaining costs of projects which have been submitted in previous RAB Submissions. QR Network has requested the projects listed below in Table 18 be included in the RAB for 2008-2009.

QR Network considers that projects have been commissioned on the date of the first revenue service over the new infrastructure. Actual project completion can lag for up to 18 months.

Table 18: Post Commissioning Projects in the 2008-2009 RAB Submission

Project ID	Project Name	RAB Submission Value
A01630	Blackwater – Blackwater-Burngrove Duplication	\$1,764,247
A01427	Blackwater – RG Tanna 3 rd Loop	\$131,967
A01640	Goonyella – Coppabella Yard Upgrade	\$2,899,747
A01505	Goonyella – DBCT 3 rd Loop	\$2,281,503
	Total	\$7,077,464

12.2 A01630 Blackwater-Burngrove Duplication

The cost and chronology of the Blackwater to Burngrove Duplication is shown in Table 19 below.

Table 19: Cost and Chronology of Blackwater to Burngrove Duplication

Stage	Date	Project Cost or Estimate	Comments
CRIMP	September 2006	\$43,000,000	
Business Case	August 2006	\$43,000,000	
Project Plan	July 2007	\$43,000,000	
Completion Report Forecast	March 2008	\$38,050,000	
Actual cost to date	December 2009	\$37,194,290	
RAB Submission 2008/2009	October 2008	\$1,729,685	Excludes IDC
RAB Submission IDC & QR Services		\$34,562	
Future Claim	RAB 2009/2010	\$198,393	

12.2.1 Prudency of Scope

QR Network states that the project was necessary to increase the Blackwater System Capacity to approximately 66 mt/a.

From the information assessed by Evans & Peck, the scope is considered prudent.

12.2.2 Prudency of Standard

Evans & Peck assumes the standard has been assessed in the year of its commissioning and has been found prudent.

12.2.3 Prudency of Cost

The post commissioning activities included for the project are included in Table 20 below.

Table 20: Post Commissioning Activities Blackwater-Burngrove Duplication

Activity	Cost 2008/2009 RAB Submission
Network engineering	\$51,852
Land matters	-
Civil works	-
Track work	-
Overhead power systems	\$1,029,554
Signalling	\$564,997
Telecommunications	\$62,364
Service relocations	\$19,995
Project management	-
QR PCIP insurance	-
PLS/WHS fees	\$923
Tender administration	-
Project contingency	-
Subtotal	\$1,729,685
IDC + Overheads + ROA	\$34,562
2008/2009 Total RAB Claim	\$1,764,247

The RAB Submission for 2008/2009 is valued at \$1,764,247. Total RAB Submission claims to date is \$40,359,713. The project currently remains within the CRIMP budget. As can be seen from Table 20, the amount being claimed is primarily for overhead power systems and signalling works, which is the kind of work expected in post commissioning activities on the Blackwater System and which is shared by both diesel and electric trains.

From the information assessed by Evans & Peck, the costs are considered prudent.

12.3 A01427 RG Tanna 3rd Loop



Figure 10: RG Tanna Coal Loading Facility, Gladstone

This project included the construction of a new third coal unloader loop and extended the existing second coal unloader loop. The cost and chronology of the RG Tanna 3rd Loop project is shown in Table 21 below.

Table 21: Cost and Chronology of RG Tanna 3rd Loop Project

Stage	Date	Project Cost or Estimate	Comments
CRIMP	September 2006	\$18,500,000	
Business Case	November 2005	\$15,500,000	
Project Plan	March 2006	\$15,500,000	
Completion Report Forecast	January 2008	\$15,894,000	
Actual cost to date	December 2009	\$15,962,144	
RAB Submission 2008/2009	October 2008	\$128,402	Excludes IDC
RAB Submission IDC & QR Services		\$3,565	
Future Claim	RAB 2009/10	\$0	

12.3.1 Prudence of Scope

The RG Tanna 3rd Loop was commissioned in December 2006.

From the information reviewed by Evans & Peck, the scope is assessed as prudent.

12.3.2 Prudency of Standard

Evans & Peck assumes the standard has been assessed in the project's commissioning year and been found prudent.

12.3.3 Prudency of Cost

Total project costs are \$15,962,144, which is less than the original CRIMP estimate of \$18,500,000.

The RAB Submission for 2008/2009 is \$131,967. QR Network reported that \$108,928 of these costs related to signalling which Evans & Peck consider reasonable.

From the information assessed by Evans & Peck, the costs are considered prudent.

12.4 A01640 Coppabella Yard Upgrade

The cost and chronology of the Coppabella Yard Upgrade project is shown in Table 22 below.

Table 22: Cost and Chronology of Coppabella Yard Upgrade

Stage	Date	Project Cost or Estimate	Comments
CRIMP	September 2006	\$33,000,000	
Business Case	November 2006	\$32,800,000	
Project Plan	November 2006	\$32,800,000	
Completion Report Forecast	December 2008	\$26,000,000	
Actual cost to date	December 2009	\$25,876,445	
RAB Submission 2008/2009	October 2008	\$2,827,062	
RAB Submission IDC & QR Services		\$72,685	
Future Claim	RAB 09/10	\$535,763	\$61,000 in 2010/2011

The Coppabella Yard Upgrade Project was commissioned in March 2008.

12.4.1 Prudency of Scope

The costs associated with the post commissioning works are larger than expected due to delays caused by inclement weather. As such, civil works and track works have contributed additional cost to the total value.

From the information reviewed by Evans & Peck, the scope is assessed as prudent.

12.4.2 Prudency of Standard

Evans & Peck assumes that the standard has been assessed in the year of its commissioning and been found prudent.

12.4.3 Prudency of Cost

The post commissioning activities included in the RAB Submission are detailed in Table 23 below.

Table 23: Post Commissioning Activities Coppabella Upgrade

Element	Cost 2008/2009 RAB Submission
Land acquisition	-
Civil works	\$529,902
Signalling	\$933,514
Telecommunications	\$33,948
Track work	\$1,064,771
Overhead wiring	\$15,124
Overhead power systems	\$19,030
Project management	\$142,468
Flood lighting	\$88,307
Project contingencies	-
Subtotal	\$2,827,062
IDC + QR Services	\$72,685
2008/2009 Total RAB Claim	\$2,899,747

The RAB submission for 2008/2009 is for \$2,899,747. Total costs to date for the project is \$27,467,828. This is within the original CRIMP budget of \$33,000,000.

From the information reviewed by Evans & Peck, the costs are assessed as prudent.

12.5 A01505 DBCT 3rd Loop

The cost and chronology of the DBCT 3rd Loop project is shown in Table 24 below.

This project included the construction of a third loop at the Dalrymple Bay Coal Terminal (DBCT). A separate project addresses the requirement for a feeder station to strengthen the power systems in the general area and Jillalan and provide power in case of failure of other feeder stations.

Table 24: Cost and Chronology of DBCT 3rd Loop

Stage	Date	Project Cost or Estimate	Comments
CRIMP	September 2006	\$83,000,000	
Business Case	July 2006	\$83,400,000	
Project Plan	March 2006	\$83,400,000	
Further Funding (Internal)	February 2007	\$26,200,000	
Completion Report Forecast	November 2007	\$106,600,000	
Actual cost to date	December 2009	\$109,687,522	
RAB Submission 2008/2009	October 2008	\$2,343,031	Excludes IDC
RAB Submission IDC & QR Services		-\$61,528	
Future Claim	RAB 09/10	\$2,674,241	

12.5.1 Prudency of Scope

QR Network's capacity modelling indicated that the third balloon loop would be required when system tonnages exceeded 100 mt/a. The Goonyella System has approximately 117mt/a contracted in 2010/2011. Babcock and Brown Infrastructure informed QR Network that the third loop would be required when net tonnages passing through DBCT exceeded 60mt/a. There is approximately 75mt/a contracted to pass through DBCT in 2010/2011.

It is not clear from the information provided by QR Network what deliverables or retentions this submission includes and consequently Evans & Peck is unable to determine prudency of scope.

12.5.2 Prudency of Standard

Evans & Peck assumes the standard has been assessed in the project's commissioning year and found prudent.

12.5.3 Prudency of Cost

QR Network states that no costs relating to the power system upgrade are included in the 2008/2009 RAB Submission and that these costs will be claimed in the 2009/10 RAB Submission. The RAB Submission of \$2,281,503 represents 2.6% of the 2007/08 submission of approximately \$89,200,000 for loop construction. QR Network has not provided details of deliverables or retentions that this claim includes.

From the information assessed, Evans & Peck is unable to validate the prudency of these costs.

13 TELECOMMUNICATIONS

13.1 General

The telecommunications projects examined in this review are asset replacement. Only an agreed percentage of the total costs of these projects is included in the RAB submission. Table 25 below lists the telecommunication projects in the 2008/2009 RAB submission.

Table 25: Telecommunications Projects in the 2008/2009 RAB Submission

Project ID	Project Name	RAB Submission Value
A02706	Statewide Data Network Upgrade	\$1,025,719
A02389	Statewide Video Conference Upgrade	\$29,720
A02708	Blackwater – Blair Athol DMR Upgrade	\$604,471
A02588	Moura – DMR Tower Replacement	\$306,142
	Total	\$1,966,052

13.2 A02706 Statewide Data Network Upgrade

The purpose of the Statewide Data Network Upgrade project is to replace existing services/utilities with "current generation *Gigabit Ethernet (GigE) equipment having sufficient capacity, bandwidth and functionality to meet QR business requirements for the next 7 years.*"⁷⁴ This upgrade will provide the following functionality out to 2016:

- availability of hardware and software maintenance;
- enhanced security;
- enhanced stability;
- ability to support videoconferencing and IP telephony;
- ability to support wireless LAN; and
- automated archival, auditing and monitoring.

The scope of works includes for replacement at the following locations:

- Pipe Networks House;
- Oracle House;
- Mayne Precinct in Brisbane;
- Railcentre 1;
- Rockhampton Administration building; and
- Paget Station and Mackay Administration Building.

13.2.1 Prudency of Scope

The existing equipment was nearing the end of its usable life with end user support and maintenance about to cease. The Business Case investigated a number of options and selected the preferred option based on a reasonable analysis.

From the information assessed by Evans & Peck, the scope is considered prudent.

13.2.2 Prudency of Standard

QR Network has selected an established industry leader in this type of system and ensured the work is consistent with two other recent similar projects accepted as prudent by the Authority: the completed data network upgrade in Townsville and the renewed data network equipment for Railcentre 2 (RC2) in Brisbane.

From the information assessed by Evans & Peck, the standard is considered prudent.

13.2.3 Prudency of Cost

The RAB Submission value of \$1,025,719 excludes CQCR's portion of 20.3% of the actual project cost. QR Network did not provide the final actual cost to QR but it appears to be approximately \$5.05m which is under the Business Case budget of \$5.665m.

QR Network state that the purchasing and delivery process will be consistent with the two projects previously assessed by the authority as prudent. QR Network have applied a reasonable split to allocate a fair proportion of this project to the RAB.

⁷⁴ 2008/09 Capital Expenditure claim Statewide Data Network Upgrade

From the information assessed by Evans & Peck, the costs are considered prudent.

13.3 A02389 Statewide Videoconference Upgrade

The Statewide Videoconference Upgrade project is aimed at establishing high definition video conferencing facilities at Brisbane, Rockhampton, Mackay and Townsville. The system uses QR Data Network instead of Telstra ISDN.

13.3.1 Prudency of Scope

QR Network have not provided evidence of a needs analysis or options analysis to support this claim.

On the documentation provided, Evans & Peck is unable to assess prudency of scope.

13.3.2 Prudency of Standard

QR Network have not provided information on the standard of the works planned or the works being claimed.

Evans & Peck is unable to assess prudency of standard.

13.3.3 Prudency of Cost

The RAB Submission for 2008/2009 is \$ 29,720. QR Network provided information claiming that the Rockhampton Administration Building had been coredrilled and communications and power cables run in preparation for the installation of the videoconferencing equipment. QR Network have also provided information on expenditure to date of \$ 321,000 from a budget of \$ 490,000.

The information provided by QR Network does not provide a complete picture of project planning, progress to date, cost of deliverables or costs relevant to the coal network.

On the documentation provided, Evans & Peck is unable to assess prudency of cost.

13.4 A02708 Blackwater – Blair Athol Digital Microwave Radio (DMR) Upgrade

The Blair Athol DMR is the key communication system between Blackwater and Blair Athol for voice, data, train control and maintenance supervisory radio, axle counter and Dragging Equipment Detector (DED) telemetry.

The Blair Athol DMR Project scope includes the following:

- replacing the DMR system between Blackwater and Blair Athol at eight communication sites;
- replacing of antennae and feeders;
- installing 24 hour remote fault monitoring; and
- upgrading 24V DC sites to 48V DC⁷⁵.

⁷⁵ QCA Submission

13.4.1 Prudency of Scope

The project has been triggered by the current system (OKI brand) reaching the end of its' operational service life. The existing system was installed in the mid-1980's and the technology can no longer be supported.

From the information assessed by Evans & Peck, the scope is considered prudent.

13.4.2 Prudency of Standard

QR Network has established a standardised NEC DMR component supplier. The work on this project is consistent with the work completed on four other DMR systems.

From the information assessed by Evans & Peck, the cost is considered prudent.

13.4.3 Prudency of Cost

In 2008, QR Network called open tenders and selected a dedicated DMR component supplier. The successful tenderer was chosen on a range of factors including price, component performance, availability and spare parts supply.

From the information assessed by Evans & Peck, the standard is considered prudent.

13.5 A02588 Moura – DMR Tower Replacement

The Moura DMR Tower Replacement project's objective was *"to replace the existing wooden poles that supported the DMR system at Banana Range and Specimen Hill on the Moura System with new free standing metal towers."* The original timber poles were installed in the 1970's.

13.5.1 Prudency of Scope

The project was triggered by the existing wooden poles reaching the end of their service life. The existing system was installed in the mid-1970's.

From the information assessed by Evans & Peck, the scope is considered prudent.

13.5.2 Prudency of Standard

The replacement towers are consistent with the towers of the Blackwater System.

From the information reviewed by Evans & Peck, the standard is assessed as prudent.

13.5.3 Prudency of Cost

The 2008/2009 RAB Submission is \$306,142. This is the final claim and covers the replacement of two towers (Banana range and Specimen Hill) with free standing steel towers.

From the information assessed by Evans & Peck, the costs are considered prudent.

14 SYSTEM WIDE

Table 26 below lists the system-wide projects in the 2008/2009 RAB Submission. The Authority has previously approved QR Network allocating 40 % of the cost of system wide projects to the coal network.

Table 26: System Wide Projects in the 2008/2009 RAB Submission

Project ID	Project Name	RAB Submission Value
A02529	QR Network Billing	\$271,485
A02478	QR Network Internet Revamp	\$30,718
A02182	Asset Information Management Improvement Program (AIM)	\$254,840
A01561	Business Intelligence Platform	\$222,948
A00825	SCADA System Replacement	\$162,497
	Total	\$742,488

14.1 A02529 QR Network Billing

14.1.1 Prudency of Scope

The QR Network Billing project's objective is to implement a billing system to calculate access revenue for QR Network. The current system is dependent on spreadsheets, databases and manual processes which leads to an increased risk of errors or omissions. The current QR Limited ERP is SAP based and it is reasonable to develop a SAP based network billing system.

From the information assessed by Evans & Peck, the scope is considered prudent.

14.1.2 Prudency of Standard

SAP is a widely used information technology platform already in use with QR. The project is not complete but from the information assessed by Evans & Peck, the standard is considered prudent.

14.1.3 Prudency of Cost

The Business Case contains an estimate valued at \$3,255,000, of which 40% will be allocated to coal. The RAB 2008/2009 submission is \$271,485.

QR Network report that the consultant was obtained through a "Request for Offer" and the Release 1 build has commenced.

QR Network have not provided sufficient information on deliverables for this project and consequently at this stage Evans & Peck is unable to assess prudency of cost.

14.2 A02478 QR Network Internet Revamp

The objective of this project is to redesign and upgrade the QR Network internet site.

14.2.1 Prudency of Scope

It is reasonable to expect large organisations to improve their internet sites at intervals of five years or less.

From the information assessed by Evans & Peck, the scope is considered prudent.

14.2.2 Prudency of Standard

QR Network has provided information reporting that the project is complete except for the rectification of some remaining software bugs.

From the information assessed by Evans & Peck, the standard is considered prudent.

14.2.3 Prudency of Cost

The 2008/2009 RAB Submission is \$ 30,718. This project was awarded through an open market tender and is forecast to be complete within the project budget of \$135,000.

From the information assessed by Evans & Peck, the costs are considered prudent.

14.3 A02182 Asset Information Management Improvement Program (AIM)

14.3.1 Prudency of Scope

The Asset Information Management Improvement Program's objective was to amalgamate critical asset information into one database from Legacy and other unsupported systems. The existence of asset data in these isolated and difficult to access systems compromises the ability of QR Network to utilise all relevant information when making asset management decisions. The objective of amalgamating this data in a robust single system is considered to be a worthwhile management goal.

From the information assessed by Evans & Peck, the scope is considered prudent.

14.3.2 Prudency of Standard

The project has currently been internally approved by QR Network for Phase 1. Phase 1 will *"define the new business processes, asset management frameworks and business requirements so that the appropriate technologies can be selected, refined benefit returns defined and the change impact understood."*⁷⁶

From the information assessed by Evans & Peck, the standard is considered prudent.

14.3.3 Prudency of Cost

QR Network has allowed for \$3,087,000 for Phase 1 of this project, with 40% allocated to coal. \$254,840 is being claimed in the 2008/2009 RAB, with no funding previously approved by the Authority. The Business Case forecast expenditure of the full Phase 1 budget of \$ 3.087m in the period 2008/2009.

The 2008/2009 claim of \$436,091 indicates that this project may not be making the planned progress. Phase 1 is the completion of a Business Definition and was anticipated to occur in 2008/2009. QR Network have provided information that progress to date is the completion of governance arrangements and the appointment of a consultant.

⁷⁶ A02182 Investment Business Case pg 2

QR Network have not provided sufficient information on deliverables or procurement methodology for this project and consequently at this stage Evans & Peck is unable to assess prudence of cost.

14.4 A01561 Business Intelligence Platform

14.4.1 Prudence of Scope

The Business Intelligence Platform project's objective was to create a data warehouse that assembles and presents information from various sources as the common reporting platform. The scope of this project was to develop a data warehouse that was scalable and could provide a secure site for data from numerous systems.

The warehouse is to be delivered in 12 modules as described in the QR Network Project Submission to the Senior Executive Strategy Council. These twelve modules are:

- ViziRail – Schedules;
- ViziRail – Actual Train Running;
- ViziRail – Advice;
- ViziRail – Rolling Stock;
- ViziRail – Billing;
- Balanced Scorecard;
- Financials;
- Configuration;
- Network Maintenance;
- Customers;
- Human Resources; and
- Safety.

QR Network completed a comprehensive project submission with senior executive review. It is reasonable that a large organisation requires a sound business intelligence platform.

From the information assessed by Evans & Peck, the scope is considered prudent.

14.4.2 Prudence of Standard

QR Network states that the data warehouse is compatible with the existing ViziRail system. The system supports the business needs of QR Network for regulatory and government reporting requirements. The system is subject to an annual external audit. The project submission describes the system modules and objectives.

From the information assessed by Evans & Peck, the standard is considered prudent.

14.4.3 Prudence of Cost

The Business Case contains an estimate value of \$3,341,000, with 40% allocation to the coal network as per the Authorities agreed QR Network Costing Manual. The 2008/2009 RAB Submission is valued at \$222,948 with \$115,251 being previously approved by the Authority.

QR Network have provided information that the project deliverables received during 2008/2009 were the Regulatory Reporting Sub-Project and the Coal Yards Network Management (CYNM) Phase 2 changes.

From the information provided, Evans & Peck assess the costs as prudent.

14.5 A00825 SCADA System Replacement

The SCADA (Supervisory Control and Data Acquisition) Power System controls and monitors power procurement and supply to the rail network. The SCADA System Replacement project was triggered by the existing system becoming outmoded and exposing QR Network to the risk of not complying with the Electrical Safety Act (ESA).

14.5.1 Prudency of Scope

The original SCADA system was installed throughout 1986-1989. The age of the current system was creating difficulties in sourcing parts and expertise which was creating further technical problems, increasing the risk of system failures and compromising the ability for timely repairs. QR Network considered an upgrade option of the system as one of the alternatives, however the replacement option was assessed as the most cost effective solution.

From the information assessed by Evans & Peck, the scope is considered prudent.

14.5.2 Prudency of Standard

Evans & Peck reviewed the Project Completion Report which included a documented audit of the completed project.

From the information assessed by Evans & Peck, the standard is considered prudent.

14.5.3 Prudency of Cost

The claim in the 2008/2009 RAB Submission is \$162,497, with 40% of cost allocated to the coal network. The project was initially approved at \$4.518m with an anticipated completion date of October 2002. The final delivered cost is \$7.555m. The Project was commissioned in December 2007 with a Defects Liability Period extending to December 2008. The Project Completion Report includes a candid review of the project and clearly acknowledges that the initial budget was based on an unrealistically low tender price with no allowance for scope contingency. The audit acknowledges that the original cost estimate was not prepared in accordance with QR Network Guidelines for Construction Cost Estimating.

QR Network undertook a competitive tender process and received submissions from four proponents. Citect provided the lowest conforming tender price at \$3.760m. Citect had no previous railway experience, however, was \$1m cheaper than the next lowest conforming tender (Alstom, ABB and Siemens). The highest conforming tender was \$9m. The lowest tendered contractor did not understand the electro-magnetic compatibility (EMC) issues which can occur in an electrified railway. As such the remote terminal units (RTUs) did not have the required electro-magnetic interference (EMI) immunity. This required QR Network to install attenuators into the telecommunications bearers.

The final cost increase to \$7.555m is partly due to additional costs resulting from the run down condition of the telecommunication bearers. In addition the cost of the necessary, but unbudgeted,

telecommunication upgrades was a further \$0.5m. The initial estimate included \$0.7m for QR project management, technical resources and possibly some contract risk. Citect was awarded the contract based upon price. Evans & Peck considers that this price was too low and should have been balanced with consideration of the contractor's inexperience working in a rail environment. It is also reasonable to reject the highest bid of \$9m as being too high. The second lowest price was \$4.76m, however, this price utilised unsuitable equipment. Adding \$2m for the supply of the correct RTU's the revised price would be \$6.76m. Allowing a further \$0.5m for telecommunication upgrades and \$0.7m for QR Network project management and technical services brings the Evans & Peck estimated value to \$7.96m.

From the information assessed by Evans & Peck, the costs are considered prudent.

15 SELF ASSESSMENT QUESTIONNAIRE

15.1 Overview

The Authority requested Evans & Peck develop a tailored self assessment tool for QR Network to assist in project assessment for QCA capital expenditure approval. The tool was developed in consultation with QCA and QR Network staff to ensure that it will deliver the desired outcomes.

The questionnaire comes in two parts; Part A and Part B. Part A is to be completed for all projects and part B is to be completed for selected projects. The objective of the Part B questionnaire is to provide a starting point for a detailed project review. The information in Part B should be considered in the context of the unique features of any particular project.

The tailored self assessment tool is included in Appendix L. The questionnaire has been developed using survey software enabling administration as a computer assisted internet survey if required.

15.2 Process

Evans & Peck was provided with source data from the Authority including project summary sheets completed by QR Network. The initial draft questionnaire was structured around information in the project summary sheets.

Evaluation of the draft questionnaire by Authority staff at an early stage occurred to test for relevance of questions and any missing information that may fall outside the scope of the proposed questions. Gaps were identified at this stage and resolved. Further pilot testing of the questionnaire has been conducted internally by Evans & Peck to assess overall flow and timing utilising one of the assessed RAB Submission projects.

15.3 Survey structure

A structured questionnaire for self completion by QR Network has been developed with questions regarding the following project details:

- **Part A Project Information:**
 - **Project information** – project number; location/system; project type; major element of work; commissioning dates; whether financial completion has been achieved; whether the project has previously been considered by the QCA;
 - **Claim details** – cost details for total claimable expenditure, applicable QR Services cost and applicable interest during construction (IDC) for previous claims, the 2008/2009 claim and forecast future claims; geotechnical characteristics considered;
 - **Project overview** – including project implementation objectives and significant quantities; data for project enhancements;
 - **Initial criteria** – definition of below-rail infrastructure; inclusion in the Coal Rail Infrastructure Master Plan (CRIMP); approval from a customer vote; cost details; reference numbers and dates of submission for documents provided; funding by QR Network; revenue source outside the RAB for enhancement; and
 - **Prudence of the project** – details outlining the project's prudence of scope, standard and cost; brief conclusion, including whether the project has achieved its major objectives and whether the project is within budget.

- **Part B Cost:**
 - **Overheads** – cost, cost as a percentage of direct costs, supervision cost, supervision cost as a percentage of direct costs, comments in regard to overhead costs;
 - **Design** – cost, cost as a percentage of direct costs, comments in regard to design costs;
 - **Track Information** – length of formation, quantity of ballast, ballast cost;
 - **Track Switches** – how many, type, comments;
 - **Bridges** – how many, length;
 - **Culverts** – how many new, how many extensions;
 - **Signalling** – single direction or bidirectional, cost, cost per km;
 - **Overhead Power** – cost, cost per kilometre; and
 - **Electrical Projects** – transformers, auto-transformers, harmonic filters, switchgear.

15.4 Electronic Operation

The self assessment tool can be implemented as a paper based system. However there is an opportunity to increase the effectiveness and robustness of the system by making it electronic.

Evans & Peck have set up example electronic questionnaires in two different web-based products. These have been partially effective but may have some limitations that constrain the potential effectiveness of an electronic application using these particular platforms. The limitations include:

- the inability to attach documents;
- security of stored data;
- implementation and ownership of the program; and
- limited reporting ability.

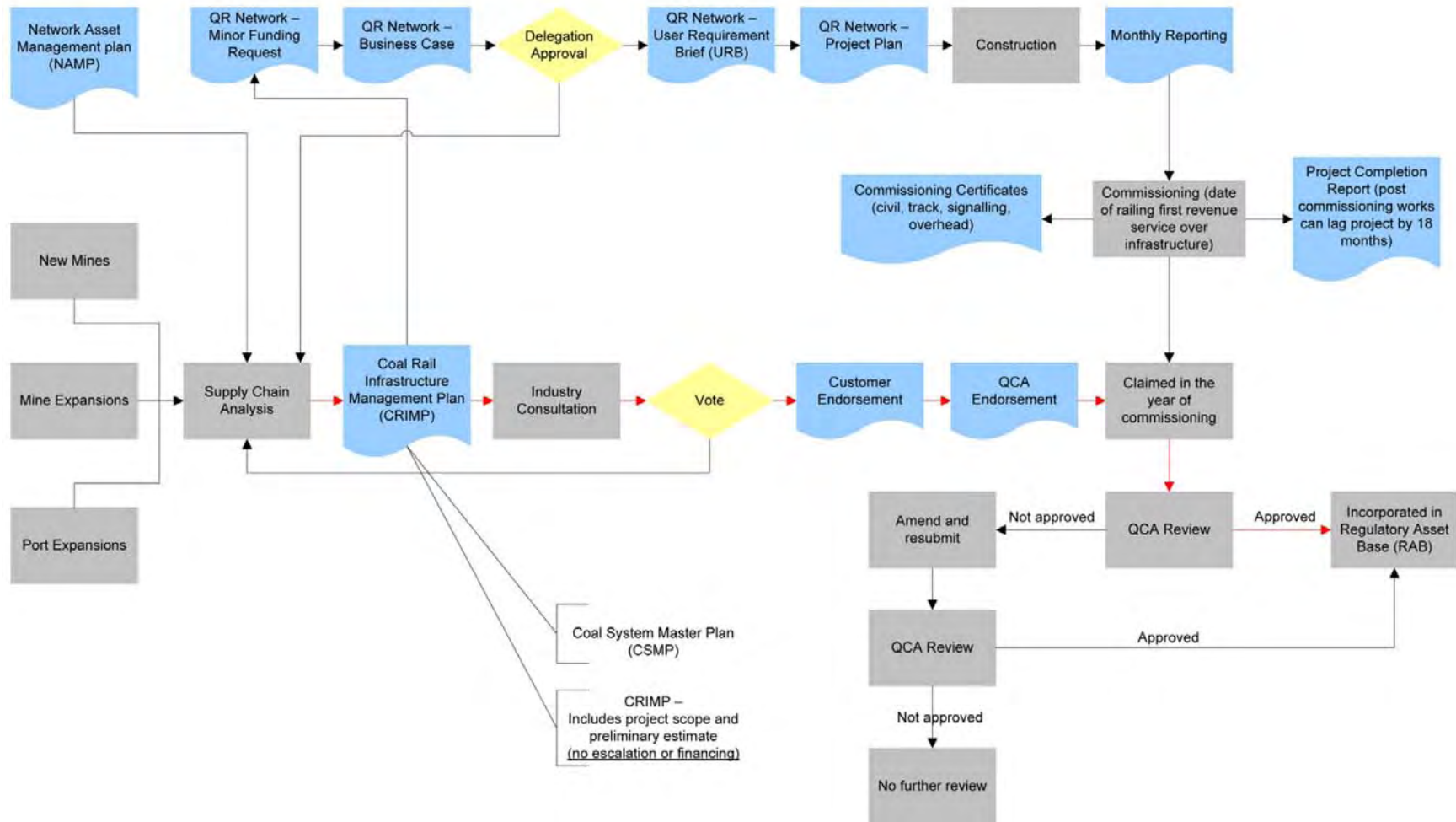
An alternative platform could be a relational database developed in software such as Microsoft Access. This type of platform could address these limitations.

Implementation of this proposed questionnaire in electronic form is outside the scope of this project. This project would require clear scope definition, objectives, milestones and consultation with stakeholders.

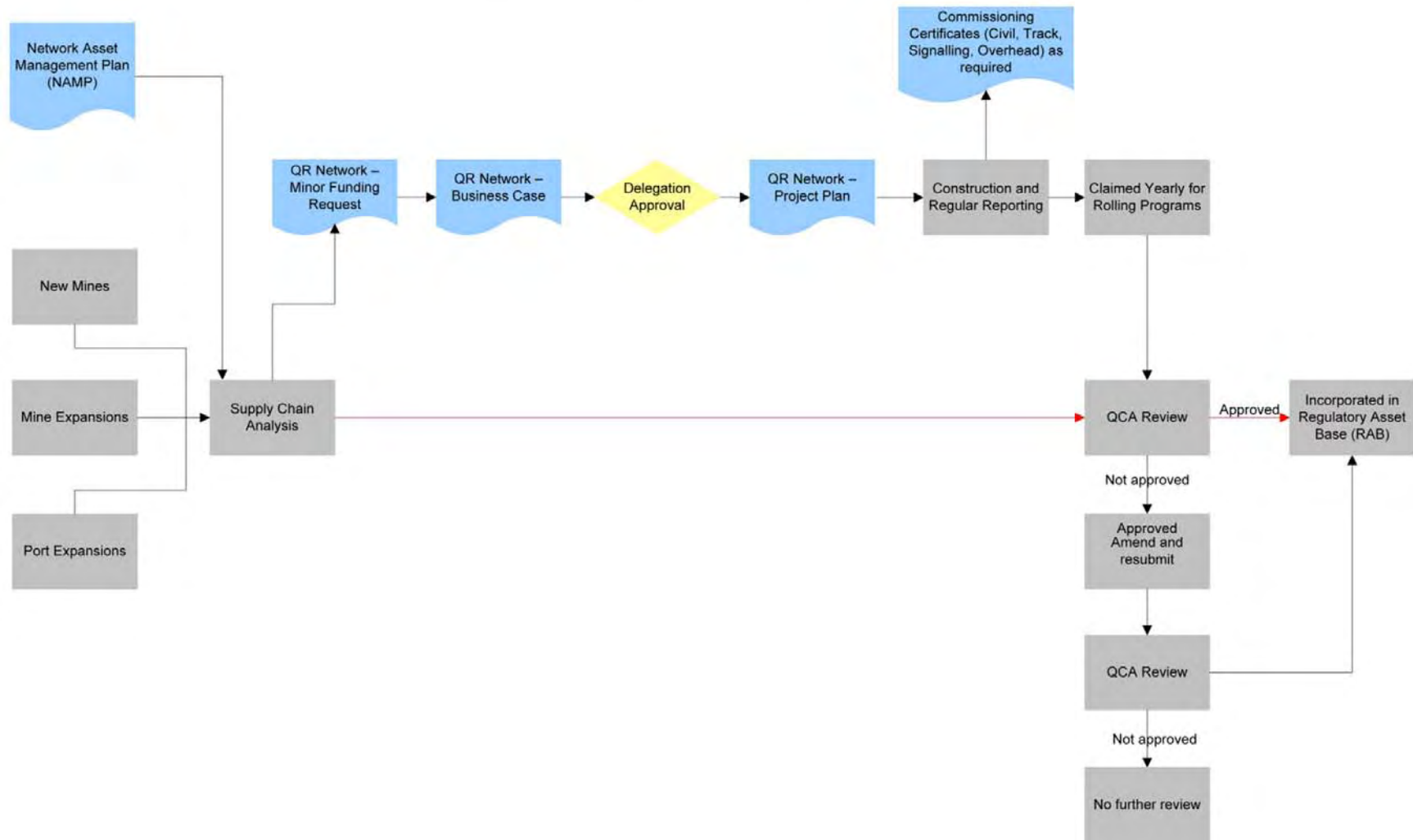


APPENDIX A Approvals Process Flowcharts

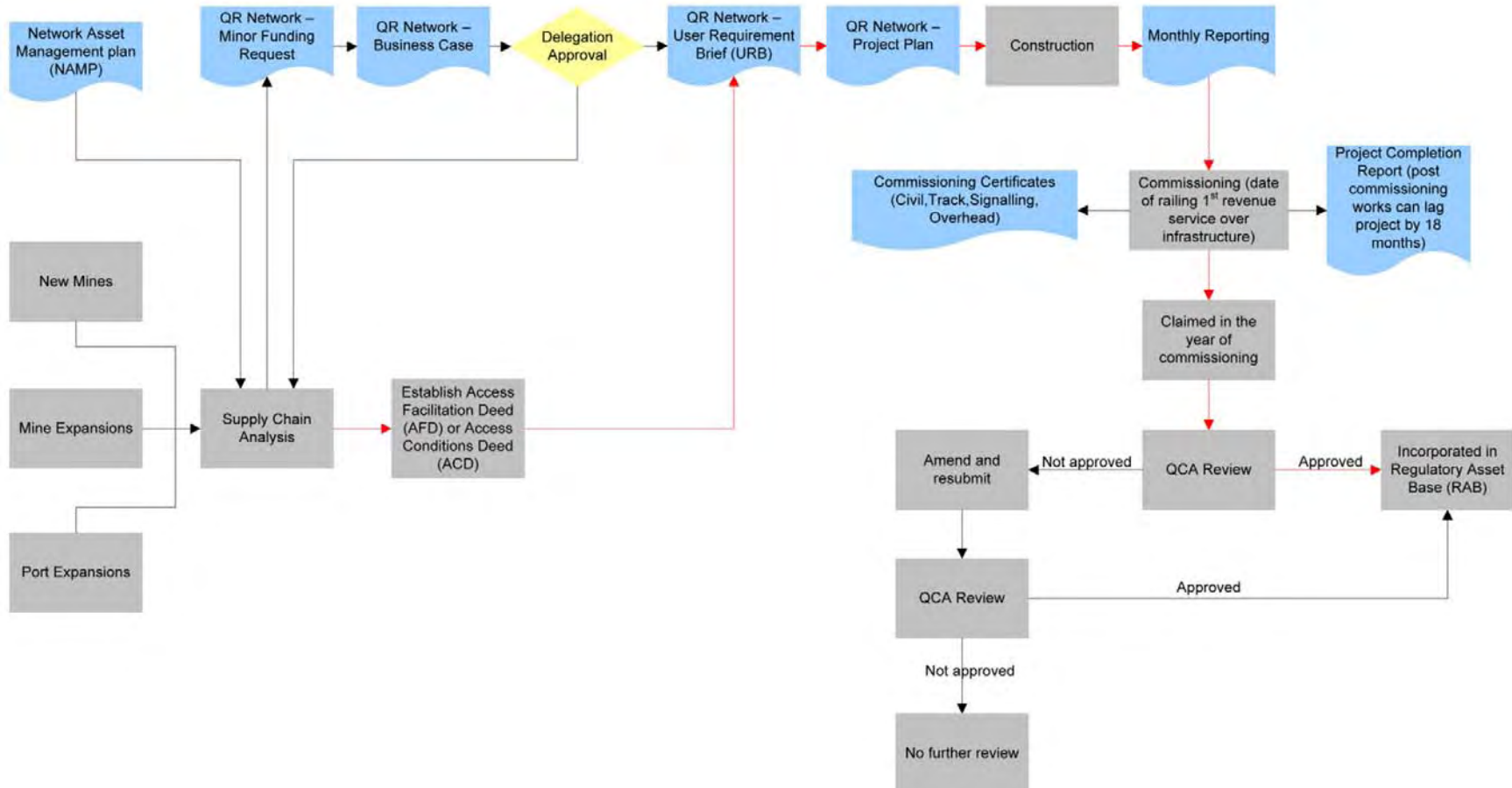
Approvals Process – System Enhancement Projects



Approvals Process – Asset Renewal Projects



Approvals Process – Customer Specific Projects



APPENDIX B Reference Documents

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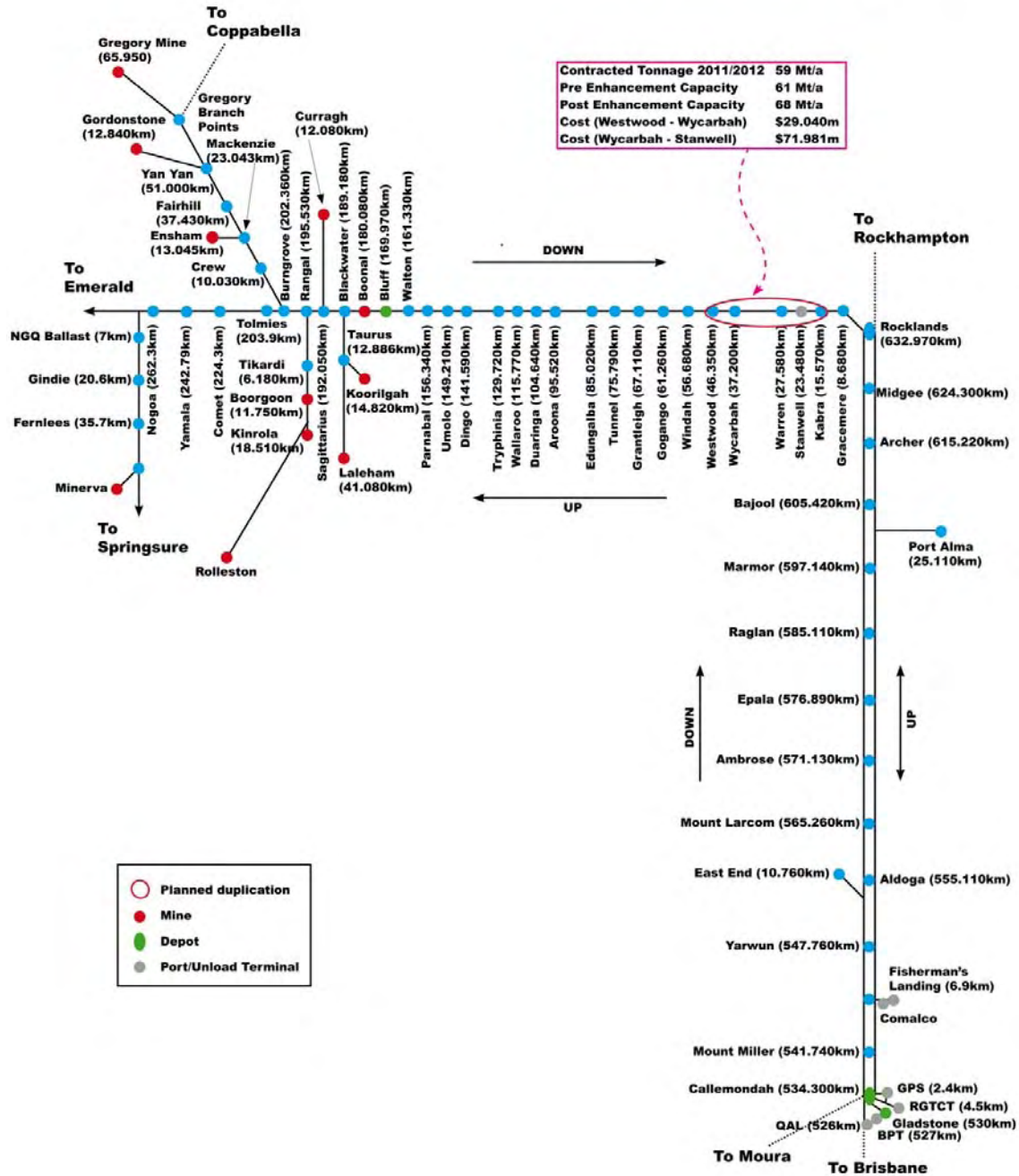
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APPENDIX C Blackwater Rail System Schematic

Blackwater Rail System



APPENDIX D Blackwater System Contracted Tonnages

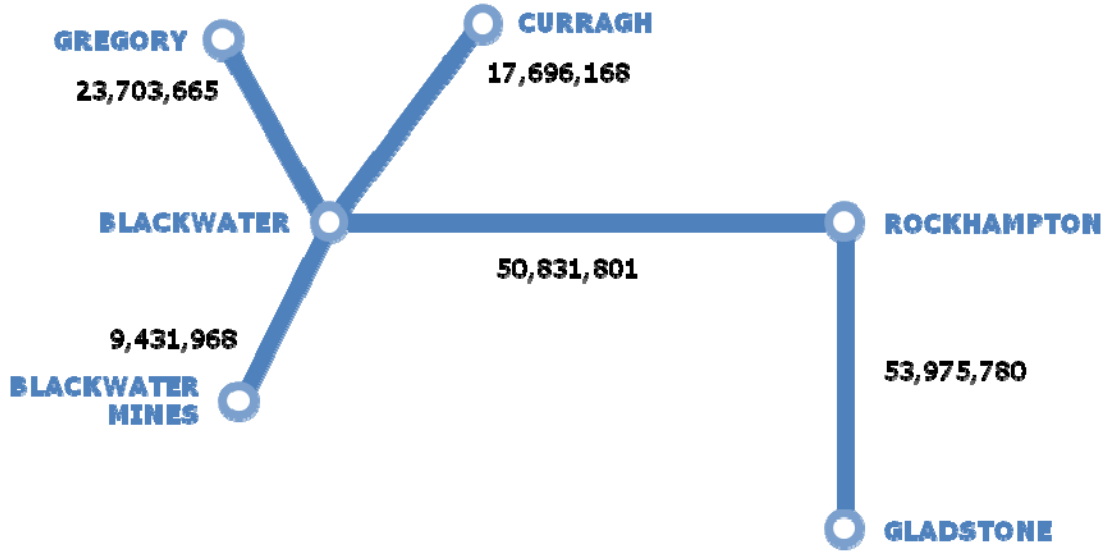


Figure D.1: Blackwater System contracted net tonnages 2009/2010

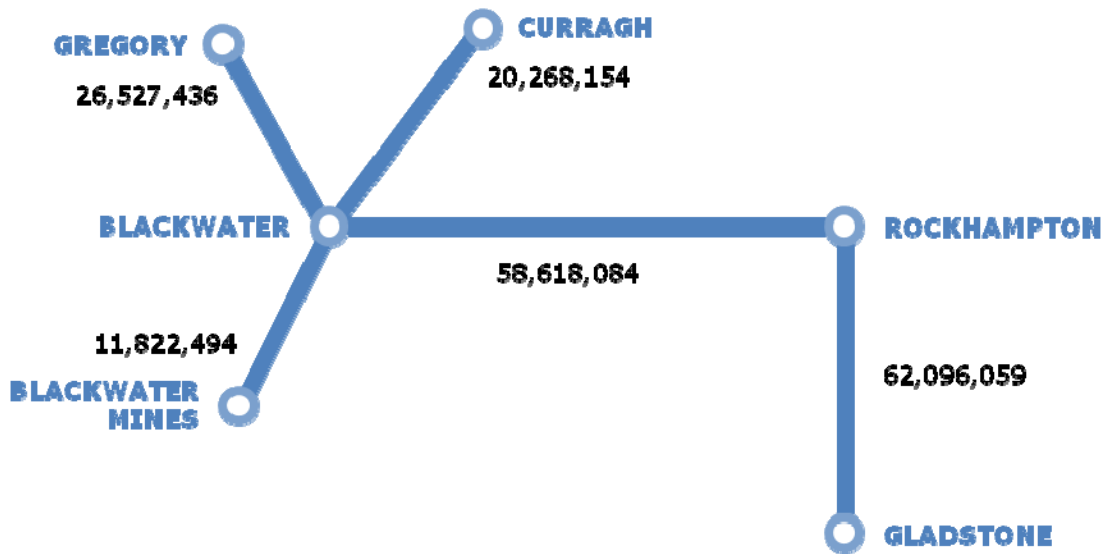
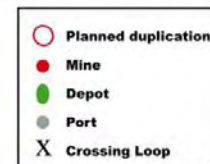
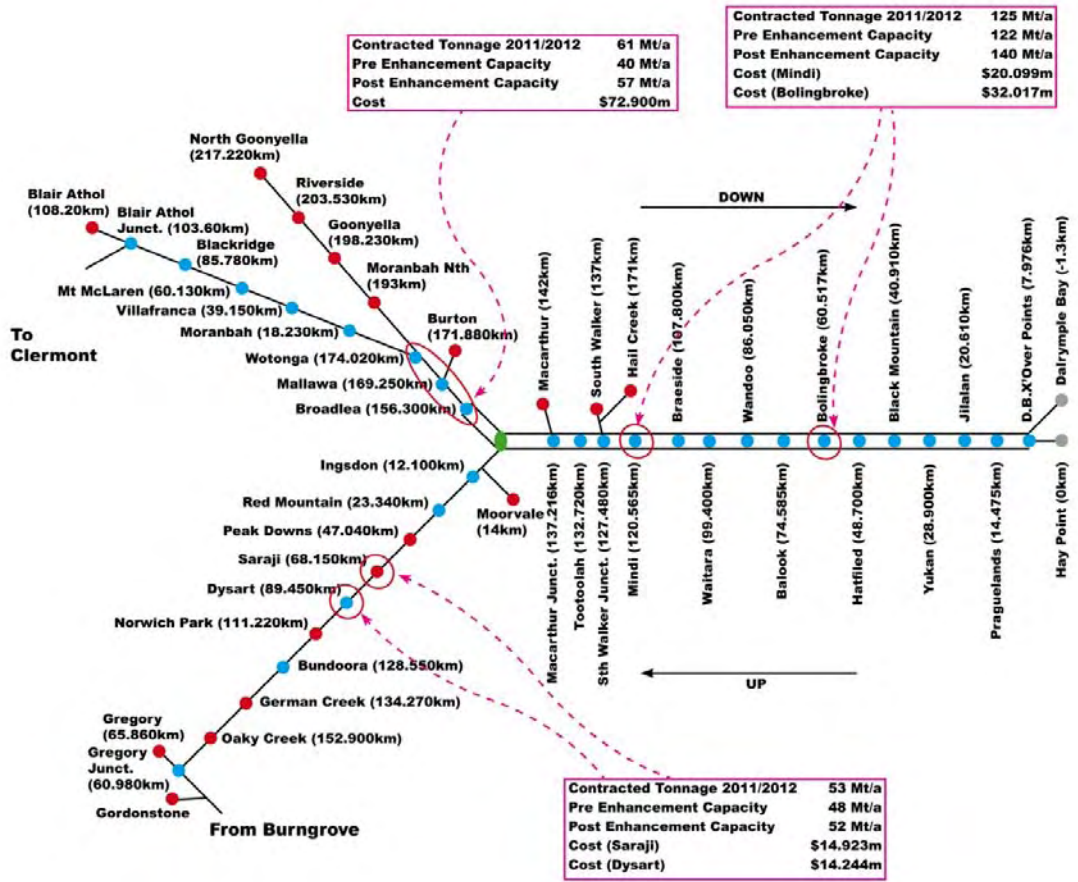


Figure D.2: Blackwater System contracted net tonnages 2011/2012

APPENDIX E Goonyella System Schematic

Goonyella Rail System



APPENDIX F Goonyella System Contracted Tonnages

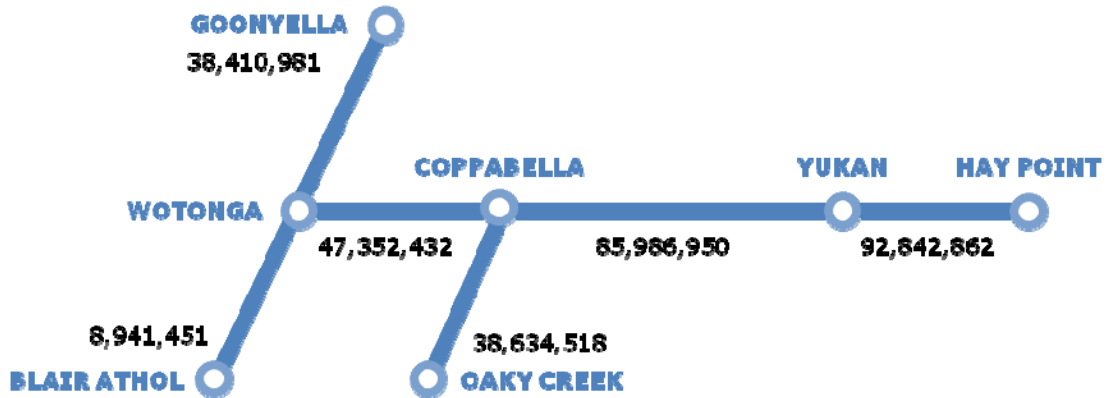


Figure F.1: Goonyella System contracted net tonnages 2009/2010

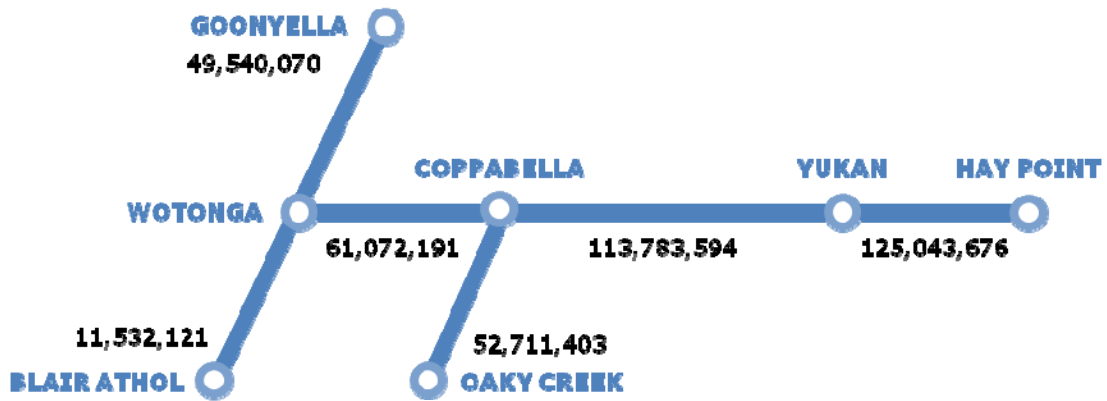


Figure F.2: Goonyella System contracted net tonnages 2011/2012

APPENDIX G 2008/2009 Project Data and Construction Standards

Table G.1: Summary of Costs

Project ID	Project Name	System	Formation Length (km)	Forecast Cost at Completion	Rate (\$/km)	Comments (All sites electrified)
SYSTEM ENHANCEMENTS						
A01574	Westwood - Wycarbah Duplication	Blackwater	6.925	\$29,039,668	████████	13 culvert extensions. 2 new turnouts.
A01732	Stanwell - Wycarbah Duplication	Blackwater	10.92	\$71,980,742	████████ ████████ ████████	Includes demolition of existing bridge and 13 culvert extensions, 6 new turnouts and 3 Bridges - 157m in length.
A01933	Callemondah 3 rd Spur and arrival Road 2	Blackwater	3.78	\$39,065,762	████████ ████████ ████████	Includes for an upgrade of Yard Power System \$5,877,000 and cable trough replacements. Callemondah Yard is a busy operating yard and a constrained workspace.
A01689	Broadlea - Mallowa - Wotonga Duplication	Goonyella	13.7	\$72,917,870	████████	28 Culverts.
A01907	Harrow Passing Loop	Goonyella	2.35	\$14,923,134	████████	2 Culvert extensions. 6.5km loop to mainline.
A02243	Stephens Passing Loop	Goonyella	2.35	\$14,243,634	████████	5 culvert extensions.
ASSET REPLACEMENT						
A02073	Oaky Creek Balloon Loop Upgrade	Goonyella	4.535	\$3,953,816	████████	Includes replacing ballast and 240m of part worn 53 kg/m rail. Two upgrades to existing turnouts. Removal of 1450m ³ of contaminated ballast. QR has advised that there will be a further claim in 2010.
A01980	CQCR - Formation Strengthening	General Coal	6.418	\$3,832,934	████████	Reconstruction of formation or injection of lime slurry as pre-emptive maintenance.
A02471	Callemondah Yard Upgrade	Blackwater	4.7	\$3,910,000	████████	Using part worn 53kg rail.
A00993	Goonyella - Rail Upgrade	Goonyella	36.4	\$11,056,328	████████	Replacing 53kg/m rail with 60 kg/m
A02074	Norwich Park Balloon Loop Upgrade	Goonyella	5.293	\$3,001,000	████████	Replacing timber sleepers with 28 tonne axle load concrete sleepers. Also includes ballast replacement, siding to be removed and overhead power.
A02072	Goonyella Mine Balloon Loop Upgrade	Goonyella	0.34	\$231,777	████████	Includes replacing a turnout and shortening a bad order siding.

Table G.2: Summary of civil standards

Project ID	Project Name	System	Design Speed (km/h)	Rail kg/m	Sleepers (tonne axle load)
A01689	Broadlea - Mallawa - Wotonga Duplication	Goonyella	80	60	28
A01732	Stanwell - Wycarbah Duplication	Blackwater	80	60	28
A01933	Callemondah 3 rd Spur	Blackwater	80	0.3km @ 60, 2.38km @ part worn 53	28
A01574	Westwood - Wycarbah Duplication	Blackwater	100	60	28
A01907	Harrow Passing Loop (Peak Downs - Saraji)	Goonyella	80	60	28
A02243	Stephens Passing Loop (Dysart - Norwich Park)	Goonyella	80	60	28
A02073	Oaky Creek Balloon Loop Upgrade	Goonyella	80	47	28
A01980	CQCR - Formation Strengthening	General Coal		N/A	N/A
A02471	Callemondah Yard Upgrade (Arrival Roads)	Blackwater	80	53	28
A00993	Goonyella - Rail Upgrade	Goonyella	80	60	
A02074	Norwich Park Balloon Loop Upgrade	Goonyella	80	2.094km @ existing 47kg/m, 3.199 km @ part worn 53 kg/m	28
A02072	Goonyella Mine Balloon Loop Upgrade	Goonyella	80	part worn 53 kg/m	28

APPENDIX H Procurement Methods

Project ID	Project Name	System	Procurement Methodology					
			Design	Civil	Track	Overhead	Signalling	Other
SYSTEM ENHANCEMENT								
A01689	Broadlea - Mallawa - Wotonga Duplication	Goonyella	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
A01732	Stanwell - Wycarbah Duplication	Blackwater	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
A01933	Callemondah 3 rd Spur	Blackwater	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
A02099	Bolingbroke Feeder Station	Goonyella	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
A01574	Westwood - Wycarbah Duplication	Blackwater	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

A01422	Mindi 132kv/50kv Feeder Station	Goonyella	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
A01907	Harrow Passing Loop	Goonyella	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
A02243	Stephens Passing Loop	Goonyella	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]



APPENDIX I QR Services Charges

Project ID	Project Name	RAB Submission Value (2008/2009)	QR Services Charge
System Enhancement		\$312,030,703	\$7,727,882
A01689	Broadlea - Mallowa - Wotonga Duplication	\$71,344,349	\$1,171,375
A01732	Stanwell - Wycarbah Duplication	\$68,527,742	\$1,175,295
A01933	Callemondah 3 rd Spur	\$36,945,062	\$606,092
A02099	Bolingbroke Feeder Station	\$28,887,179	\$498,370
A01574	Westwood - Wycarbah Duplication	\$28,804,922	\$461,809
A01422	Mindi 132kv/50kv Substation	\$16,782,168	\$262,950
A01907	Harrow Passing Loop (Peak Downs - Saraji)	\$14,035,956	\$235,931
A02243	Stephens Passing Loop (Dysart - Norwich Park)	\$13,136,774	\$229,629
A02262	Coal Dust Environmental Evaluation	\$948,787	\$15,751
A02416	Coal Fouling Investigation	\$763,053	\$12,642
	GAPE Early Works	\$31,854,711	\$3,058,038
Asset Replacement		\$14,432,162	\$247,760
A02073	Oaky Creek Balloon Loop Upgrade	\$4,313,476	\$70,804
A01980	CQCR - Formation Strengthening	\$3,934,087	\$69,639
A02471	Callemondah Yard Upgrade (Arrival Roads)	\$3,029,720	\$52,416
A02117	Goonyella - Switchrollers	\$819,144	\$14,235
A00993	Goonyella - Rail Upgrade	\$680,195	\$12,091
A02074	Norwich Park Balloon Loop Upgrade	\$615,567	\$10,793
A02575	ViziRail Coal Network Paths	\$554,343	\$9,764
A02072	Goonyella Mine Balloon Loop Upgrade	\$267,384	\$4,151
A02223	Rangal Feeder Station Reconfiguration	\$218,246	\$3,867
Customer Specific		\$55,507,325	\$984,127
A02395	Vermont Spur and Balloon Loop	\$55,507,325	\$984,127
Telecommunications		\$1,966,052	\$35,115
A02706	Statewide Data Network Upgrade	\$1,025,719	\$18,369
A02708	Blackwater - Blair Athol DMR Upgrade	\$604,471	\$10,890
A02588	Moura - DMR Tower Replacement	\$306,142	\$5,372
A02389	Statewide Video Conference Upgrade	\$29,720	\$484
System wide		\$942,488	\$29,907
A00825	SCADA System Replacement	\$162,497	\$10,572
A02182	Asset Information Management Improvement Program (AIM)	\$254,840	\$7,545
A01561	Business Intelligence Platform	\$222,948	\$6,358
A02529	QR Network Billing	\$271,485	\$4,892
A02478	QR Network Internet Revamp	\$30,718	\$540



Project ID	Project Name	RAB Submission Value (2008/2009)	QR Services Charge
Post Commissioning		\$7,077,464	\$125,858
A01630	Blackwater-Burngrove	\$1,764,247	\$30,975
A01427	RG Tanna 3 rd Loop	\$131,967	\$2,299
A01640	Coppabella Yard Upgrade	\$2,899,747	\$50,626
A02478	QR Network Internet Revamp	\$2,281,503	\$41,958

APPENDIX J Projects Approved by Customer Vote

Projects with customer pre-approval of scope (received from QCA on 20 November 2009 originating in correspondence of 21 February 2007)

Project ID	Project	Value
System Enhancement		
A02262	System Wide – Coal Dust Environmental Evaluation	\$3,000,000
A02416	System Wide – Coal Fouling Investigation	
A01574	Blackwater – Westwood - Wycarbah Duplication	\$34,000,000
A01732	Blackwater – Stanwell - Wycarbah Duplication	\$71,500,000
A01933	Blackwater – Callemondah 3rd Spur	\$48,000,000
A01689	Goonyella – Broadlea - Mallowa - Wotonga Duplication	\$67,000,000
A02099	Goonyella – Bolingbroke Feeder Station	\$16,000,000
A01422	Goonyella – Mindi 132kv/50kv Substation	\$14,000,000
A01907	Goonyella – Harrow Passing Loop (Peak Downs - Saraji)	\$10,000,000
A02243	Goonyella – Stephens Passing Loop (Dysart - Norwich Park)	\$10,000,000
	Goonyella to Abbott Point Early Works	\$27,000,000
Post Commissioning		
A01630	Blackwater – Blackwater - Burngrove Duplication	\$43,000,000
A01427	Blackwater – RG Tanna 3 rd Loop	\$19,000,000
A01640	Goonyella – Coppabella Yard Upgrade	\$33,000,000
A01505	Goonyella – DBCT 3 rd Loop	\$83,000,000

APPENDIX K Power Capacity Analysis

Table K.1: System Loading with No Upgrade Normal Condition

Table K.1 represents the Coppabella to Oonooie electrical supply system for the Goonyella System prior enhancement. A green cell indicates that the system has the electrical capacity to manage the load, however a red cell indicates that overloading and tripping of the system will occur. This table shows that the current system cannot carry trains at 20 minute intervals.

Distance	Electrical Section	Peak Loading (MVA)		1 min Avg (MVA)		10 min Avg (MVA)	
		32+/-2min	22+/-2min	32+/-2min	22+/-2min	32+/-2min	22+/-2min
24-55km	Oonooie to Bolingbroke	45	60	40	55	23	30
55-89km	Bolingbroke to Wandoo	35	53	25	40	18	22
89-111km	Wandoo to Mindi	35	36	34	35	20	21
111-149km	Mindi to Coppabella	35	55	30	52	19	30
		<i>>50MVA for 1 min Avg. results in trip</i>					

Table K.2: System Loading with No Upgrade Feeder Station Failure

Table K.2 represents the same system without installing feeder stations at Bolingbroke and Mindi and the impact of a failure at the Oonooie Feeder Station. A dark red cell indicates significant overload. This table shows that the system could not carry 22 minute or 32 minute train intervals if Oonooie failed.

Distance	Electrical Section	Peak Loading (MVA)		1 min Avg (MVA)		10 min Avg (MVA)	
		32+/-2min	22+/-2min	32+/-2min	22+/-2min	32+/-2min	22+/-2min
24-89km	Oonooie to Wandoo	60	85	58	80	32	50
89-149km	Wandoo to Coppabella	60	90	55	80	36	50
		<i>>50MVA for 1 min Avg. results in trip</i>					

Table K.3: System Loading with No Upgrade Feeder Station Failure

Table K.3 represents the system without installing feeder stations at Bolingbroke and Mindi and a failure at Oonooie and shows the train interval this system could accommodate is 62 minutes +/- 2 minutes.

Distance	Electrical Section	Peak Loading (MVA)		1 min Avg (MVA)		10 min Avg (MVA)	
		62+/-2min	42+/-2min	62+/-2min	42+/-2min	62+/-2min	42+/-2min
24-89km	Oonooie to Wandoo	45	60	35	55	22	32
89-149km	Wandoo to Coppabella	35	55	35	50	23	30
		<i>>50MVA for 1 min Avg. results in trip</i>					



APPENDIX L Questionnaire
