OFFICE OF RAIL REGULATION

ORR Best Practice Study

Visit to Australia - 20 August to 05 September 2007

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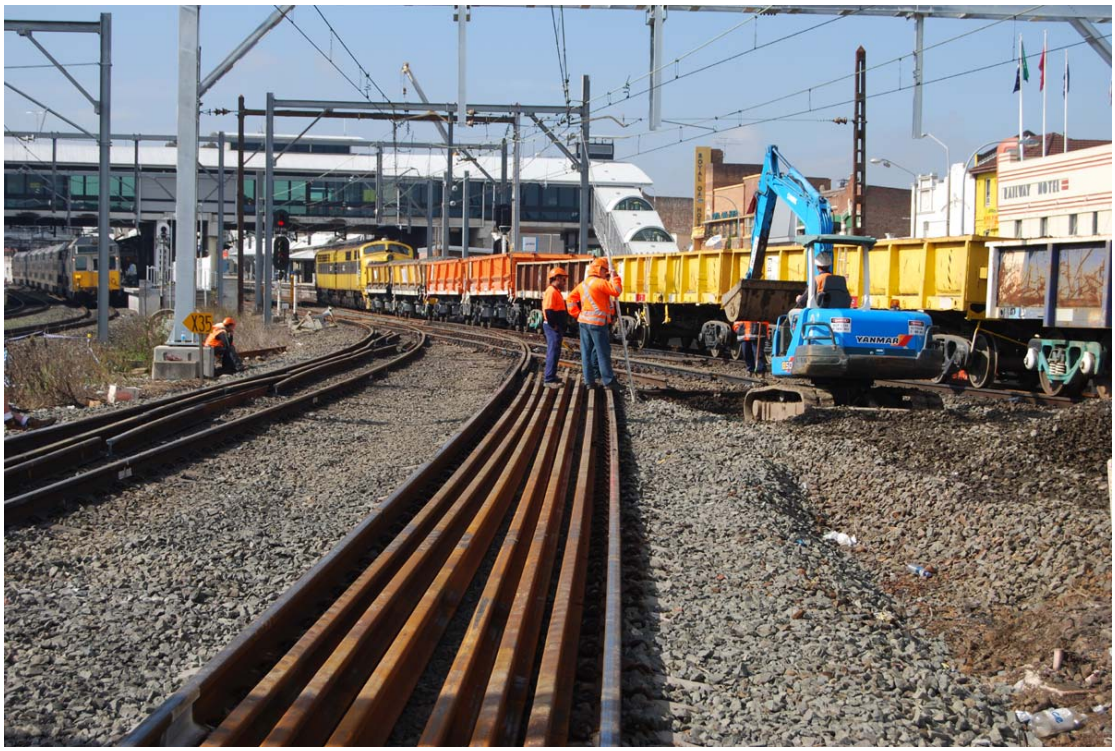

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Glossary of Acronyms

ACCC	The Australian Competition and Consumer Commission
ARA	Australasian Railway Association
ARTC	Australian Rail Track Corporation
ATSB	Australian Transport Safety Bureau
BHP	BHP Billiton World's largest resource company
CASA	Civil Aviation Safety Authority
COMET	Consortium of Metropolitan Transport Operators
CPI	Consumer Price Index
CRC	Co-operative Research Centre
DoI	Department of Infrastructure, Victoria
DORC	Depreciated Optimised Replacement Cost
gmpta	gross million tonnes per annum
ICE	Institution of Civil Engineers
IPART	Independent Pricing and Regulatory Tribunal
ISG	Infrastructure Services Group (Queensland Rail)
ITSRR	Independent Transport Safety and Reliability Regulator
OTSI	Office of Transport Safety Investigation
PDFH	Passenger Demand Forecasting Handbook
PLC	Programme Logic Controller
PPP	Public Private Partnership
QCA	Queensland Competition Authority
QRNA	Queensland Rail Network Access
QR	Queensland Rail
QT	Queensland Transport
RailBAMS	Acoustic Bearing Monitor
SCT	Specialised Container Transport
TIDC	Transport Infrastructure Development Corporation
TSC	Transport Services Contract
WILD	Wheel Impact Loading Device

Executive Summary

The visit to Australia between 22 August and 04 September was arranged around 6½ full days of meetings, 1½ days of site visits and a full day asset management workshop. Additional time was spent travelling on the different networks to inspect infrastructure.

Context of Findings

The Australian railway system consists of a disparate group of individual State railways linked by a limited number of interstate lines. The State railways generally comprise urban passenger networks to serve the principal conurbations, rural networks that have limited seasonal freight plus infrequent passenger services and heavy haul freight, mainly minerals and coal.

Historically the rivalry between States has led to each adopting its own standards and especially track gauge forcing traffic to be transferred from one railway to another. This legacy has been inherited and to some extent complicated by the number of different institutional/organisational structures within which the systems operate. In the last ten years there have been frequent changes in structure (e.g. RailCorp is the latest of five reorganisations in NSW) with the inevitable instability that results.

Despite the complexity of the railway structure in Australia, there is a common theme throughout the States that has a big influence on what has been and is being achieved. There is a high level of political and financial support for the development of the networks. As a consequence there were no apparent financial constraints on the activities of the Infrastructure Controllers spoken to.

Asset Management Tools

RailCorp has developed the Ellipse (formerly MIMS) asset management system to be the major tool for managing most assets. The development has ensured that the front end is “user friendly” and that associated systems are closely integrated. The asset register, works orders, cost information, asset history from creation through to disposal are all included and mandated on local managers to use.

Possession Strategies

Each Railway Infrastructure Controller had a clear vision on its most appropriate possession strategy. RailCorp, a passenger (commuter) focussed business with an extensive interlinked network is able to adopt full route 48 hours blockades (typically from 02.00hrs Saturday morning to 02.00hrs on Monday morning) on a cyclical basis. Its strategy is based on its customers preference for closures that are well publicised and meet a regular pattern (typically every thirteen weeks). QR and ARTC on the other hand, being predominately focussed on the freight market, plan their possessions around their customers’ needs which are inextricably linked with the activities and maintenance of the source mine and destination port or processing plant facilities. Most routine maintenance and renewals activities have to be completed within a 6-hour window. There are few diversionary routes. For

interstate, inter-modal traffic, the emphasis is on meeting on-time delivery requirements for customers to unload.

However there was no evidence for seeking more efficient maintenance techniques within possessions although RailCorp places a lot of emphasis on maximising the use of its blockade cycles by operating multiple and multi disciplinary worksites during the 48hrs available. The “Possession Controller” met on Saturday 25 August 2007, expressed disappointment that he only had 89 worksites running that weekend with a workforce of around 1100 personnel who were undertaking Aus$ 4.8m worth of work, being a mixture of enhancement work by TIDC, and maintenance and renewal work by RailCorp.

Rail Grinding

Three of the four Infrastructure Controllers expressed satisfaction that their focus on the management of the wheel/rail interface was paying dividends through the evidence of reduced track and rolling stock maintenance costs and extended asset life. Noted below are measures adopted for the management of rolling stock condition that is a contributory factor as well. RailCorp, QR and ARTC all reported that they ran extensive rail grinding programmes to maintain rail-head condition to its optimum profile to match wheel profile. RailCorp now adopts a single pass grind to maintain profile for 33% of its rails per annum.

Acoustic Monitoring

QR and ARTC have both adopted acoustic monitoring equipment and an associated vehicle tagging system so that early warning of wheel flat or bearing condition deterioration can be detected and reported immediately to the vehicle owner.

Digital Image Recognition Technology

QR utilises web cams at depots where electric traction is employed to scan pantographs and compare with permissible profiles, instantly reporting occasions when a pantograph condition falls outwith the standard set, so that intervention may take place at the earliest opportunity.

Import Technology from Defence Industry Telecoms

ARTC is negotiating a deal with Telstra for the provision of a secure radio transmission network for its train control systems obviating the need to provide its own dedicated networks in the future

Staff Training-

ARTC is training its front line staff in a set of multidisciplinary skills so that they are competent and therefore able to perform emergency repairs to a variety of assets

Skills and Technology

The ARA are actively promoting a Rail Skills Council to identify needs in 10 years time and to define immediate actions to address any shortfalls.

Summary

Australia has diverse rail networks to serve a range of transport needs from urban commuter through long haul inter-modal to mine-port supply chain. The networks visited appeared to be safe, well run and fit for purpose. There were many examples of good asset management practice and a clear understanding of the need to match maintenance and renewal activities to available possessions. The examples of best practice found on the visits could be adopted on other rail networks, even after discounting the particular features of the Australian rail network and the markets it serves.

1. Purpose

To review railway engineering in Australia, particularly in the application of best practice asset management where it is believed that Australia is ahead of best practice elsewhere.

Australia is in many ways like Europe in that each state has adopted a different model to ownership, funding, operation and regulation. Overriding this and in many ways conflicting with the State approach are Federal (Commonwealth) influences trying to provide a unified countrywide system.

To understand this better, the visits have included 3 separate State infrastructure owners, State funders and regulators plus Federal agencies, an inter-state infrastructure owner and an Australasian industry wide forum.

The information gained will help inform ORR's assessment of the October 2007 Strategic Business Plan that will be submitted by Network Rail at the end of October 2007.

2. Introduction

Australia has seven separate States, each with its own primary legislation and with an over-arching Federal (Commonwealth) authority based in Canberra.

The States chosen for visits were selected on the basis that they possessed or operated substantial mixed traffic rail networks.

Network infrastructure owner/operators were met in each state as well as funders and regulators.

To better understand the Federal influence, The Bureau of Regional Transport & Economics was also visited. To complete the Federal view, ARTC (the only inter-state infrastructure owner) and the Australasian Railway Association were also visited.

To put all this into context with the “real” railway on the ground, site visits were carried out to a substantial engineering possession in the Sydney area and to coal workings around Newcastle NSW.

Finally, journeys were made on service trains in Sydney, Brisbane and Melbourne and on one long inter-state railway (Adelaide to Sydney).There was insufficient time to visit any of the major private freight railways that transport minerals from mine to port nor to any major contractors involved in railway maintenance or renewals.

This report comprises key findings from the discussions that took place at each meeting or visit and a resumé of responses to the Standard Set of Questions. More detailed information is contained in material supplied in hard copy format by the hosts and short hand notes of all meetings. The hard copy material will be retained for reference within the Directorate. Where appropriate, cross-references have been made to these documents.

The meetings and visits all took place between 22 August and 04 September 2007.

The ORR team consisted of David Brace (Asset Engineering Adviser) and Paul Dawkins (Consultant –CDL Group).

3. Background

The Australian railway system consists of a disparate group of individual State railways linked by a limited number of interstate lines. The State railways generally comprise urban passenger networks to serve the principal conurbations, rural networks that have limited seasonal freight plus infrequent passenger services and heavy haul freight, mainly minerals and coal.

Rail traffic between States (inter-state) is mainly freight comprising inter-modal (substantial domestic plus some import/export), heavy haul minerals and coal(mine to port) plus a very limited passenger service either scheduled or luxury tourist.

Lack of inter-state cooperation during development of the railway networks resulted in 3 separate track gauges (narrow 3' 6", standard 4' 8½" and broad 5' 3"). Until recently (late 1900s) this has been a major constraint on inter-state working. This is now being corrected with standard gauge adopted for the developing inter-state network. As a result some lines remain with dual gauge track.

Railway administrations/ownership/structure varies from full vertical integration (e.g. RailCorp) through quasi-vertical integration (eg Queensland Rail which has Transport Service Contracts for above rail and below rail but both of which are delivered by QR) through to full vertical separation (e.g. ARTC which owns most of the interstate infrastructure and sells train paths on an open access basis).

Inter-city distances are very large by UK standards. Long distance passenger trains are uncompetitive with air travel. There are substantial and growing inter-modal services east-west between Perth and the eastern seaboard. These increasingly comprise double stacked containers. However, they cannot work through to Sydney due to loading gauge restrictions in NSW. Similar services operate north-south between Brisbane, Sydney and Adelaide/Melbourne although on this axis, road competition is more intense.

In summary, the principal markets are:

<u>Freight</u>

a) Heavy haul part of an industrial process (mine/quarry to port or power station)

b) Inter-state inter-modal (mainly domestic but some import/export)

c) Seasonal products, mainly grain fruit and vegetables

<u>Passenger</u>

d) Urban metro serving the main cities and hinterland

e) Intra-city services within the state

f) Regional railways within the state

g) Inter-state and within state tourist trains

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4. Issues

A number of issues emerged which need to be borne in mind when reading and assessing the comments made in this report. The issues, in order of importance as implied by RailCorp for example, are:

a) Safety (in the light of recent accidents)

b) Capacity constraints

c) Reliability

d) Shortage of appropriate skills

a) Safety

Recent high profile accidents (Waterfall and Glenbrook in New South Wales and Bundaberg in Queensland) and the fact that rail transport figures highly in the political agenda means that safety issues receive a great deal of attention.

b) Capacity

Capacity constraints, for both passenger and freight, are a major issue. This applies to urban metros where increasing patronage driven by rising fuel prices is leading to overcrowding on commuter services. It also applies to two areas of freight services – the movement of bulk minerals and coal and the inter-modal inter-state services. The constraint on handling bulk minerals traffic is a particularly important issue because of the impact on the export market, primarily to Asia.

c) Reliability

Reliability has been an issue in the past but is being addressed in a number of ways as it is recognised as a key customer requirement. Solutions include more robust timetabling (e.g. introducing less demanding schedules and improving infrastructure).

d) Shortage of Appropriate Skills

Progress on addressing capacity and reliability issues is being constrained by widespread skills shortages in most disciplines, signalling especially. This is due to skilled people retiring, emigrating or transferring to more lucrative industries. The problem is exacerbated by the demands to create more capacity on the network.

5. Funding and Financial Regulation

1. Funding did not appear to be a significant constraint. There is a strong political will to develop railway infrastructure. Regardless of the institutional arrangements, all of the organisations responsible for delivering rail transport services are fully supported (e.g. RailCorp) or effectively under-written by State or Federal government. There appears to be limited control on output cost efficiency.

2. Meeting with NSW Treasury

   A meeting was held on 23 August 2007.

   It appeared that Treasury had little control of spending as rail was such a political issue. Overspending was routine. Since the creation of RailCorp however, budgets had generally been met with no end of year "bail out"

   Key information provided:

   - Rail Infrastructure Corporation (RIC), TIDIC and RailCorp all funded by the State;
   - 21.5% of Opex rail spend is from farebox;
   - Fares are in theory controlled by IPART (see separate note);
   - Freight income is minimal;
   - No financial consequences if rail companies fail to perform;
   - Most pressure is from safety issues;
   - A PPP model is being used to fund new rolling stock;
   - Little enthusiasm for private sector involvement;
   - RailCorp prepares annual budget, Treasury scrutinises and allocates funds using a deficit funding model;
   - RailCorp can borrow but Treasury controls level of borrowing;
   - Treasury views itself as funder of first and only resort;
   - Current RailCorp expenditure Aus$2.3bn pa excluding depreciation. Operational costs are As$1.6bn pa

3. Meeting with Independent Pricing and Regulatory Tribunal NSW (IPART)

   A meeting was held on 03 September 2007. The purpose of the meeting was to understand if and how IPART influenced the fares/ pricing policy in NSW. Key information provided:

- IPART has responsibility in energy, utility and transport fields;
- IPART currently has little or no influence on fares/pricing in NSW. Railcorp and government agree the budget and, for political reasons fares are kept very low;
- Typically Aus$500m pa from farebox, Aus$1500m pa from government;
- Fares are set on a straight percentage increase each year – not a rigorous process, mainly political;
- Commuting is not price sensitive;
- Typical season ticket represents 5% of disposable income, even less if commuting longer distances;
- Rail has a very high percentage of commuter market as cost of parking in central Sydney is very high;
- IPART about to start a review of cost and efficiency;
- Recent studies show Railcorp performing better than MTRC (Hong Kong) below rail but poorer above;
- There is a view that MoT micro-manages Railcorp;
- There are concerns that there is increasing federal influence within the state – possible conflicts between RailCorp and ARTC over proposed new lines in greater Sydney area

6. Findings

Topic	Organisation	Findings	Evidence
Asset Policies	RailCorp (NSW)	1. It was not clear that any of the Infrastructure owners/maintainers spoken to had well developed asset policies for each asset group	Discussions with RailCorp staff who explained that this was at an early stage with only two asset groups completed to date QRNA advised that Asset Policies are based on the outcome of its business planning process, the forward forecasts of traffic and associated demand No evidence was provided by ARTC
Asset Management	RailCorp (NSW)	1. RailCorp provides a good example of an integrated asset management system using Ellipse with good front end user interface	Demonstration by RailCorp staff of their ability to interrogate the recent history of each asset, eg a switch or crossing, with respect to inspection and maintenance intervention and renewal of components. Spend profiles currently being developed on the basis of recent work enabling them to determine when renewal becomes the better option from an economic/financial perspective. Each asset has a maintenance instruction linked to it enabling works orders to be issued. ORR View – the best example of the use of Ellipse seen
	DoI (Victoria)	2. DoI is less advanced than RailCorp but has a GIS based system to enable interrogation of any or all assets at a geographic location. Photographs and plans can be viewed. Used by service	DoI put this system up as a good example of best practice. Demonstration of system by DoI non-proficient employee showed ease of use for all staff).

Topic	Organisation	Findings	Evidence
		operator but updating only by asset owner.	ORR view - Limited asset information with no condition data. Quality control on asset register and other information not obvious
	ARTC	3. ARTC uses a traditional spreadsheet based asset management system that was demonstrated to be fit for purpose. Weakness was that each component was developed as a standalone system with limited inter-linkage and depended heavily on individual retained knowledge	Paper based outputs from spreadsheet models. ORR view – it seems to work for ARTC
	Queensland Rail	4. Procurement of an asset management system based on a German financial system/product (SAP).	Advice from QR representative. ORR would question the appropriateness of using financial based systems for broader asset management.
	RailCorp (NSW)	5. The development of a rational approach to asset disposal as part of an overall sustainable approach to whole life asset management,	Advice from RailCorp. Each asset was allocated a primary owner and before any asset is disposed of, the owner and others with a vested interests would formally sign off the disposal plan (eg removal of a cross-over would need confirmation by passenger and freight operators, the possession management team and train control that the asset was no longer needed for up to a further 10 years in the future). ORR note that RailCorp was the only organisation consulted which had assets that need to be rationalised apart from DoI and its Metropolitan network. (See comment below on

Topic	Organisation	Findings	Evidence
			Capability, Maintainability and Reliability
	ARTC, RailCorp, Queensland Rail	6. Cascading second hand materials	ARTC, RailCorp and QR all had active policies that balanced the cost of cascading service rail, when replaced, to secondary use versus scrapping.
Capability, Maintainability, Reliability	NSW	1. The "Clearway" project in NSW is aimed at creating independence for each route that currently shares infrastructure to minimise disruption caused by "knock-on" effects from delay on any one route	NSW plans to physically separate routes by the building of additional assets such as flyovers, turnbacks etc. Removal of some assets, following layout rationalisation, will hopefully lead to improved reliability The downside may be that the removal of some assets will lead to less operational flexibility
	DoI, Queensland Rail	2. Similar proposals to 1 above	Advice received from the respective administrations
	ARTC, RailCorp, Queensland Rail	3. Renewal of track assets with modern equivalent form is leading to better ride quality, reduced maintenance and longer asset life.	Advice received from RailCorp. Installation of CWR with concrete sleepers, adoption of Absolute Track Geometry (ATG), replacement of side mounted point machines with "in bearer" type, replacement of all turnouts on curves with tangential turnouts and regular "maintenance grinding" is showing better ride KPIs and the asset management information is demonstrating increased asset life with slower degradation. ARTC can show

Topic	Organisation	Findings	Evidence
			similar trends but does not adopt ATG because gauging constraints are much less of an issue. QR is adopting “low profile” concrete sleepers but arguments to support this policy were not provided.
	ARTC	4. Use of “RailVac” type plant to remove coal dust from switches and crossings.	Advice from ARTC (Hunter Valley). Coal spillage (particularly after unloading) leads to unreliable switch operating mechanisms on the return routes from unloading points. Regular vacuuming reduces delays. It is noted that QR has a similar issue but did not advise ORR of its solution
	ARTC	5. Replacing flat ladder crossing with flyover. 	Advice from ARTC (Hunter Valley). Benefit/Cost study showed that high maintenance, low reliability and constrained operational flexibility of ladder crossovers over 4 tracks justified the installation of a grade separated flyover.

Topic	Organisation	Findings	Evidence
Engineering Access	RailCorp	1. Fundamental recognition that the approach for engineering maintenance and renewals should be driven by the possessions patterns available	Evidence from RailCorp and demonstrated on site at an engineering possession. RailCorp's asset management policies for maintenance and renewals is planned and executed on the basis of time available for possessions.
	RailCorp	2. Optimising engineering access to specific commuter corridors on a cyclical basis to reduce overall passenger inconvenience.	RailCorp believes that this is the best option as inconvenience to the traveller is predictable and well publicised in advance, that advance planning is facilitated and engineering work optimised. The evidence is circumstantial as no customer satisfaction surveys have been seen that would support the approach.
	ARTC	3. Customer requirements dictate engineering access for maintenance and renewal	Evidence from ARTC (Hunter Valley) ARTC consults directly with customers to establish the optimal access arrangements to suit traffic flows. Normally limited to 6 hours to keep traffic flowing or longer possessions that match maintenance periods on mine or port facilities. Only extreme events require longer access (eg major flooding)
Remote Condition Monitoring	Queensland Rail	1. Automatic Pan Check using digital webcam image recognition technology equipment installed at exits from marshalling yards	Digital image recognition to check actual condition against required (carbon strip, horns, damage etc).
	ARTC, Queensland Rail	2. Lineside acoustic monitoring for identifying faulty bearings and wheel sets. Every vehicle tagged for precise	Advice provided by ARTC and QR

Topic	Organisation	Findings	Evidence
		identification	
	Queensland Rail	3. Programme logic equipment to check continuing functionality of switch detection.	Advice provided by QR

Topic	Organisation	Findings	Evidence
Wheel/Rail Interface	RailCorp and QR in particular	1. Optimised profile for both wheel and rail head now achieved. Rail head grinding now carried out as a single pass “maintenance” function on a regular and frequent basis.	Physical evidence visible on most tracks around Sydney. Speno 64 stone grinder seen on site. Asset information indicates reduction in broken rails, reduced ballast degradation and reduced maintenance on wheelsets and vehicle suspensions. This was a common theme with all infrastructure maintainers.
Modern Track Plant	All	1. No innovations identified despite widespread use of track renewal and maintenance plant	ORR invited hosts to put forward innovative practices that they had developed but none were forthcoming.
	ARTC, RailCorp, Queensland Rail	2. Most yellow plant owned by contractors and sharing of plant between infrastructure maintainers is achieving good utilisation.	Advised by ARTC, RailCorp and QR. High degree of cooperation evident with all parties sharing plant to ensure high usage
Alliancing	ARTC, Queensland Rail	1. Where adopted, alliancing is working well with active participation to achieve common objectives	Advice from ARTC, QR

Topic	Organisation	Findings	Evidence
Skills and Technology	ARTC (and QR which is watching ARTC's progress keenly)	1. Procurement of a data communications system on the public network from Telstra obviating the need for dedicated networks	Press release and discussions with ARTC on its relationship with Lockheed Martin.
	ARTC	2. Recruitment of staff from other industries capable of being retrained to meet a skills shortage	Advice from ARTC Hunter Valley. Reduction of traditional signalling and concentration of control staff in a few centres has resulted in a loss of staff through retirement or voluntary redundancy.
	ARA, ARTC	3. Promotion of non-rail innovations (mainly defence industry) to provide technology solutions	Evidence from ARA and ARTC. Recognition that other industries, particularly defence, have already solved the problem of precise location and control of safety critical assets. There is an urgent need to reduce or remove line-side equipment, cabling etc. See Item 1 above)
	ARA	4. Promotion of a Rail Skills Council to identify needs in 10 years time and to define immediate actions to address any shortfalls	Advice from ARA.
	ARTC	5. Training staff in multi disciplinary skills to enable more front line maintenance activities to be undertaken by a wider range of staff	ARTC advice

7. Safety and Other Regulators

1. Independent Transport Safety and Reliability Regulator (ITSRR)

A working lunch was held on 23 August and a meeting on 24 August. ITSRR wanted information on the UK passenger franchising process and this was provided at the lunch.

At the subsequent meeting ITSRR explained its role:

- Set up in 1993;
- Required because NSW government had set up Trading Corporations that were quasi-private;
- The Rail Safety Act of 1994 made ITSSR responsible for licensing operators within NSW (currently 77 No licensed);
- ITSRR reports to NSW government;
- Regulatory and accident investigation now separated;
- Federal Government also has conflicting interests in rail safety;
- ITSRR looks at reliability issues in relation to safety;
- Concerned with sustainability of State owned assets;
- Checks made against standards to see if assets can deliver against those standards;
- ITSRR not concerned with efficient delivery of capability or performance (role of APART);
- Current enquiry to see if ITSRR is sufficiently independent from government interference. CEO cannot be removed except for demonstrable incompetence;
- Serious concerns about future management of standards and loss of competence in industry;
- ARA taking on a role similar to RSSB in the UK but under-funded;
- ITSRR may be required by government to set safety policy;
- Increasing concern on high level of derailments in country areas. There is also a high level of derailments In metropolitan areas but these are mostly low speed and result from SPAD incidents and the use of catch points as the relatively fail safe measure;
- Increasing concerns on level crossing incidents – same as UK, mainly caused by road users;

2. Victoria Audit Office (VAO)

We visited the Victoria Audit Office on 29 August to obtain clarification on the Victorian railway systems.

The VAO used Interfleet Technology to carry out an audit of the DoI's activity. In addition, Scott Wilson carried out a condition survey (10% of assets) and planning review. Audit Office has carried out a field audit with condition measured on about 50% of the assets in Scott Wilson assessment. Public transport safety was reviewed by Alan Osborne (ex HMRI UK).

Main points made were:

- The economic regulator concluded that Pacific National, the incumbent infrastructure owner/maintainer wanted too much money to provide the infrastructure in Victoria. After judicial review, PN sold the assets back and withdrew;
- The main failing was that condition was not measured and future condition not specified – the lines had to be capable of carrying 19 tonne axle load at 22kph;
- Connex is now the sole operator and DoI now specifies the minimum levels of renewal even though Connex has an AMP and an annual works plan. There appears to be no acknowledgement of a whole life cost approach;
- 10% of delays are attributable to infrastructure;
- Connex has been subject to substantial penalties for delays to passenger trains;
- The condition of regional lines is so poor that a fast track improvement plan was required and the performance regime has required a short-term waiver;
- The Audit Office is disappointed at the lack of objectivity in assessing asset condition. DoI/Connex do not appear to understand asset deterioration;
- Audit Office is concerned that DoI does not appear to have a long term asset management plan;

3. Australian Competition and Consumer Commission (ACCC)

We visited ACCC on 30 August 2007 find out how it influences competition issues in Australia. The main points were:

- The operation and management of railways in an Australian context was different from that which is experienced in the UK;
- ACCC's area of expertise is in the inter-state systems, predominately the east-west (Adelaide to Perth) route which is relatively profitable as it is the best suited mode to meet market demand. Oddly, there is a high demand for Monday

morning arrivals in Perth which may then not get handled by the customer until sometime later in the week;

- The north – south routes are less competitive with road transport, there being more congestion points on the network. Passenger peaks take preference;
- ACCC reinforced statements by other organisations met that political influence is very strong in Australia;
- ACCC is involved in the access arrangements associated primarily with ARTC managed routes on which TOLL and Patrick are the dominant freight operators. There is a proliferation of access regimes between Perth and Brisbane (3 or 4) that creates a significant constraint to effectiveness of rail freight. ACCC is currently undertaking a review, which includes NSW, that when completed will result in just one regime for interstate traffic;
- Recent issues have emerged over the effect of one operator taking over another. If a merger and acquisition could substantially reduce on-rail competition, ACCC can block it;
- ARTC in the first instance determines access rights, licence conditions and access charges for an operator and then submits the proposals to ACCC who check against statutory provisions. Failure to agree is dealt with by a dispute resolution procedure;
- Charges are based on an asset valuation using the DORC principle (Depreciated Optimised Replacement Cost) which is similar to the UK's RAB (Regulatory Asset Base);
- The framework is set every 5 years and monitored by ACCC

4. <u>Independent Pricing and Regulatory Tribunal (IPART)</u>

We visited IPART on 03 September 2007 to find out about fares regulation in relation to funding for RailCorp in New South Wales.

The main points were:

- IPART currently has little influence on fares as the issue is very political. Aus$500m pa is obtained from farebox, Aus$1500m pa from Government;
- There is a view that the Minister for Transport micro-manages RailCorp;
- IPART has no leverage on RailCorp to increase revenue from fares. A previous attempt was blocked by Government. It would appear therefore that RailCorp has no real incentive to improve efficiency;
- Fares are currently increased annually by a set percentage, probably below or at inflation, for political reasons;

- Commuting is not price sensitive as parking in Sydney is very expensive and limited;
- There is a revue in progress to seek ways of promoting efficiency;
- An independent study compared RailCorp with MTRC in Hong Kong. RailCorp was considered better above rail but worse below.

8. Other Meetings and Visits

1. RailCorp Asset Management Workshop

We were invited by RailCorp to attend a one-day (part of a six-day) asset management workshop on 22 August 2007. To date, over 700 employees had attended such courses. The subject of the day was risk and quantified risk management techniques and, in particular, concentrated on a recent serious derailment of a passenger train at Waterfall. The causes of the over-speeding of the train down a steep grade were analysed at length.

The course notes are available (RC06)

Jim Kennedy led the course. He is an internationally recognised expert in his field who works part time for RailCorp and part time for the Australian Armed Forces.

2. RailCorp Engineering Possession – Site Visit

On 25 August 2007 we were invited to observe a typical weekend engineering blockade on a suburban route near Sydney. For the passenger commuter routes (plus some freight), regular weekend blockades are the standard means of engineering access. Regular in this context means every 13 weeks. The closures are planned over a year in advance, are widely advertised on-line, in the press and at stations. (A network schematic and the route affected by the observed possession can be viewed see RC15). Bustitution is adopted. Value of work carried out has typically to exceed four times the cost of the possession. On this possession, value of work was Aus$4.25m.

The possession that we observed comprised 89 separate work sites with a workforce of over 1100 working on a range of activities from routine maintenance (tamping, rail grinding), track renewals to enhancements (installation of turn-back sidings to isolate routes from delays on other routes). All possessions are multi-disciplinary. In our short visit, we observed civil engineering, track relaying, track tamping, station reconstruction and OLE component renewals.

Management of the possession was from a remote dedicated office. A simple map showed the track layout and all work sites. Communication was entirely by radio and there were detailed work plans with times for all activities.

The overall impression both from the control room and from the two sites visited was of a well planned, well organised, safe and efficient operation that delivered an improved railway with only limited disruption to RailCorp's customers.

For urban railway systems such as south of London, such an approach might well be an effective alternative to the "7 Day Railway" concept currently being proposed by Network Rail.

3. Booz Allen Hamilton

We met Steve Kanowski, a Senior Associate and Economist at BAH for an evening meeting on 26 August 2007. He provided invaluable background information on Queensland Rail prior to our meeting on the following day. QR has the following characteristics:

- Queensland Rail is vertically integrated;
- There is virtual separation between “Above Rail” (Aus$1.3bn pa) and “Below Rail” (Aus$0.6bn pa);
- Both have Transport Service Contracts with State Government. The contracts include normal performance metrics;
- QR export 170m tonnes pa of coal through three ports from an area the size of Europe. 1500m long, up to 16,000 tonne trains are hauled by up to 4 locos on 3’6” gauge track. Most routes are electrified to 25kv;
- There is also 4m tonnes pa inter-modal traffic travelling north-south, a mixture of import/export and domestic (fruit and veg, home grown, in refrigerated containers). This traffic travels on the standard gauge line connecting Brisbane with Melbourne, Adelaide and Perth;
- The passenger services mainly serve the metropolitan districts surrounding Brisbane, and the lines are electrified at 25kv. The suburban system carries 160,00 passengers per day;
- There appears to be a diversity of signalling systems, even around Brisbane;

4. Bureau of Transport and Regional Economics Canberra

We visited BTRE on 28 August 2007 to obtain a better understanding of Australian Railways from a federal viewpoint. The main points were:

- BTRE is a Research & Analysis organisation which briefs Federal Government;
- BTRE is mainly concerned with inter-state freight;
- BTRE is currently deliberating on charging. Should the charge reflect what the market can bear (ARTC view) or should it be full cost recovery?;
- No account is taken of social issues (policies to keep lorries off roads etc);
- BTRE appears to consider that ARTC is doing a good job in running the infrastructure;
- BTRE has concerns about forms of access. Hammersley Iron Ore is resisting calls for open access on lines that it has built as part of the mine to port process. It fears that

open access requirements might lead to wasteful investment for new lines being proposed to open up untapped mineral reserves;

- 800km is viewed to be the minimum distance at which rail becomes competitive;
- Road regulations are outdated and new laws are likely to restrict driver hours;
- BTRE has published useful documentation on economics of access charging and other digests on competition (see DTSR01 and 02);
- ARTC has set fixed charge high to counter long train concept – that ARTC would have difficulty in accommodating.

5. Australasian Railway Association (ARA)

We visited the ARA on 28 August 2007 to understand the contribution made by ARA in the delivery of rail services in Australia. The main points were:

- ARA Board comprises the CEO of all main passenger and freight railways plus infrastructure owners, regardless of ownership;
- Primary objective is to get principal players in Australia, New Zealand, Japan, Hong Kong and Korea to work together;
- ARA is different to UK's RIA and is not involved in promoting private sector suppliers;
- ARA is responsible for Safety & Standards (RSSB equivalent);
- ARA is responsible for Rail Skills Council to identify future training needs for next 10 years;
- ARA is responsible for Cooperative Research Council to identify and help fund research for the railways;
- ARA is encouraging the idea of a single Australian Safety Regulator;
- ARA recommended visiting Pilbara Railway as an example of world best practice in asset monitoring and failure prevention;
- ARA also recommended visiting Rio Tinto for best practice in availability and reliability of assets and processes and procedures;
- ARA view is that Federal Government is "awash" with funds it wishes to invest in railways (to help expand mineral extraction and export?);

- ARA is a lobbying organisation pointing out that 1 train replaces 1000 trucks with corresponding environmental benefits. Accordingly, it is lobbying for the building of a new inland rail route to link Melbourne with Brisbane;
- ARA wants to address recent problems with inappropriate rolling stock/infrastructure that causes damage to one or other;
- Strong view that China's low cost base to produce S&C and similar is being ignored by developed world.

6. Yarra Trams

We made a brief visit to Yarra Trams on 29 August to compare practices on the extensive tram network (3rd largest in world with 250km of double track). The infrastructure is owned by DoI (the same as the metropolitan rail system). Main points were:

- 800 broken rails currently on the system;
- Transdev holds franchise but this is re-tendered every 7 years;
- DoI specifies and reimburses Yarra Trams for renewal works;
- Biggest safety risk is derailment on ballasted tracks, especially near road under-bridges;
- There is an incompatability with pantographs (instead of trolley poles) with tram wires and no auto tensioning. De-wirements are frequent;
- 3 major incidents per week – typically put right in hours;
- Yarra Trams is incentivised through performance regime;
- Revenue is pooled with bus and metropolitan rail. Yarra Trams receives 40%.

7. Hunter Valley and Newcastle (ARTC)

On the last day of the mission, September 04 2007, we were invited by ARTC to visit the coal operations in the Hunter Valley area of NSW to observe the track infrastructure and the coal workings at the port of Newcastle as well as the ARTC control room for the area.

This involved a very early start from Sydney as there was a week-long blockade on the main line between Sydney and Newcastle. The latter gave us a first hand illustration of the efficiency of the possessions process. One line was being renewed and in the morning peak, only commuter trains to Sydney could run on the remaining single line with no freight and commuter trains away from Sydney replaced by buses. In the evening peak period the process was reversed. In the inter-

peak period, only freight trains ran and all passenger services were replaced by buses.

The trip started with a visit to the ARTC signalling control centre for the whole of the Hunter Valley area. This is a state of the art centre with all trains controlled from various work stations. The timetable is flexible as coal has to be supplied to ships in the order of berthing and individual ships are contracted to carry coal from a specific mine.

We then had a cab ride in a RailCorp service train (new DMU) to inspect the infrastructure and coal trains. This was a mainly four track line with coal trains on two tracks and inter-modal, grain and passenger services on the other two. Of particular interest was a new flyover to replace a former flat double junction. The cost/benefit justification was based on the high cost of replacement like for like and the difficulty in maintenance of complex S&C.

Coal spillage was apparent and ARTC employ RailVac equipment to keep points clear. Most of the spillage is post-unloading on the way back from the port.

The visit continued with a trip to the port to see the coal transfer arrangements and then to observe some of the 56 ships waiting off-shore to load.

We concluded the day with a visit to ARTC’ s area offices.

Appendix A Meetings and Visits Schedule

Date	Time	Organisation	Attendees	Purpose	Key Findings
22 Aug	09.00 – 17.00	RailCorp Asset Management workshop	Jim Kennedy Director, Asset Management Improvement Terry Howard Asset Manager Performance and Reliabilty	Introduction to RailCorp's Asset Management Processes	RailCorp treats Asset Management very seriously. Over 700 employees and contractors have sat the 6 day course
23 Aug	10.00 – 12.00	NSW Treasury	Kim Garvey Principal Advisor Transport Liz Locksley Senior Business Analyst David Thorp Principal Analyst Transport Phil McDonough Principal Analyst Transport	To research the institutional arrangements within which rail services are delivered within New South Wales	Transport Administration Act defines roles and objectives Governance Structure aimed at promoting appropriate commercial behaviour Performance Targets follow models from UK Treasury controls level of funding but funding not targeted Treasury describes itself as Funder of first and only resort
23 Aug	12.00 – 14.00	ITSRR working lunch	Theresa Mejia Principal Research Officer Service Reliabity Alex Petlevanny Principal Reliability Consultant (Engineering)	To provide information to our hosts on UK Passenger Rail Franchising	ORR feeding ITSRR with data

Date	Time	Organisation	Attendees	Purpose	Key Findings
			John Austen Manager, Reliability Strategy Simon Foster Executive Director Service Reliability Dr Natalie E Pelha Executive Director, Transport Regulation Strategy		
23 Aug	14.00 – 17.30	RailCorp AM team	David Spiteri Manager, Asset Management & Planning Terry Howard Asset Manager, Performance $Reliability Angelo Koutsouko Manager, Implementation & Support David Bennett Manager, Strategy & Business Analysis Ann Wong Manager, Asset Analysis and Reporting	To understand RailCorp's approach to Asset Management	Incorporated in main body of report
23 Aug	19.00 – 21.30	RailCorp dinner	Ruth Wallsgrove Nigel Howlett Jim Kennedy		
24 Aug	09.00 – 12.00	ITSRR	Carolyn Walsh Chief	To understand the environment in which NSW	There is no national

Date	Time	Organisation	Attendees	Purpose	Key Findings
			executive Simon Foster Executive Director, Service reliability John Austen Manager, Reliability Strategy Simon Meiers Director, Safety Intelligence & Development Colin Holmes Director Rail Audit Accreditation and Compliance	Railways are operated and maintained	regulatory body ITSRR has jurisdiction in NSW Rail Safety Act 1994 made ITSRR responsible for licensing operators - but this is seen as a bit of a blunt instrument ITSRR report on compatibility between Asset capability and performance but not whether they were being delivered efficiently
24 Aug	pm	Report writing and planning			
25 Aug	07.00-13.00	RailCorp engineering possession	David Spiteri	To witness possession activity	See main body of the report
25 Aug	pm	Report writing and Planning			
26 Aug	12.00-17.00	Travel Sydney - Brisbane			
26 Aug	19.00-21.00	Booz Allen Hamilton	Steve Kanowski	Background information	Steve Kanowski described the Australian Railway Systems as the rail transport laboratory of the world in view of the fact that it exhibits a wide variation in technology and organisational structures

Date	Time	Organisation	Attendees	Purpose	Key Findings
27 Aug	am	Sample travel and inspect infrastructure			
	14.00-17.00	Queensland Rail	Mike Carter Group General Manager Network Access Tim Ripper Group Asset Manager Network Infrastructure	To understand the manner in which QR Network Access ids organised and to find out what it thinks it does well	See main body of the report
28 Aug	07.00-11.00	Travel to Canberra			
	11.00-13.00	BRTE	Peter Kain Senior Economist Gary Dolman General Manager, Regional Research & Transport Services Phil Potterton Executive Director	To understand the organisation of railways in Australia	BTRE is a Research and Analysis organisation which briefs Government See BTRE Report No 114
	13.00-14.00	Working lunch			
	14.30 -16.00	ARA	Brian Nye Chief Executive Officer	To understand the role played by ARA in the delivery of rail services in Australia	Its mission is to get the principal players in the Railway Industry in Australia and NZ working together. It also has links with Japan. Taiwan and Hong Kong. Brian Nye as CEO takes directions from a Board comprising the CEO's of

Date	Time	Organisation	Attendees	Purpose	Key Findings
					either Passenger or Freight Train Operators, Infrastructure Maintainers or vertically integrated railway systems either publicly funded or privately funded. It is fundamentally different from the UK's RIA as it seeks to promote beneficial behaviours between all industry participants as opposed to promoting the private sector suppliers.
	16.00-23.15	Travel to Melbourne			
29 Aug	am	Victoria Audit Government Office	Ray Winn – Director, Performance Audit	To understand how railways operate in the State of Victoria	See Doc Reference VAG01
	lunch	Yarra Trams	Andy Wood	More background into public transport provision in Melbourne To get a comparative view on a slightly different type of operation but one owned by DoI	Maintenance governed by budget not Standards more often than not
	pm	Department of Infrastructure	Tom Sargant General Manager - Infrastructure & Asset Management	To discuss DoI's approach to the management and maintenance of the assets it is responsible for	See main body of report

Date	Time	Organisation	Attendees	Purpose	Key Findings
			Rod Simpson Neil Charnock Manager compliance – Infrastructure & Asset Management Paul Gartner Signal & communication Engineer Chris McKeown Manager Safety Systems and Risk Rocky Campana Engineer		
30 Aug	am	ACCC	Margaret Arblaster General Manager	To understand ACCC's role in delivery of rail services	Responsible for the National Access regime which at the moment only applies to the regulation of ARTC
	midday	Travel to Adelaide			
	pm	ARTC	David Marchant Chief Executive and Managing Director Tim Ryan General Manager – Asset Manager Glenn Edwards Manager Research and Planning	To understand how an Interstate Infrastructure Service Provider goes about its business	See main body of report

Date	Time	Organisation	Attendees	Purpose	Key Findings
31 Aug		Travel Adelaide to Sydney			
01/02 Sept		Some free time and report writing			
03 Sep	am	IPART	Fiona Towers Director, Energy and Transport Aaron Murray Programme Manager Ineke Ogilvy Senior Analyst Rachel Goodyer Senior Analyst	To understand how Price/Fares Regulation is undertaken in NSW	IPART has no leverage over RailCorp at the moment Fares set on a percentage rise basis - not a particularly rigorous process
	pm	RailCorp	David Spiteri	Follow up to earlier meetings	See main body of report
04 Sep	All day	ARTC in Hunter Valley	Tony Frazer Corridor Manager Hunter Valley	To understand how the Hunter Valley goes about its business	See main body of report

Appendix B

Papers Provided by Hosts

DTRS01	Australian Rail Freight Performance Indicators 2005-2006
	Joint report between Dept of Transport & Regional Services and the Australasian Railway Association
DTRS02	Rail Infrastructure Pricing: Principles & Practice
	Development of pricing policies
ARTC01	ARTC Network Maintenance Cost Assessment
	Review of maintenance costs to ensure efficiency
ARTC02	ARTC's Maintenance Costs Relative to Efficient Industry Practice
	Summary of ARTC01
ARTC03	Asset Performance & Condition Report Quarter 1 2007
	An example of typical performance report
ARTC04	Links No15 April 2007
	Newsletter giving progress on various projects
ARTC05	Regulatory & Pricing Framework Presentation to ORR
	Background to freight market and ARTC role
ARTC06	Operations Performance Report July 2007
	Typical monthly performance report
ARTC07	Annual Report 2006
	Last published report
ARTC08	ARTC Hunter Valley Network
	Details and schematic of network
ARTC09	NSW Schematic Showing Origins and Destinations
	Schematic showing leased and owned lines
ITSRR01	Survey of CityRail Customers 2006 (NSW)
	Service Reliability Report (Passenger Focus type report)
ITSRR02	Information Pack &Annual Report 2005/06
	Typical pack plus CD
RC01	AMCL Asset Management High Level Assessment
	Draft report comparing RailCorp and Network Rail's relative performance in asset management

RC02	RailCorp Asset Management Plan 2007/8 – 2011/12 The current detailed Asset Management Plan
RC03	Possessions Management & Coordination Meeting Notes Typical issue for one weekend's engineering possession.
RC04	Major Closedowns & Weekend Possessions Programme 2007/08 Detailed bar charts showing locations, events and dates for all possessions.
RC05	Infrastructure Works Program Ranking Process Details of formal ranking process of jobs
RC06	Asset Management for Engineers & Managers Course Notes
RC07	Strategic Asset Management Major Programme Production Outputs by year to achieve steady state
RC08	Strategic Asset Management Business Plan 2007/08 Final draft
RC09	Lines of Reporting from AM Group to GM
RC10	Weekend Possession & Closedown Report July 2007 Example of work undertaken in one period
RC11	Weekend Possessions & Closedown Top 50 Programs Example of extent of work carried out in one weekend
RC12	Asset Management for Engineers Workshop – Case Study "Rendevous at Waterfall Issues surrounding serious derailment
RC13	Track Possessions Weekend 8 Summary of possessions
RC14	CityRail Network Schematic of lines serving Sydney
RC15	Possessions configurations Two schematics showing Possession Configurations and the Configuration inspected on site
VAG01	Maintaining Victoria's Rail Infrastructure Assets Report by Auditor General

Appendix C Responses to Standard Set of Questions

Question	ARTC	RailCorp	DoI	QR Network Access
1. Please describe briefly the principal quantities of Assets under the Organisation's control	Have asked for this data	Data contained in copy of Annual Management Plan Supplied (RC02)	Have asked for this data	Have asked for this data
2. Please describe briefly the Governance arrangements and Organisation Structure employed to manage these assets	Wholly owned by and therefore accountable to Federal Government - see ARTC Annual Report for details (ARTC07) ARTC own interstate assets in SA, WA and NSW but lease assets elsewhere - see document entitled "Regulatory & Pricing Framework (ARTC05)	See Organisation Chart supplied (RC09) Vince Graham (CEO) reports to DfT Fares are regulated by IPART. ITSRR regulates Safety and Reliability. Senior Officers were dismissed for their parts in the “Waterfall” accident	DoI is a Government of Victoria Department which owns the fixed and rolling stock assets of both the metropolitan and Melbourne tram system (Yarra Trams) The ownership of VLine - the outer suburban network is less clear.	There are two shareholders in QR, Treasury and the Minister of Transport All of the assets are therefore state owned and the railway is operated as a vertically integrated operation although there are Transport Service Contracts in place for Above and Below Rail services which introduces a degree of horizontal separation
3. Accurate and current management information is necessary to run any business efficiently. ORR would like to understand what information is held about the Organisation's rail infrastructure assets and its performance and how it is used to maximise the life expectancy of an asset.	Life expectancy of an asset is not used as a measure per se. Asset intervention is based on delivery of the 3 fundamental business principles • Transit time • Reliability • Yield However ARTC is concerned with maintaining its assets in a	RailCorp's Asset Management team was able to demonstrate the manner in which it has built a user friendly front end to the Ellipse model it uses for managing the majority of its assets. We were able to drill down into a unit of S&C to see when it was last inspected, what its last intervention was, how a component replacement could be planned and how a note was made recording the outcome of the work We were told it was possible to retrieve a report on expenditure history associated with an asset. It was not clear	DoI's representative (Rocky) demonstrated its asset information system. This was not as good as RailCorp's front end of Ellipse but we were able to drill down into its database and retrieve basic asset data. Its accuracy and completeness was not known and there were no apparent quality standards for data acquisition. There was no	Knowledge based on people and their personal knowledge Have embarked on AIM project going out to industry and proposing to use SAP (German financial system) financial system. Track recording Track defect system Wear rates done manually

Question	ARTC	RailCorp	DoI	QR Network Access
	manner which prolongs life. This strategy manifests itself through its claimed close attention to the wheel/rail interface for example. Having heard the claim it was therefore somewhat surprising to note from ARTC's Annual Report for 2006 that there are only limited numbers of the trackside monitoring devices used. • Wheel Impact Load Detectors (WILD) 3 no. • One in each of Vic, SA and WA • Acoustic Bearing Monitor (RailBAM) 1 no. • However the report goes on to say that ARTC has a roll out programme for 4 more RailBAMs • 2 no. sets of Wheel Profile measuring equipment • Unspecified no. of Bogie Angle of Attack and Hunting Detection devices • 4 more WILD • This may not sound all that many over the network as a whole but then it is possible to locate these	whether or not they are using the data to predict future maintenance requirements though if they are not we don't believe it would be a big step for them to achieve this. It was apparent that their approach to the use of Ellipse is mandatory in so far as managers on the ground cannot get "candidate' work orders accepted if asset and asset records are not up to date	background map.	using miniprof every 6 months Monash University has developed an excel spreadsheet model Database used to predict maintenance spend but is not virtuous

Question	ARTC	RailCorp	DoI	QR Network Access
	strategically so as to monitor each individual piece of rolling stock on a regular basis.			
4. Do you hold cost data as well as asset data? Please explain how the data is used on a day to day basis and strategically to manage the rail infrastructure.	Data is held in spreadsheet format in the Hunter Valley Corridor	See above For example, our hosts were able to reveal that Aus$ 4.8m was being spent by a site workforce of 1174 over 89 worksites (inclusive of plant and materials) over the weekend of 25/26 August. (RC03, RC09, RC10) We were advised that a blockades measure of value was that cost of work done must be at least 4 times the cost of the possession. The cost of a possession includes possession costs, bus substitution and Public Consultation/Communications Note however that value of work done doesn't seem to be measured	Not Clear	QRNA and ISG have an aggressive relationship re pushing for productivity and efficiency gains ISG have activity planning tool to prove NA estimate
5. Do you produce Key Performance Indicators to show how the assets are performing?	See monthly report (ARTC06)	First level of reporting is at Safety (no of reportable incidents) and Reliability (no of service affecting incidents, no of train delays in excess of 5 minutes) Next level reports • Rail Flaws • Geometry exceedences • Broken Rails • Headwear	Safety requirements dominate. Service providers, Connex and Transdev, are measured on typical ppm arrangements ie Trains on time. No. Of cancellations. DoI specifies work to be done but hides behind the incentive on Operator to do what's necessary to meet its performance measures. This	There is a current audit and review of KPI reporting regime 40 plus KPIs being monitored but primarily it is all about tonnes of Coal carried per annum and number of Passenger trains running more than 3 minutes outwith scheduled time

Question	ARTC	RailCorp	DoI	QR Network Access
		• Contact Wire x-Section In fact anything that can be measured is measured	suggests Operators will only do the minimum	
6. Are these for internal use or do they go into the public domain?	Not researched	Report to ITSRR report on asset condition good working relationship - monthly report - contains details on what is being delivered - monthly meeting with Gary Seabury eg • effect of storms in June • No of TSRs in place • Safety Score - risk assessed against outcome • preventing incidents	Not researched	Not researched
7. What level of Asset Breakdown Structure is reported on to the Governing Board?	See monthly report (ARTC06)	See Asset Management Plan supplied (RC02)	Not Sure	Not Sure
8. For which rail infrastructure assets do you have remote condition monitoring (RCM)?	-Acoustic monitoring - Vehicle tags - Track quality measurement - rail head profile monitoring	Some locations being trialled - one point motor to date - signalling is going in with some self diagnostic equipment Track recording every 3 months	There was no evidence given to suggest any RCM is undertaken	Similar to ARTC Pantograph Digital Recognition Technology monitoring
9. Is RCM only fitted to new installations, or do you fit it to old equipment to improve performance?	Not Clear	Railcorp new at this HABD yes WILD on entrance to system wheel flats reported by driver no track side	See above	QR has addressed a switch detection issue which has now led to RCM of switch drive condition

Question	ARTC	RailCorp	DoI	QR Network Access
		monitoring most damage comes from freight trains a lot of reliance on human intervention		
10. Which asset has the best Reliability and Availabilty statistics	Refer to monthly report (ARTC06)	OLE one incident a year , a 95percent improvement from 20 years ago life expectancy for • wire 40 years , • catenary 60 years, • structures 80 years Blue mountain experience replace the lot rather than intermittent replacement - had to strengthen the old supporting structures Broken rails down to <10 pa	Not clear	Rail breaks down to <5 pa
11. Which asset has the worst Reliability and Availabilty statistics	Refer to monthly report (ARTC06)	Turnouts as a consequence of interaction between track and signalling acerbated by vibration Track circuits	Signalling accounts for 70% of infrastructure failures	Probably switch detection equipment as a consequence of coal dust build up
12. How does the above influence asset management planning	• Transit time. • Reliability • Yield	Programme of replacing S&C on timber with S&C on concrete bearers Locating S&C on straight track	It doesn't really. DoI is awaiting the right technology to come along that will enable it to adopt cab signalling but will only do this when its demonstrably cost effective	QRNA has looked at a different arrangement of switch tip detection using detectors wired in parallel as opposed to original design of detectors in series
13. Do you have targets for	No – more a case of	RailCorp prefers not to use such metrics.	Not obviously but Operators	Like ARTC – focus is on

Question	ARTC	RailCorp	DoI	QR Network Access
Mean Time Between Failure (MTBF) for key assets?	determining impact on customer which will then drive type of response	Intervention is based on impact on overall delay to traffic	and contractors may have	business drivers
14. Do you have targets for Mean Time to Repair (MTTR) for key assets?	See above	See above	See above	See above
15. Do you have a WheelChex type system?	WILD and RailBAM See above	We don't think so. However David Spiteri did report that as a consequence of the rail grinding programme, wheel profiles were being sustained for longer – acknowledging that this is not necessarily what WheelChex is about	Unlikely	Digital web cams used in marshalling yards to detect pan damage using digital recognition technology Track recording vehicle does height and stagger of contact wire every 3 months Load weighing and lineside accoustic detectors for flat wheels – plus wagon tagging Use HABD Dragging equipment detectors (measuring high friction levels)every 10km QRNA collects lots of data but problem is use of this data – it needs common platform but can't find a package available
16. If not how do you manage the wheel rail interface, OLE/Pantograph interface and shore to ship signalling	Rail Head Profile measurements No OLE on ARTC infrastructure	Back log of rail grinding has been removed enabling RailCorp to carry out extensive maintenance rail grinding which means that 33% of all rail has a	Not clear	See above

Question	ARTC	RailCorp	DoI	QR Network Access
and communication interfaces?	Signalling will move to radio based system	one pass grind per year		
17. At what level in the Infrastructure organisation would decisions be taken if a particular asset group showed poor performance?	Corridor Manager will put case to ARTC Sub Group and argue the case	Candidate projects have to be submitted for scrutiny by Strategic Asset Management group	Within Tom Sargant's organization i.e. General Manager - Infrastructure & Asset Management	Mike Carter is likely to be key decision maker
18. Could you describe your approach to spares and stock management?	Almost Just In Time Relatively few spares held Reliance on Alliance partners to manage this	The stock held is for defect/emergency repair only. If a defect re-occurs, a full replacement is ordered and installed ASAP. Materials required for planned maintenance and renewal are ordered as required	Not researched	Not researched
19. Do you have a strategic spares policy?	Not specifically	RailCorp runs a good logistics programme with its suppliers - back to the holy grail of planning possessions – and so doesn't hold strategic spares as such	Not researched	Not researched
20. What techniques have been developed to improve efficiency in the last 2 or 3 years?	Removal of Signal Boxes Re distribution of excess ballast from one location to another (from cess or on ballast shoulders)	The Ellipse Asset Management planning software is very effective and facilitates planning. It comprises an equipment register, holds maintenance plans, costs, instructions and issues work orders.	Introduction of redundancy. For example DoI has constructed a disaster recovery centre which replicates its control systems.	Some pressure is put on efficiency targets but these are no longer CPI linked because of the heat in the economy which is forcing prices up. QRNA claim it is difficult to determine an efficiency factor as a result

Question	ARTC	RailCorp	DoI	QR Network Access
		RailCorp's other initiatives with which it is proud are • its Possession Strategy and Works planning capability and • Rail grinding programme		
21. How does your response to these questions fit into the whole life cost benefit cycle for the track asset?	More efficient use of ballast	Its renewal of the Bankstown route was quoted as an example of how it was determined to be beneficial to replace rail which had an estimated 5 year life expectancy ahead of its renewal date to achieve a better overall cost effective solution which had most of the other assets in need of replacement	It was not evident that WLC was a subject close to DoI's heart	No suggestion that WLC approach adopted
22. How is the condition of the assets assessed? For example is use still made of track patrolmen, or has the process been mechanised?	For Hunter Valley, in addition to Track Quality Recording, use is made of rail/road Hiab type vehicle used for visual inspection of plain line, the vehicle running in traffic	RVX4 track patrolling machine used –but Chief Engineer still requires that junctions be patrolled by foot, the machine being OK for plain line but not capable of coping with the additional complexities of S&C	DoI has inspectors who periodically check on Operators and produce Quarterly Reports which report on trends in asset condition and/or performance. It was reported that DoI had good data on rail head condition.	We did not get close enough to engineers on the ground to determine the answer
23.Are different approaches adopted for each asset group?	Yes eg Bridge Inspection Cycle S&T approach not researched	Not really. What is good is the fact no one asset is disadvantaged at expense of others When budget constrained, RailCorp prefers to cut out reconfiguration (altering	Not researched in detail. Asset policies were claimed to exist but **not** for structures which appear to be treated on a case by case basis.	Not researched

Question	ARTC	RailCorp	DoI	QR Network Access
		materials) and will replace like for like and is of the opinion that the effect isn't seen for a couple of years. David Spiteri is of the opinion that a reduction of $100m pa (i.e. 25%) wouldn't exhibit any noticeable deterioration in performance for some time. RailCorp has a good relationship with Treasury who can see what's happening.		
24. What does the Organisation believe is a particular feature of the maintenance and renewal activities undertaken by it that may be different to other railways?	Coal Dust Vacuuming at S&C Concentration on Customers needs first, engineering access second	Its Access Strategy and its approach to multiple worksites in possessions	Use of low profile sleepers. However no clues were given on why these should be better than normal. Introduction of more redundancy	QR is proud of the manner in which it manages the wheel/rail interface . It optimises how wheel sits on rail. It is also pleased with the way it has become business focused not engineering led.
25. What particular aspect of the Organisations infrastructure maintenance would you say is world class?	ARTC does not claim to be world class at its maintenance but does pride itself on its customer focus	Its use of Ellipse Its management of rail head profile	No obvious candidate. The reporters' conclude that its institutional arrangements are not conducive to innovation - key message	The perception generated is that QRNA does well in monitoring of the condition of the vehicles which operate on its infrastructure
26. How does the maintenance strategy differ for different parts of the network? (eg for technical, geographic or economic reasons)	Biggest challenge is the remoteness of its long distance routes	Usage affects intervention periodicities	No differences observed	Maintenance regimes developed to suit the different traffic types
27. Briefly, how would you describe the Organisation's	Paper/Spreadsheet based using asset and maintenance	Make hay when sun shines. Make do when funds are restricted. However	Fundamentally, DoI appears to be aiming to hold assets in	It was not clear what QRNA's philosophy is – it is

Question	ARTC	RailCorp	DoI	QR Network Access
infrastructure asset maintenance, philosophy and strategy?	managers' knowledge	whole process is informed and supported by the Ellipse AM system	a steady state condition.	certainly customer focused
28. How far ahead does the strategic asset management plan extend (how many years?)	I year plan, 5 year budget and 10 year look ahead	Renewal 5 years - capital 10 - 30 year overview	DoI claims to be looking ahead. (30 years)	Strategic plan looks ahead for 30 years
29. What is the overall spending level for the maintenance, operations and renewal of the network? Is it possible to break this down into the key asset groups (track, train control and signalling, structures) and by route types?	Aus$22k/km in Hunter Valley 96m net tones pa of coal	See Copy of AMP provided (RC02)	Not given	Track dominates spend [but note that numbers don't add up below] Total ..... Aus$310m pa Trackside systems ..... Aus$68m pa Track ..... Aus$100m pa Mechanised maintenance ..... Aus$95m pa Structures .... Aus$27m pa
30. What are the typical expected services lives of assets under different conditions (high speed vs low speed etc)	Primary difference is between heavy haul and passenger lines. Sample x-Section of 60 kg/m hardened rail shown to us which had seen 1400 gmt of traffic and which had lost over 50% of head. Installed in 1984 and removed in 2004 Typical expectations are:	Life of Control Systems assets governed by obsolescence criteria. But rail has good service lives Note no loco mounted lubricators and no axle steering	Not researched	Typical life of rail Some 53kg rail is over 50 years old But will last only 6 years on a 300m radius curve which carries 90gmpta

Question	ARTC	RailCorp	DoI	QR Network Access
	53 kg/m non-hardened rail on mainly straight track 800mgtpa 60 kg/m hardened rail at least 1200 gmtpa On lines with 300m radii curves up to 50% reduction in life.			
31. How is the infrastructure performance measured? Do you have Key Performance Indicators (KPIs) and can you describe the measuring concepts and technology used.	Primary measure is tonnage of traffic carried by route, by corridor	Right time arrivals, cancellations, possession overrun	Responsibility for infrastructure performance passed on to Connex and Transdev who are measured on ppm type output measures	6 principal KPIs • SafetyTargets • Derailments • Budget • TSR/Delays due to TSR • Delays due to track side equipment failures • Track condition indices
32. What are the performance levels for the defined key performance indicators? Are you able to show us infrastructure performance data for previous years?	To be researched from papers supplied	See copy of AMP supplied (RC02).	Not given	No more detail provided
33. Do you differentiate between maintenance and renewal works and how are each defined	Not obviously	Routine maintenance defined in AMP inspection and rectification minor corrective action Cyclical maintenance. re-rail re-sleeper Upgrading - anything that changes reconfiguration of asset but which	DoI specify renewals. Operators responsible for maintenance	QRNA does not differentiate between the two

Question	ARTC	RailCorp	DoI	QR Network Access
		doesn't affect capability Safety and environmental is different - staff walkways, substation bunding etc trying to stay ahead of game - budget set - if evidence that progress is being made regulators remain content. DDA is a capital programme prioritised		
34. What does the Organisation believe is a particular feature of its maintenance and renewal activities that may be different to other railways?	Multi-skilling of its work force	Ellipse and possession strategy	DoI proud of its assets database	Vehicle condition monitoring
35. Does the Organisation embrace a life-cycle-cost approach to asset management? How can confident is the Organisation's Management Team that it is being applied?	Investment Committee hurdle for jobs in excess of Aus$500k If proposed spend can be supported by a robust business case it will be approved	RailCorp will be able to do Bath-tub curve analysis in time In meantime it is evident that RailCorp weigh up cost of going back to do work which can be done within an existing possession	Not obvious that DoI adopts such principles	Not obvious that QRNA adopts such principles
36. How does the maintenance strategy differ for different parts of the network? (eg for technical, geographic or economic reasons).	Maintenance strategies dictated by business needs	Not really relevant to RailCorp within the Metropolitan area of Sydney Different strategies adopted on Blue Mountain route where there are tight curves with heavy loaded coal trains - leading to frequent rail replacement?)	Not researched	Like ARTC, maintenance strategies dictated by business needs
37. What service life do you achieve (in million gross tonnes) for rail, sleeper, ballast and S&C for different	To be researched from papers supplied	To be researched from AMP provided (RC02)	Not researched	See above

Question	ARTC	RailCorp	DoI	QR Network Access
route types (main lines - rural lines)?				
38. What maintenance activities do you consider essential to achieve the maximum economic life of track, OLE or Signalling assets?	Re-Sleepering from timber to concrete Wheel Rail profile management	Not viewed individually but grinding, tamping to ATG, good formation all lead to extended track asset life	Not researched	Management of the wheel/rail interface
39. At what level in the organisation is the decision taken whether to renew, life extend or continue maintaining? What financial constraints are there at this level?	Corridor Managers present to Investment Committee	Strategic Asset Management - led by Gary Seabury who empowers his discipline leaders to make decisions	Tom Sargant's team seem to hold this responsibility	Mike Carter's organization. There seem to be no real financial constraints. If more money needed, the feeling is that State Government will pay
40. Can you describe your possession strategy please?	Track Access routinely negotiated with Customers Normal to complete work within 6 hours	Cyclical Blockades which have a uniform pattern (normally weekend total blockage but some weekday single line blocks with partial 'bustitution') enabling customers to plan around these. RailCorp plans as much work as it can within a blockade Weekday blockages are single line. The open line carried uni-directional passenger services to Sydney in am peak, freight off-peak and services from Sydney in pm peak. The passengers in the opposite direction are taken by bus.	Weekends and possibly engineering hours during the weekend	There is a monthly shut down of the freight routes which coincides with Port maintenance activity. Over and above the above typically take possession of 15km of route at a time For Metropolitan Lines – 4 hours per night plus about 4 weekend line closures a year
41. How is your possession strategy affected by safety	Not researched	Blockades simplify the arrangements although as a consequence of the	Not researched	Not researched

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considerations		multiple tracking work sites can very often be alongside operational tracks. Safety Risk assessments are undertaken and Safety briefings given to all operatives and visitors on site		
42. How are Organisation's Safety Targets set.?	ARTC sets its own targets based on loss time and injury rates – Board Members take personal liability	Set in conjunction with ITSRR	Not researched	QT is Independent Safety Auditor QRNA claims to have a good relationship with QT
43. What systems do you have to forecast severe weather and how is this made available to your staff in the field? Do electric storms interfere with your signalling system? How do you guard against this?	Constantly receive weather reports and observations from drivers	Infrastructure Operations Centre Different rules apply e.g. Air temps for timber and concrete track and need for high temperature speed restrictions because of track buckling risk Wind speeds for OLE - not a problem for RailCorp because of lower operating speeds - more to do with trees down	Not researched	Not researched
44. Do you have "Golden Assets" where special attention is given to prevent failure in service	None specifically mentioned	Signal boxes. Strategy to get to 2 control centres which will be able to operate whole network. Aus$2m project for Grandville to Blacktown for example. Trialing ATP on Blue Mountains line. Signalling around for a long time yet.	Not researched	No Golden assets as such – QRNA has attempted to engineer solutions with built in redundancy if possible Track side teams are in place at Roma Street during peak hours to attend to problems as they occur. Roma street is at centre of Metropolitan network in Brisbane

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45. Does the Organisation use contractors to maintain and renew track.	Yes – in fact mostly contractors – ARTC is a lean organization	Yes. Multiple contractors can be engaged within a blockade, especially as infrastructure enhancement is under taken by TIDC's contractors. RailCorp uses both direct labour and plant and contract	Two Operators are contracted to maintain the Metropolitan and Tram networks. They in turn subcontract out maintenance	QR's Infrastructure Services Group with 3000 staff seem to be the direct labour organization employed to maintain its infrastructure
46. Whether or not the Organisation uses contractors or direct labour, what measures do you use to ensure compliance to technical specification?	Alliancing – open book approach – tough negotiation on annual budgets but then work together to deliver – incentives are aligned – joint inspections – joint audits	Works Inspectors are employed by RailCorp. Self certification is avoided if possible As an example of its approach, the TIDC Contractor was served with a Defect Notice as a consequence of our visit to the Homebush enhancement site on Saturday 26 August as it had failed to deal properly with the repair of a failed section of formation.	DoI has its own team of engineers and inspectors who check on quality of work carried out	Audit and reporting of 40 plus KPIs
47. Does the Organisation have a policy of cascading materials from prime routes to secondary routes?	Example given of how excess ballast from one route was moved to replenish another route	Definitely especially out toward the country routes RailCorp routinely offer rails to be replaced to ARTC for use in yards or less important lines. If the bid is lower than scrap value, the rails are scrapped. ARTC routinely re-use 85%	Not researched	There is a cascading policy for rail and telecommunications equipment
48. Do you believe the Organisation has any innovations in terms of infrastructure management, technology and costing approaches?	Signals to be replaced by advanced train management systems – will be operable in 2 to 3 years – American Defence Technology being imported, Lockheed Martin assisting – but there are some regulatory	No new techniques, practices or plant evident. Many techniques employed have been imported from the UK RailCorp is however especially proud of its ability to plan possessions and their	None observed	Vehicle monitoring

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	constraints. See pamphlet on subject (ARTC04)	work content efficiently.		
49. What mix of full track renewal versus partial renewal do you specify for different routes?	All decisions are based on market need	RailCorp does not have a big track renewals programme preferring to either clean ballast, renew sleepers and/or rail for example. There is evidence of new OLE structures being installed to replace existing heavily rusted structures	Not researched	Not researched
50. What is the most common possession length for track renewals on primary routes, secondary and rural/freight, and what is the typical output (for plain line and S&C)	6 hours Longest possession recently was a 4 day blockade for a bridge renewal. This was stated as being unusual	48 hour route blockade, 02.00hrs Saturday to 02.00his Monday morning	Not researched	See above
51. Single line working - is this the normal for track renewals?	Most of ARTC's network is single track. Sometimes make use of Adelaide – Sydney alternatives (direct or via Melbourne) to take access.	On north coast line this is very common, so that in between morning and evening peaks linear maintenance techniques can be deployed	Not researched - but it was noted that blockades are not normally taken	Not researched
52. Is there a basic cost benefit analysis for absolute track geometry?	Don't believe in Absolute Geometry – able to let track settle to most comfortable position as most places clearances are not an issue	RailCorp has monumented its track alignments and does put track and OLE back to their designed alignments	n/a	Not researched
53. Has any research been done to support the practice of maintaining track	See above	Strong view held that this does help especially from perspective of OLE	n/a	Not researched

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geometry to the original design (Absolute Track Geometry)?		registration.		
54. Do you use absolute geometry or relative geometry in maintaining alignment and if the former how is it demonstrated that the extra maintenance costs (surveying and data management are justified	See above	Not researched	n/a	Not researched
55. Does the Organisation have different technical standards for new construction and maintenance?	Not obviously	Apparently so, to the extent that issues are emerging with the new Infrastructure being built to TIDC's design which as built are not necessarily acceptable to RailCorp.	Not researched	Not researched
56. Switches and Crossings take heavy loads and components wear, especially the switch blades and crossing nose. What is Organisation's policy? Do you renew individual switches and crossings before the unit is renewed? Are these recovered and refurbished for future use? How many different types of switch and crossing designs do you have?	Not researched in great detail However it was evident on Hunter valley visit that there is a policy to get S&C onto straight track and on Concrete Bearers	Typical switch life (curved section) 12-14 years On straight up to 70 years 10 years on Xing Policy to get all S&C on straight	Not researched	Not researched

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57. What is the service life of Switch and Crossing units and how does it vary between different categories of line (speed and tonnage)	Not researched	See above	Not researched	Not researched
58. In the UK there are infrastructure asset policy documents written by Network Rail that set out the service lives for particular assets on routes with known speed and annual tonnage.		3 policies • Track • OLE and • turnouts e.g. turnouts should be on bearers When doing a renewal must be tangential on concrete RailCorp recognise it is young at this. Subject to periodic peer review (annually). RailCorp do not compromise and will reduce quantities first	Not researched	These do exist – they are focused on business plans and a view of what will be needed in the future
59. What measures does Organisation use to ensure track renewals are executed to specification?		RailCorp has not experimented with different frequencies - DS thinks that RailCorp over-tamps but can't quantify. Tamping frequency dictated by technical standard	Not researched	Not researched
60. And what measures does Organisation's use to ensure that the tamping of plain line and switches and crossings	Not researched	Not researched	Not researched	Not researched

Question	ARTC	RailCorp	DoI	QR Network Access
actually improves the track asset?				
61. Has any research been done to support the use of DTS with maintenance tamping of track? Does it extend the intervention interval?	Not researched	Yes - return to line speed	It was reported that no ballast cleaning has been done since 1988'.	Not researched
62. Does Organisation invest in Research and make use of the Technical Universities either in Australia or overseas?	Not researched		No reference found	Not researched
63. Would you say that Organisation's has a special relationship with higher education in Australia in order to nurture and attract well qualified people.	Not researched	Graduate training scheme - prefers cadet and apprenticeship programme. RailCorp offers good job opportunities but does not pay enough to retain good people	No reference made	QR operates an apprentice programme but loses out to Power Sector which pays more
64. What is the Organisation's asset disposal policy	Not researched	Sleepers to nurseries Steel to scrap or resale to others (see above) Old buildings demolished Responsible disposal of all redundant assets		Not researched