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Foreword

This statistical report is a further development of the previous rail freight performance publications series. These publications are collaborations between the Australasian Railway Association (ARA) and the Bureau of Infrastructure, Transport and Regional Economics (BITRE).

As with its predecessor publications, *TrainLine* provides an overview of rail freight performance, railway infrastructure standards and freight haulage. This, and future issues, will broaden coverage of the industry.

We acknowledge the assistance of ARA members with providing data about the Australian railway industry. Members of ARA include all rail operators, private and government, track owners, and manufacturers of rollingstock and components in Australasia. We also acknowledge the assistance of Ash Salardini of the ARA.

This report was compiled in the Infrastructure, Surface Transport and Road Safety Statistics section by Jack McAuley with assistance from Peter Kain and Jeremy Dornan.

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June 2012

At a glance

- The railway network consists of around 33 000 route-kilometres of track, with around 10 per cent being electrified. Between 2009 and early 2012, over 330 route-kilometres of track were opened, principally for the export of iron ore and coal. In early 2012 there were more than 230 route-kilometres of railway being constructed, including 37 kilometres of urban railways.
- The impact of the Global Financial Crisis is evident in the freight traffic data, especially with declines in freight between 2007–08 and 2008–09. This was particularly marked in the intermodal freight movements on the North–South corridor. Steel traffic, which is a significant rail task on the interstate network, also declined during this period of economic slowdown.
- These declines in traffic are echoed by the number of scheduled trains, with declines in the number of scheduled intermodal trains on the North–South corridor. Scheduled Melbourne–Perth intermodal trains increased marginally during the period but there was a sharp decline in the landbridging services between Adelaide and the Port of Melbourne.
- Data are presented on traffic levels (excluding coal) on line segments of the interstate corridors. These data show the commodity patterns along the network: intermodal traffic dominates across the network but bulk (including steel) traffic is an important task in particular areas of the network, such as in the NSW Southern Highlands and west of Kalgoorlie.
- In terms of net tonne-kilometres, the railway freight task is dominated by bulk movements, accounting for 89 per cent of the total rail freight task. Such movements are principally intrastate, and bulk movements within WA — overwhelmingly iron ore traffic — account for 60 per cent of the nation's rail freight task. Intrastate NSW and Queensland movements (principally coal) account for 27 per cent of the total rail freight task (with 7 per cent, and 20 per cent, respectively).
- Rail freight traffic *within* Western Australia dominates the rail freight task, being 64 per cent of national rail freight tonne-kilometres; the WA intrastate rail freight rose by 47 per cent between 2007–08 and 2009–10. Over the same time period, national rail freight tonne-kilometres rose by 27 per cent.
- The principal intermodal rail flows continue to be on the East–West corridor, especially Victoria–Western Australia origin–destination movements. Intermodal movements are most competitive over longer distances so these flows are predominantly interstate movements. However, around 18 per cent of the intermodal traffic is intrastate, dominated by movements within Queensland (where there are large distances between major population centres).
- Scheduled transit times on the North–South corridor have continued to fall as investments in infrastructure on that corridor are commissioned.
- Track standards have generally improved in recent years, notwithstanding the areas between Sydney and Melbourne where track bed and re-railing work remains to be completed.

- Recent infrastructure investments on the North–South corridor are reflected in lower freight train dwell times on this track compared with 2007–08. Similarly, track capacity enhancements and modernised signalling have reduced the number of stops that freight trains have to make.

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CHAPTER 1
Introduction

TrainLine provides a range of measures of infrastructure provision, activity and performance in the Australian railway industry. In this first issue[1], *TrainLine's* primary focus is on freight and infrastructure aspects of the industry; subsequent reports will also consider features of passenger activities.

The first section provides an overview of the industry. This is followed by freight market, freight train and track indicators. Information is reported on the usage and quality of interstate track, as well as estimates of all rail freight movements between and within states. The indicators primarily cover the interstate network, comprising the North–South (Brisbane–Melbourne) and East–West (Sydney/Melbourne–Perth) corridors.

An indicator not previously reported has been introduced: gross tonnage by segment on the interstate network. This gives an indication of overall track usage, as well as providing specific information on intermodal, steel, grain and other bulk flows. The types of indicators presented are as follows:

Freight market indicators

- **Distance-weighted gross tonnage** indicators show intensity of use across the interstate network. Separate data are presented by commodity for 2007–08, 2008–09 and 2009–10.
- **State by state freight task** indicators show the railway freight task by state of origin and destination, and commodity.
- **Freight mode share** indicators show the share of intermodal freight that is carried by rail on each interstate route.
- **Access revenue yield**, for selected interstate line segments, is an indicator reflecting infrastructure improvements and uptake by operators. Infrastructure enhancements can enable longer, heavier and faster trains. Where train operators are in a position to, exploiting these can reduce the effective infrastructure price per tonne.

Freight train indicators

- **Transit time** indicators show average scheduled and actual transit times for inter-capital intermodal freight trains.
- **Train service frequency** indicators show the number of intermodal freight train services between capital cities and the number of intermodal and steel services across segments.

1 Freight rail performance indicator information has previously been reported in 'rail freight performance indicators' reports. Previous reports present data for 2005–06, 2006–07 and 2007–08.

Track indicators

- **Train capacity indicators** show the maximum permitted train capacity (length and height) across the interstate network.
- **Track quality indicators** are presented for North-South and East-West corridors.
- **Train flow patterns** indicators, derived from analysis of freight timetables, identify the pattern of freight train movements across the corridors. They include average train speeds, the number of stops and the duration of stops.

CHAPTER 2
Industry overview

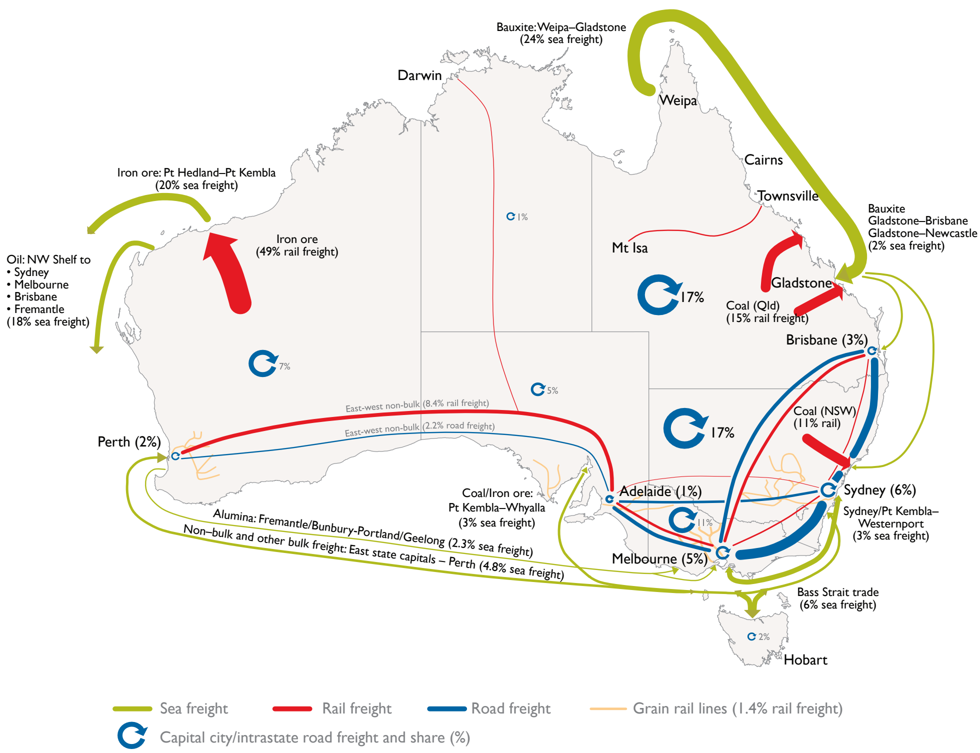
This chapter provides a brief overview of the railway industry. The chapter considers, first, the freight and passenger tasks that are performed. The chapter concludes with an outline of infrastructure scope, developments and ownership.

Appendix A lists significant events in the rail industry in the last two decades.

Freight overview

Figure 1 shows a stylised representation of major freight flows in Australia, with principal rail activities shown in red.

Figure 1 Principal freight movements in Australia, 2006–07



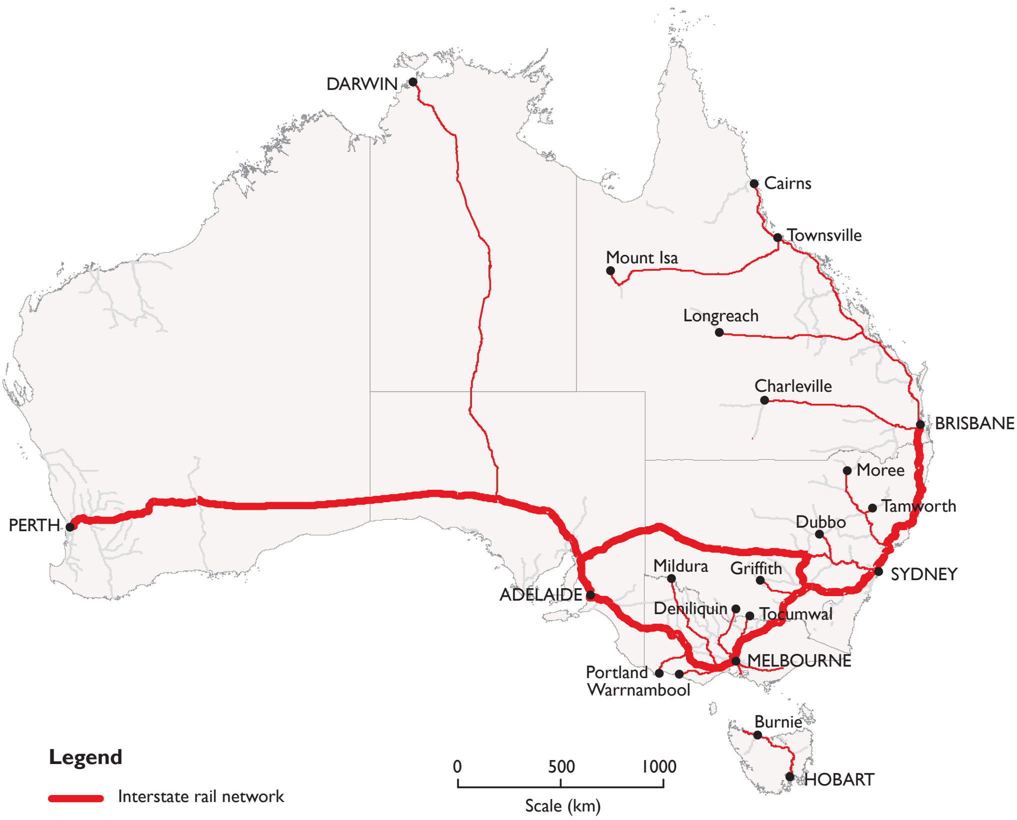
Source: BITRE (2009).

Notes: Line widths indicate relative freight volumes (tonnes), percentages are the share of total modal freight task (tonne kilometres)

Rail freight in Australia can be loosely categorised into a number of different tasks, taking place in different areas. In tonnage terms, the most significant rail movements are iron ore and coal from mines to ports in Western Australia and the eastern states respectively. There are similar, but smaller, movements of other minerals in other areas. Rail also carries grain to ports (often in capital cities). For inter-capital non-bulk freight, rail plays a role parallel to road. Rail's share of this freight is highest between the eastern states and Perth. The other significant role for rail is in moving steel products between production facilities in Perth, Whyalla, Westernport, Wollongong and Newcastle.

Figure 2 shows the lines used for intermodal flows while Figure 3 shows the primary lines with iron ore and coal movements.

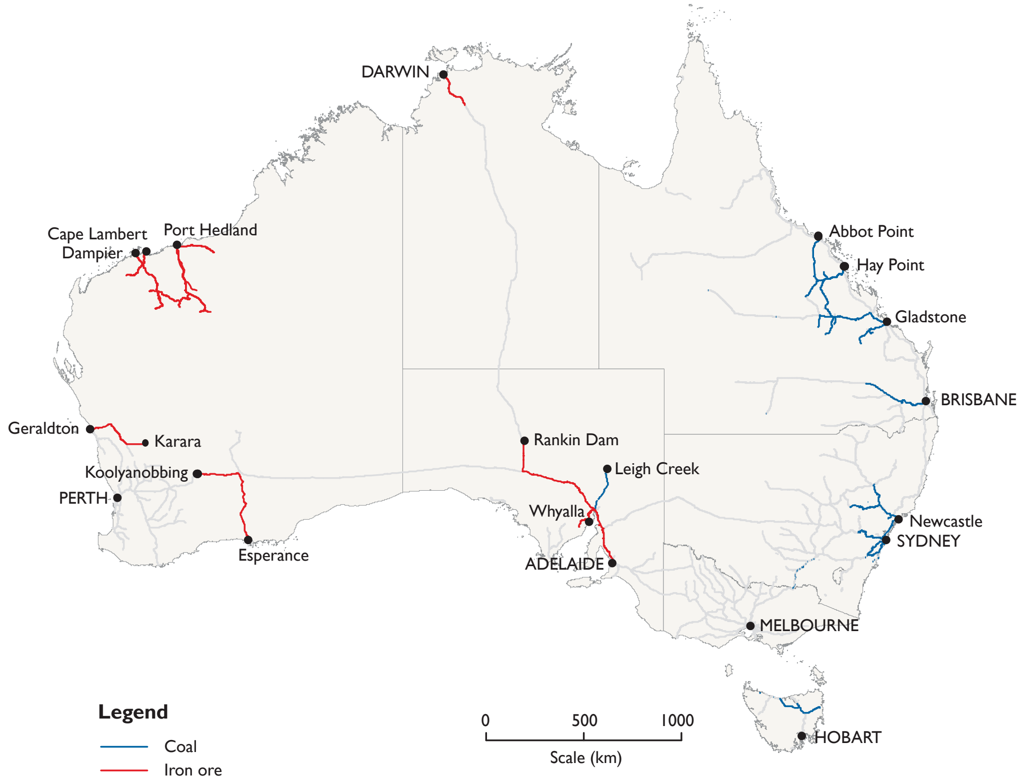
Figure 2 Lines used for intermodal movements, 2012



Source: BITRE rail database

Notes: The 'interstate rail network' comprises the segments which are covered by most of the indicators in this report.

Figure 3 Lines used for iron ore and coal movements, 2012



Source: BITRE rail database

Passenger overview

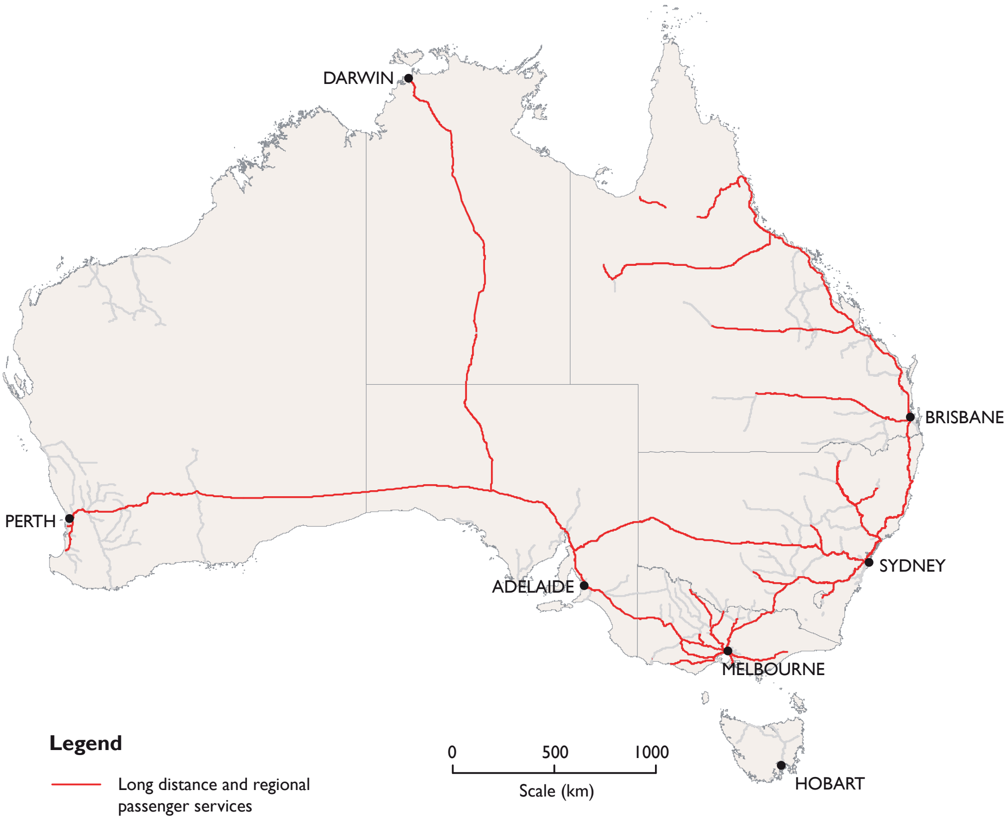
There are three types of passenger trains on the network, with urban, intercity and long-distance services. In addition, there are a number of heritage train operators, operating trains on their own rail tracks (amounting to 578 route-kilometres of track) or on the main rail system.

There are five urban networks: Brisbane, Sydney, Melbourne, Adelaide and Perth[2]. Brisbane has intercity links to the Sunshine Coast and the Gold Coast. Sydney has intercity trains serving Newcastle, Lithgow and Wollongong. Melbourne's primary intercity services operate between the city and Ballarat, Bendigo, Geelong and Traralgon. There are intercity trains between Perth and Bunbury.

Long-distance and regional services are presented on the map in Figure 4. The long-distance operations cater for both regional transport links and tourist services.

2 Further information on these networks is set out in Bureau report, *Understanding Australia's urban railways, Research Report 131* (forthcoming).

Figure 4 Long-distance and regional passenger services, 2012

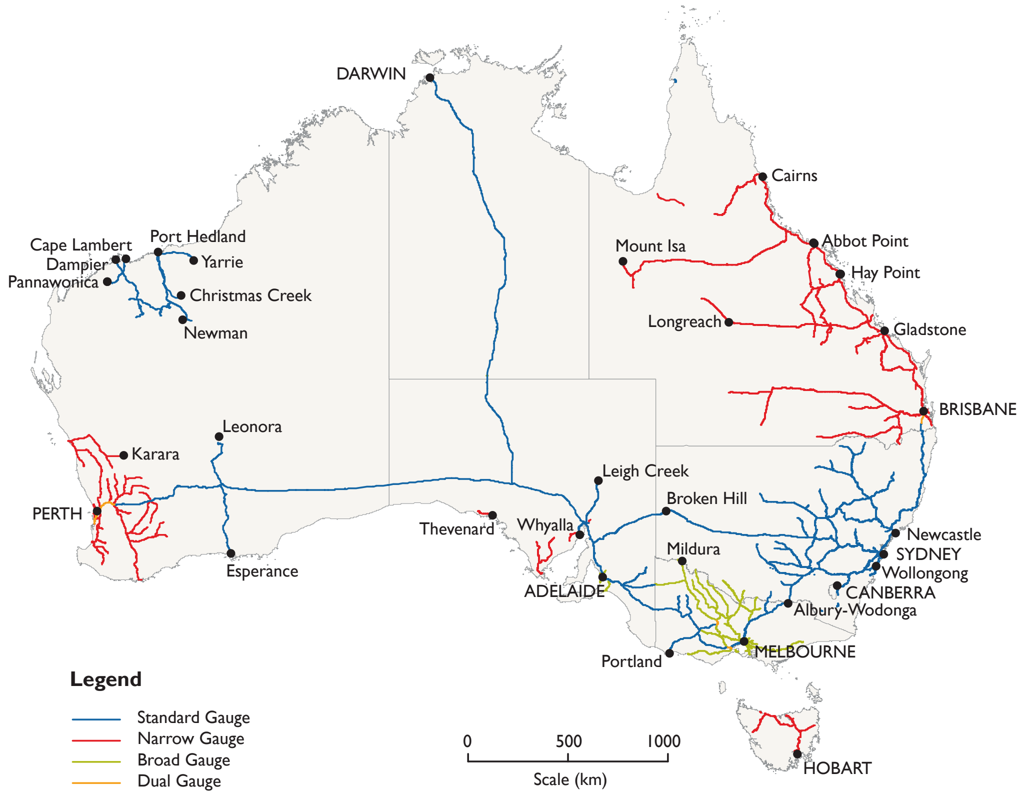


Network overview

In common with experiences in other countries, Australia's railway network was constructed with different gauges at different parts of the system. In particular, the network developed outwards from the State capitals, with cross-border links coming only after intrastate lines were well developed. While that legacy remains to this day (Figure 5), interstate trains operate uninterrupted across a common 1 435 mm 'standard' gauge.

There have been key investments in interstate and bulk-haulage railways in recent years. A major addition to interstate operations was the 2004 opening of the Alice Springs – Darwin line. Since that time there has been substantial Commonwealth investment in the interstate network, with new signalling, passing loops and passing lanes; re-railing, re-sleepering and re-ballasting. Additional line capacity and routes have been introduced in the Pilbara iron ore and east coast coal railways.

Figure 5 Railway network, by track gauge, 2012



Source: BITRE rail database

Note: The map shows open railways, including mothballed lines.

Expansion of the mining industry has provided the source of much of the infrastructure expansion and subsequent rail freight task. Coal exports, centred on the Bowen, Galilee and Surat Basins and the Hunter Valley, rely on the railway network for moving coal to ports. New lines (notably, the 69 kilometre Newlands–Goonyella line) and additional line capacity (with new or longer passing loops and signalling upgrades) have enabled the substantial expansion of exports.

For iron ore exports, the development of iron ore mines in the Pilbara region of Western Australia has led to the construction of a network of railways linking mines with ports at Dampier, Cape Lambert and Port Hedland. BHP Billiton's network in the region began with the opening of the 208 kilometre Goldsworthy – Port Hedland Railway in 1965. Rio Tinto's line between Tom Price and Dampier opened in 1966. The third large mining company in the region is Fortescue Metals Group, which opened a railway between Cloudbreak Mine and Port Hedland in 2008. By early 2012, the three mining companies had constructed more than 2 040 route kilometres of railway. An understated achievement since the original line constructions has been the substantial expansion of track and train capacity that has enabled the growth in exports of the ores. Enhancements to track and train specifications mean that trains in the region are amongst the longest and heaviest in the world.

Table 1 show route kilometres of open and electrified railway in each jurisdiction. Queensland, Western Australia and NSW have similar-sized networks. Most of the network is single-tracked although with significant exceptions, such as the Sydney–Melbourne line (of which around three-quarters is now double-track).

Table 1 Route kilometres of open railway in 2012, by jurisdiction, gauge and electrification

	State or Territory								
	ACT	NT	NSW	Qld	SA	Tas	VIC	WA	Total
Route-kilometres by gauge									
Broad			73		247		2 961		3 281
Narrow		28	8	7 779	561	687	16	3 516	12 595
Other†			1	88	22		58	220	389
Standard	6	1 690	7 029	67	3 069		1 217	3 957	17 034
Total	6	1 718	7 110	7 935	3 899	687	4 252	7 692	33 299
Route-kilometres by electrical system									
1 500 V DC			627				456		1 084
25 kV AC				2 037				171	2 208
33 kV AC			8						8
Total			635	2 037			456	171	3 300

Source: BITRE rail database

Notes: V denotes volts, kV denotes kilovolts, and Hz denotes hertz. DC denotes 'direct current' and AC denotes 'alternating current'. SA's urban electrified network will be 25 kV AC.

"Open" railways include heritage railways; "mothballed" lines (that is, lines with no scheduled or unscheduled services) are excluded. Queensland's extensive narrow-gauge (610 mm) sugar tram network of around 4 000 route-kilometres are excluded.

† "other" includes dual-gauge trackage.

Queensland has the longest length of electrified railway, principally arising from the electrified line between Rockhampton and Brisbane and the coal lines of Central Queensland. Elsewhere, the electrified lines are used entirely for urban passenger services. Around 10 per cent of the network route-kilometres are electrified.

Table 2 lists railways opened from 2009, with 310 route-kilometres of freight track and 28 kilometres of passenger track. Beyond the projects in this list are a range of other significant infrastructure construction and renewal activities. For example the Goonyella–Newlands railway is part of the Goonyella to Abbot Point ("GAP") infrastructure expansion project, enabling a large expansion in coal exports. Other notable projects include the conversion of the Albury–Seymour broad-gauge line to standard gauge, enabling the track to become an integral part of the North–South corridor. On that same corridor, there have been passing lanes constructed, passing loops extended and track re-sleepered and re-railed. Another example is Sydney's Rail Clearways, enhancing track capacity by removing key bottlenecks; the infrastructure programme has been underway since 2004.

Table 2 Railways opened from 2009

State	Location	Purpose	Length, km	Project	Infrastructure builder
QLD	Goonyella–Newlands	Coal line	69	Northern Missing Link	QR National
	Robina – Varsity Lakes	Interurban passenger line	4	Varsity Lakes	Queensland Rail
	Middlemount Rail Spur	Coal line	16	Middlemount	QR National
	Darra–Richlands	Urban passenger line	5	Springfield line	Queensland Rail
NSW	Epping–Chatswood	Urban passenger line	15	Epping–Chatswood railway	RailCorp
VIC	Epping – South Morang	Urban passenger line	4	South Morang extension	V/Line
	Brockman 2 – Brockman 4	Iron ore line	41	Brockman 4	Rio Tinto
WA	Tilley Siding (Morawa) – Karara	Iron ore line	85	Karara Rail Spur	Gindalbie Metals
	Cloudbreak–Christmas Creek	Iron ore line	50	Christmas Creek extension	Fortescue Metals Group
	Pannawonica (Mesa J) – Waramboo (Mesa A)	Iron ore line	49	Mesa A	Rio Tinto

Source: BITRE rail database

Table 3 lists new railways currently under construction, with 234 route-kilometres being built. Again, the infrastructure activities extend well beyond new railways themselves. For instance, a major project underway in Adelaide will involve the electrification of much of the urban passenger network. Similarly, extensive capacity expansion is being introduced to the Fortescue main line by double-tracking the existing single track. In the Hunter Valley additional capacity is being introduced with additional tracks, passing loops and signalling upgrades.

Table 3 Railways under construction, 2012

State	Location	Purpose	Length, km	Project	Infrastructure builder
QLD	Richlands—Springfield, Brisbane	Urban passenger	11	Richlands to Springfield Rail Extension	Queensland Rail
	Petrie– Kippa Ring	Urban passenger	12.6	Moreton Bay railway	Queensland Rail
NSW	Macarthur–Sefton, Sydney	Urban freight	36	Southern Sydney Freight Line	ARTC
	Glenfield–Leppington	Urban passenger	12	South West Rail Link	RailCorp
VIC	Deer Park–West Werribee, Melbourne	Interurban passenger	27	Regional Rail Link	V/Line
SA	Noarlunga Central–Seaford, Adelaide	Urban passenger	6	Noarlunga Line extension and electrification	Adelaide Metro
WA	Clarkson–Butler, Perth	Urban passenger	8	Butler Extension	Transperth
	Hancock Railway–Hope Downs 4	Iron ore freight	53	Hope Downs 4 mine railway	Hope Downs Joint Venture
	Solomon Junction–Solomon	Iron ore freight	81	Solomon Spur, Pilbara	Fortescue Metals Group

Source: BITRE rail database

Note: Excludes light railway projects.

Infrastructure management

The network is managed by a number of track managers—see Table 4 and Figure 6. In essence, each urban passenger system has its own manager (who is also the integrated train service provider); the interstate network is primarily managed by ARTC, with Kalgoorlie–Perth managed by Brookfield Rail, both entities being vertically-separated.

Intrastate track management is diverse in structure and operation. Heavily-trafficked lines, such as the Pilbara iron ore railways, have integrated infrastructure management and train operation. However, most of the Queensland coal lines are managed by the integrated railway company, QR National with its own train operations, but also with extensive third-party use of the track. In NSW, the coal lines are primarily managed by ARTC, with open access use of that track. In Tasmania, the infrastructure and train operations are managed by the single entity, TasRail.

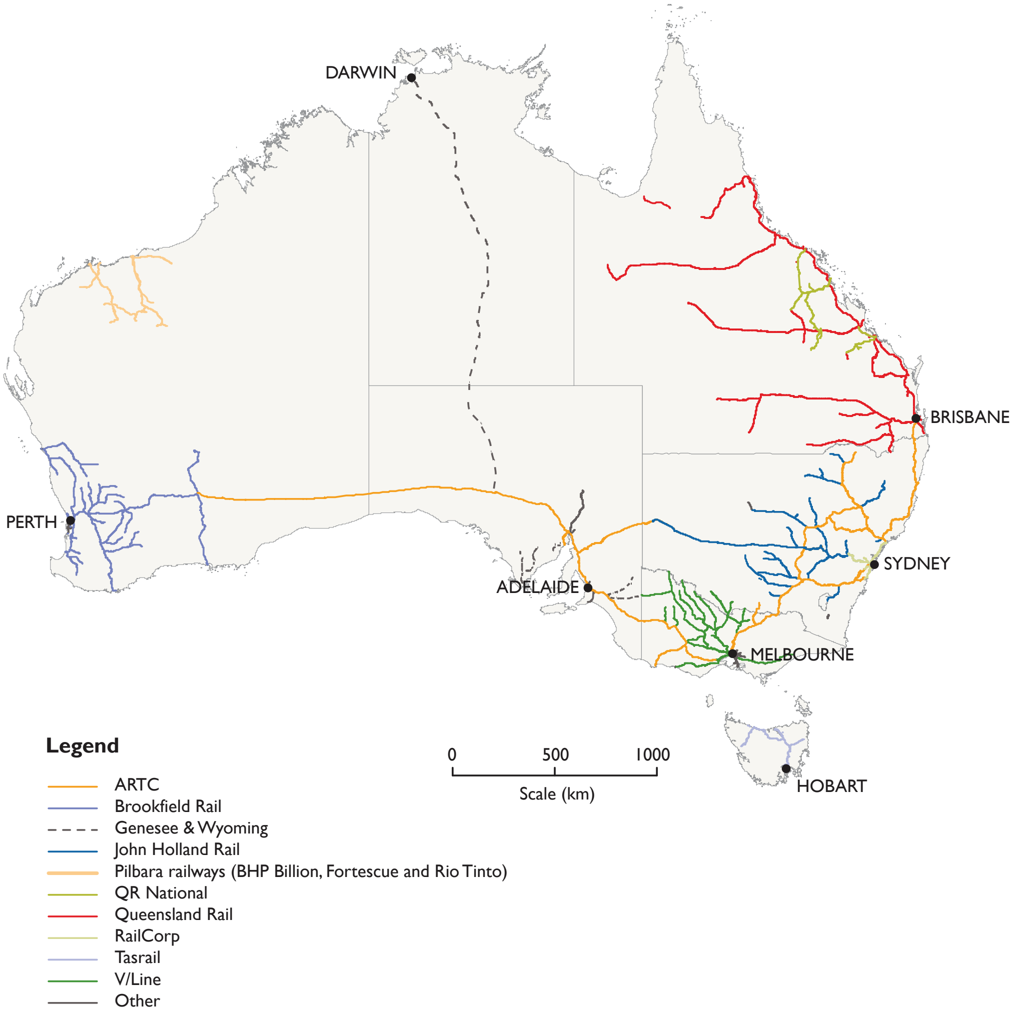
Table 4 Principal infrastructure managers of Australian railways, 2012

Infrastructure manager	Integrated or separated	Location	Primary usage
Interstate			
ARTC	separated	Brisbane–Kalgoorlie, via Melbourne and Broken Hill [excluding track around Sydney–Newcastle]	intermodal, grain, ores, steel
Brookfield Rail	separated	Kalgoorlie–Perth	intermodal, grain, ores, steel
Genesee & Wyoming Australia	integrated	Tarcoola–Darwin	intermodal, ores
Urban railways			
CityTrain (Queensland Rail)	integrated	Brisbane	urban passenger
Airtrain Citylink Limited	integrated	Brisbane	urban passenger
CityRail (RailCorp)*	integrated	Sydney and Newcastle	urban passenger
MTM (Metro Trains Melbourne)	integrated	Melbourne	urban passenger
Adelaide Metro (Dept of Planning, Transport & Infrastructure)	integrated	Adelaide broad gauge	urban passenger
Transperth (Public Transport Authority of WA)	integrated	Perth	urban passenger
Intrastate			
QR National	integrated	Goonyella, Newlands, Moura, Blackwater coal lines	coal
Queensland Rail	integrated (mostly)	Non-coal lines in Queensland (but including West Moreton coal)	passenger, grain, coal, cattle, ores, intermodal
John Holland	separated	NSW grain lines and Cobar line (Country Regional Network)	grain, ores, cotton
RailCorp	integrated (passenger); separated (freight)	Sydney, Newcastle, Wollongong metropolitan areas	passenger
ARTC	separated	Hunter Valley, Parkes–Dubbo, Boggabilla, Yarrawonga–Oaklands	coal, grain, cotton
V/Line	integrated (passenger); separated (freight)	Intrastate Victoria	passenger, grains, mineral sands, intermodal
ARTC	separated	Portland, Benalla–Yarrawonga	grain, mineral sands
TasRail	integrated	Tasmania	intermodal, coal, ores
Genesee & Wyoming Australia	integrated	Intrastate SA, including managing Arrium's Middleback Ranges track	grain, gypsum, ores
Asciano (for Alinta Energy)	integrated	Stirling North – Leigh Creek	coal
Brookfield Rail	separated	Intrastate tracks in south-west WA	grain, ores
BHP Billiton	integrated	Pilbara (to Port Hedland)	iron ore
Rio Tinto	integrated	Pilbara (to Dampier, Cape Lambert)	iron ore
Fortescue Metals Group	integrated	Pilbara (to Port Hedland)	iron ore

* From 2012 CityRail will be split into Sydney Trains and NSW Trains, providing urban passenger and Newcastle/interurban/country passenger services, respectively.

Note: There are a number of other, smaller, infrastructure managers, including heritage railways with 578 route-kilometres.

Figure 6 Australian railways, by network manager, 2012



Source: BITRE (2011).

CHAPTER 3
Market indicators

This section presents the following indicators of rail's market performance:

- **gross tonnage** carried on the interstate network, for each commodity group, by line segment. Gross tonnage includes the weight of the goods, the containers, and the train rolling-stock.
- **rail freight task** performed on a state-by-state basis, for both intermodal and bulk freight;
- **market share** of intermodal freight on each interstate route that is carried by rail; and
- access revenue yield indicator **on the ARTC network**.

TrainLine uses specific definitions for bulk and non-bulk freight. In principle, 'bulk' freight generally involves large quantities of homogenous product that is conveyed in wagons; non-bulk freight is generally perceived as any containerised or unitised freight, generally placed or lifted into transport holds. However, in practice the 'non-bulk' freight may not be containerised; conversely bulk commodities are often conveyed in containers. In this report, 'bulk' is used to refer to anything not considered 'intermodal'—so 'bulk' includes steel, which may—in other contexts—be classified as non-bulk. 'Intermodal'' is defined by the classification of train as used for infrastructure charging. Box 1 provides more insight into these definitions.

Box 1 Defining 'intermodal' and other trains

TrainLine provides statistics for 'intermodal', 'steel' and 'bulk' freight movements. The definition used here for intermodal freight is 'market-based'. Defining the traffic in terms of the market served (such as relatively high priority goods for which road freight is a strong competing mode) is argued to be clearer than when defined in terms of the type of goods (notably, non-bulk) conveyed or the type of wagon used. In particular, where data for 'intermodal' trains is reported, such trains are defined as trains with axle loads up to and including 21 tonnes and a maximum speed of 115 kph. In terms of ARTC infrastructure charges, this categorisation consists of the 'Express Freight' trains (with maximum train speed of 115 kph and axle load up to 20 tonnes) and 'Superfreighter' trains (with maximum train speed of 110 kph and axle load up to 21 tonnes).

These specifications reflect the competitive freight market for the conveyed traffic. Thus, the nature of the wagons themselves may not reflect the traditional perception of 'intermodal' as meaning 'more than one mode'; and may not reflect a situation where the goods can be readily transferred across modes.

As defined here, the 'intermodal' traffic can consist of wagons conveying containers on flat (or well) wagons as well as by louvre wagons. Further, the goods may be bulk goods (such as grains or hay) as well as non-bulk (such as palletised tinned dog food). However, the type of train operated is unambiguous. The defining feature of an 'intermodal' train is the infrastructure charge rather than the way the goods are conveyed. 'Container' can be used to define the 'intermodal' activity but it does not convey the market within which rail is competing. For instance, containers can be used to classify goods movements but the goods within the container may include 'bulk' items such as steel, grain or minerals.

Steel movements occur on timetable-defined 'steel' trains, which ARTC defines as 'Regular Freight' trains. It is possible, however, for such trains to convey other, low-priority, goods.

Finally, bulk-freight activity is also reported. Measuring 'bulk' freight can be ambiguous because the goods traditionally classified as bulk may be conveyed on intermodal trains (in louvre wagons or containers) and, on the definition used here, will be classified as 'intermodal'. Bulk freight can also be conveyed by containerised trains; when compiling data presented in this report, train operators have classified containerised bulk goods trains (such as ores, grains, steel and mineral sands) as 'bulk'.

Gross tonnes on the interstate network

In this section, data are presented on the level of freight across defined segments of the interstate network. The line segments are illustrated in Figure 7. The freight traffic is defined in terms of gross tonnes per line segment. These data are presented here in three formats. Figure 8 shows gross tonnages by direction of intermodal traffic for 2009–10; Figure 9, Figure 10 and Figure 11 show rail freight intensity by interstate track segment for steel, grain and other bulk traffic, respectively.

The flows for 2007–08, 2008–09 and 2009–10 are shown in Table 5 and Table 6 and presented in Figure 12 through to Figure 16. These numbers are distance-weighted gross tonnages across each segment—where tonnage does not move along the entire length of a segment, the tonnage is weighted by the proportion of the line segment travelled. Note that coal traffic on the interstate network is excluded—see Box 2 for a discussion of the underlying reason for its omission.

Box 2 Coal on the interstate network

Coal is excluded, in part because most coal traffic is not recorded in a form amenable to comparison with other commodities. While coal networks are largely independent of the interstate network, on the segments where they overlap, coal tonnages are an order of magnitude higher than all other commodities carried on any parts of the interstate network. Thus the most heavily used segments on the interstate network—in gross tonnage terms—are where coal is moved along part of the interstate line. Specifically, these sections are between Maitland and Islington Junction near Newcastle, followed by the segment between Tahmoor and Moss Vale in the New South Wales Southern Highlands.

Excluding coal-based flows, the most heavily used segments of interstate track are between Adelaide and Perth, followed by those between Melbourne and Adelaide and those between Sydney and Melbourne.

Most segments are dominated by intermodal freight, which is moved across the entire interstate network. Steel is also moved across the entire interstate network, though in smaller volumes than intermodal freight. Grain movements on the interstate network are heaviest close to Perth and in rural NSW. (Some grain is carried in containers, and may be classified as 'intermodal'.) Other significant movements of minerals include from near Kalgoorlie, from the Southern Highlands to Sydney, from near Broken Hill to Adelaide.

Table 5 and Table 6 show gross tonnage for intermodal, and total traffic, for each track segment from 2007–08 to 2009–10. Over these years, gross tonnes carried declined across most of the interstate network. This was dominated by declines in intermodal traffic across most of the network. Declines on the North–South corridor were proportionally greater than on the East–West corridor. The decline largely occurred from 2007–08 to 2008–09, coinciding with the economic slowdown. Over this time period, total intermodal interstate freight also grew slower than historical trends, at less than one per cent per annum. Traffic levels stabilised between 2008–09 and 2009–10.

Steel traffic also declined across most of the interstate network. Changes in grain and other bulk traffic were less consistent, with large increases in some areas and large decreases in others.

Figure 7 Interstate network by line segment

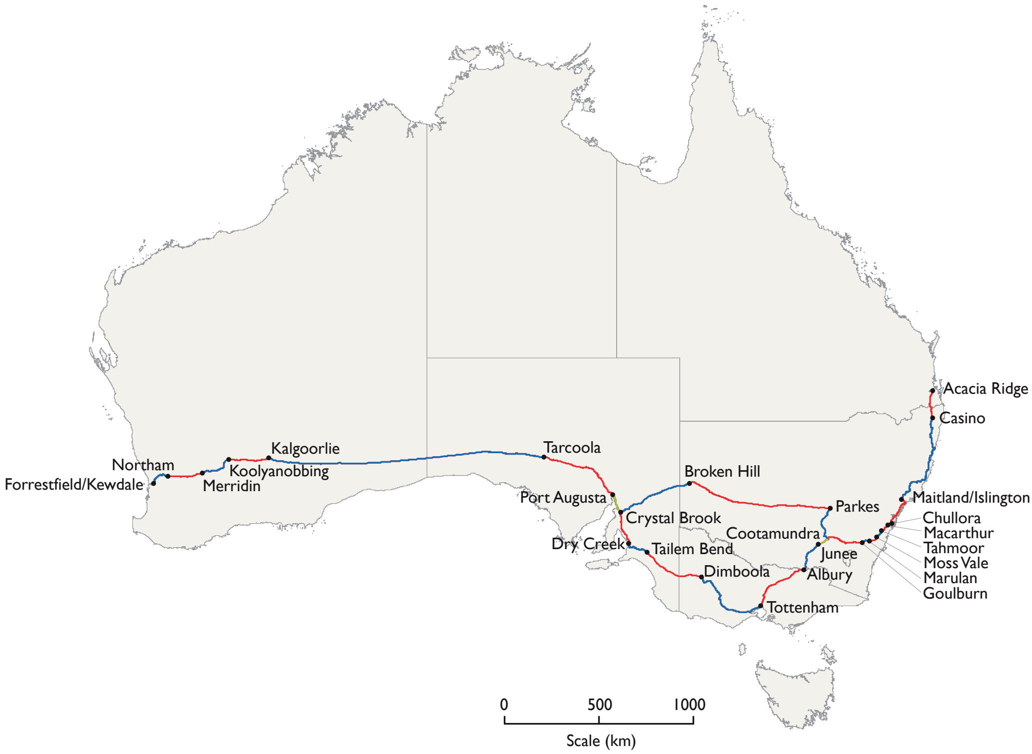
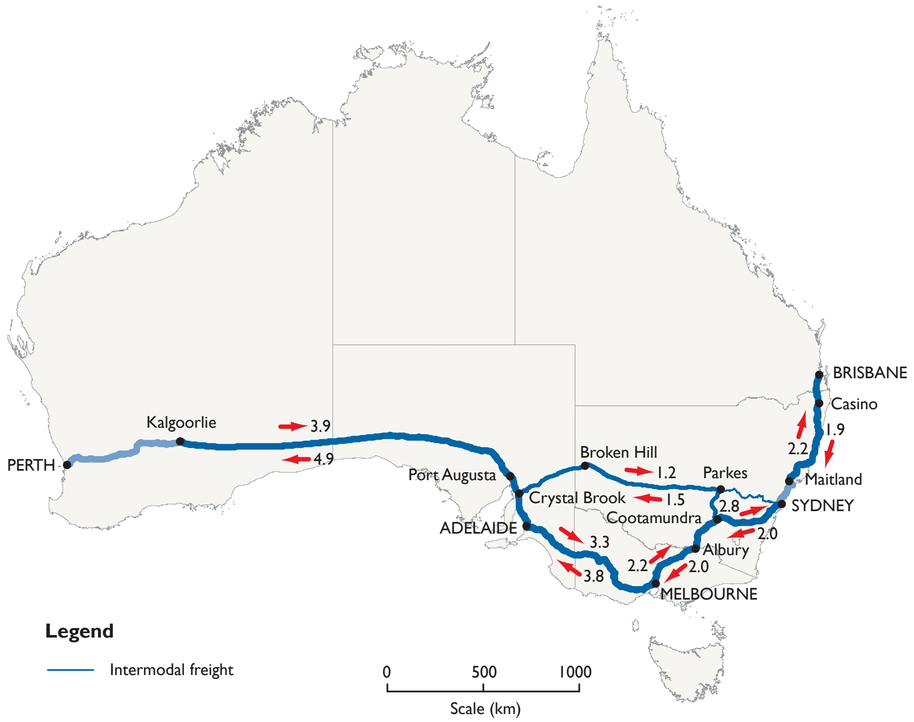


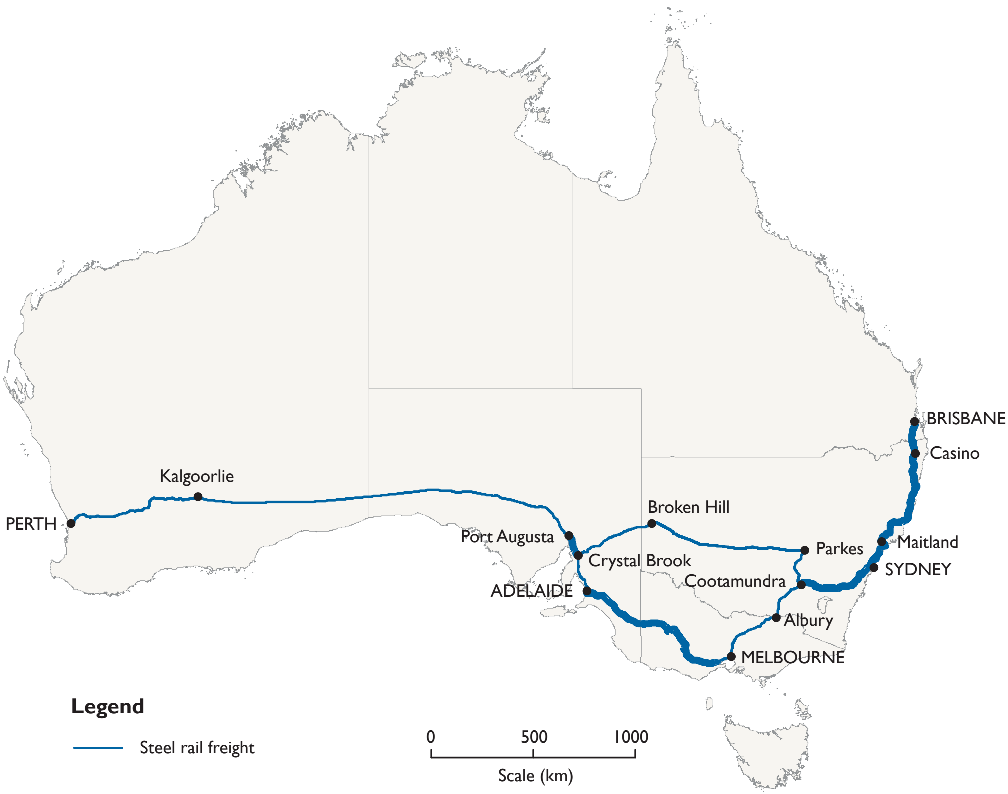
Figure 8 Intermodal freight on interstate network — million distance-weighted gross tonnes by line segment, 2009–10



Source: Rail track managers (ARTC, Brookfield Rail)

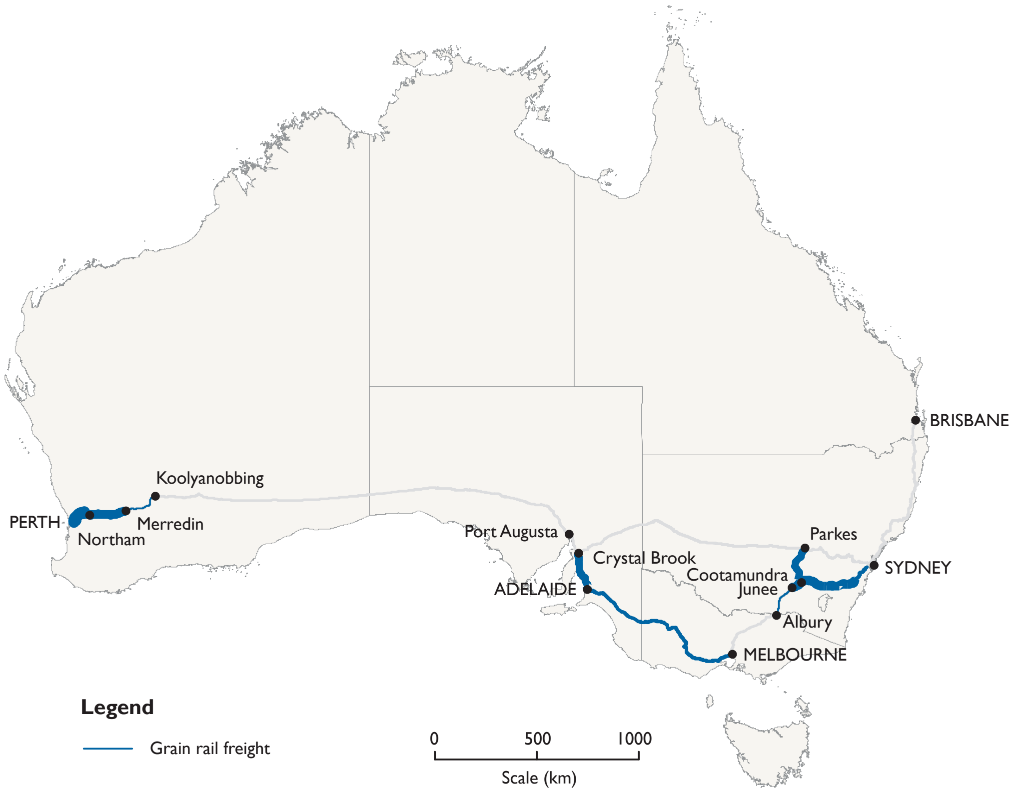
Note: Lighter lines are estimates. Line thicknesses are illustrative of traffic levels. Numbers are millions of gross tonnes by direction. For data see Table 5 and Table 6, pages 18 and 19.

Figure 9 Steel rail freight on interstate network — million distance-weighted gross tonnes by line segment, 2009–10



Note: Line thicknesses are illustrative of traffic levels. Numbers are millions of gross tonnes.

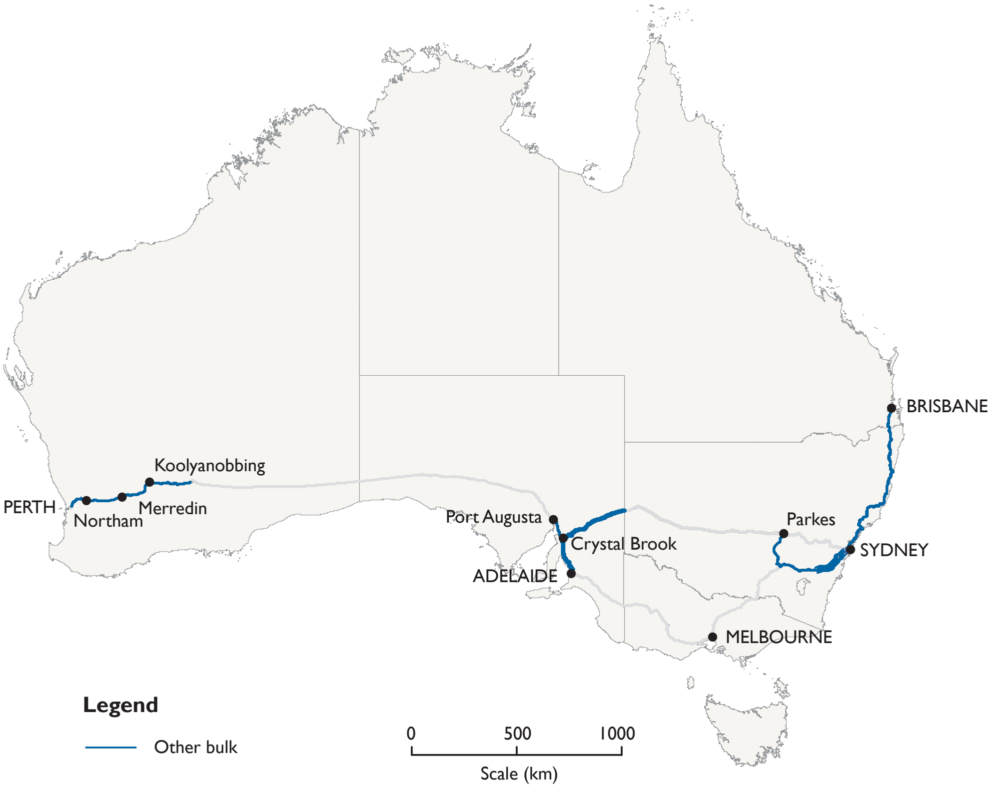
Figure 10 Grain rail freight on interstate network — million distance-weighted gross tonnes by line segment, 2009–10



Note 1: Line thicknesses are illustrative of traffic levels. Numbers are millions of gross tonnes.

Note 2: The segments nearest Perth carries narrow gauge as well as standard gauge grain traffic. Some NSW grain traffic is carried to Port Kembla via Robertson.

Figure 11 Other bulk rail freight on interstate network — million distance-weighted gross tonnes by line segment, 2009–10



Note: Line thicknesses are illustrative of traffic levels. Numbers are millions of gross tonnes.

Table 5 Distance-weighted gross tonnes by line segment, North–South corridor

Line segment, by direction of freight	Million distance-weighted gross tonnes					
	Intermodal			Total		
	2007–08	2008–09	2009–10	2007–08	2008–09	2009–10
Acacia Ridge to Casino	2.50	2.10	1.95	2.72	2.30	2.30
Casino to Acacia Ridge	3.02	2.41	2.17	3.62	2.92	3.05
Acacia Ridge–Casino	5.52	4.51	4.12	7.14	5.93	5.76
Casino to Maitland	2.49	2.07	1.96	3.10	2.67	2.66
Maitland to Casino	2.99	2.37	2.19	4.35	3.54	3.52
Casino–Maitland	5.48	4.44	4.15	7.45	6.20	6.18
Macarthur to Tahmoor	3.46	2.92	2.88	6.04	5.42	5.46
Tahmoor to Macarthur	4.06	3.38	3.29	6.68	5.99	5.62
Macarthur–Tahmoor	7.52	6.31	6.16	12.72	11.42	11.08
Tahmoor to Moss Vale	3.46	2.92	2.85	6.05	5.46	5.48
Moss Vale to Tahmoor	4.06	3.38	3.25	6.68	6.13	5.84
Tahmoor–Moss Vale	7.52	6.30	6.10	12.72	11.59	11.32
Moss Vale to Marulan	3.70	3.01	2.93	6.46	5.92	5.90
Marulan to Moss Vale	4.17	3.48	3.36	7.31	7.48	7.21
Moss Vale–Marulan	7.86	6.49	6.28	13.77	13.39	13.11
Marulan to Goulburn	3.70	3.01	2.93	6.46	5.92	5.90
Goulburn to Marulan	4.17	3.48	3.36	7.31	7.48	7.21
Marulan–Goulburn	7.86	6.49	6.28	13.77	13.39	13.11
Goulburn to Cootamundra	3.70	3.02	2.93	5.17	4.80	4.81
Cootamundra to Goulburn	4.16	3.48	3.35	6.11	6.60	6.18
Goulburn–Cootamundra	7.86	6.49	6.28	11.28	11.40	10.99
Cootamundra to Junee	2.90	2.37	2.31	3.97	3.73	3.70
Junee to Cootamundra	3.06	2.57	2.51	4.15	3.97	3.95
Cootamundra–Junee	5.96	4.95	4.81	8.12	7.70	7.65
Junee to Albury	2.90	2.63	3.05	4.33	3.79	3.84
Albury to Junee	3.06	2.67	2.83	4.09	3.52	3.53
Junee–Albury	5.96	5.30	5.88	8.41	7.32	7.37
Albury–Tottenham	6.66	5.97	6.11	8.53	7.27	7.44

Source: Rail track managers (ARTC, Brookfield Rail).

Note: Figures for intermodal freight were not available from Brookfield Rail on a comparable basis with ARTC.

Table 6 Distance-weighted gross tonnes by line segment, East–West corridor

Line segment, by direction of freight	Million distance-weighted gross tonnes					
	Intermodal			Total		
	2007–08	2008–09	2009–10	2007–08	2008–09	2009–10
Cootamundra to Parkes	0.92	0.73	0.67	1.63	1.74	1.62
Parkes to Cootamundra	1.22	0.98	0.90	2.31	2.94	2.37
Cootamundra–Parkes	2.14	1.71	1.57	3.94	4.69	4.00
Parkes to Broken Hill	1.58	1.53	1.47	2.39	2.11	2.04
Broken Hill to Parkes	1.46	1.19	1.18	2.69	2.28	2.10
Parkes-Broken Hill	3.23	2.72	2.65	5.27	4.39	4.14
Broken Hill to Crystal Brook	1.59	1.55	1.47	3.34	2.89	2.83
Crystal Brook to Broken Hill	1.43	1.33	1.18	2.97	2.50	2.31
Broken Hill–Crystal Brook	3.02	2.88	2.66	6.31	5.39	5.13
Tottenham to Dimboola	4.08	3.84	3.77	5.76	5.10	4.91
Dimboola to Tottenham	3.56	3.35	3.27	5.75	4.95	4.76
Tottenham–Dimboola	7.64	7.19	7.04	11.50	10.05	9.68
Dimboola to Tailem Bend	4.13	3.84	3.72	5.81	5.27	5.08
Tailem Bend to Dimboola	3.61	3.27	3.09	5.49	4.84	4.42
Dimboola–Tailem Bend	7.74	7.11	6.81	11.29	10.12	9.50
Tailem Bend to Dry Creek	4.17	3.88	3.93	5.88	5.35	5.38
Dry Creek to Tailem Bend	3.63	3.29	3.12	5.55	4.91	4.50
Tailem Bend–Dry Creek	7.81	7.17	7.05	11.44	10.27	9.89
Dry Creek to Crystal Brook	4.69	4.52	4.23	5.85	5.44	5.18
Crystal Brook to Dry Creek	3.59	3.42	3.46	5.85	5.45	5.72
Dry Creek–Crystal Brook	8.36	8.01	7.77	11.78	10.96	10.97
Crystal Brook to Port Augusta	6.11	5.92	5.93	7.52	6.96	7.10
Port Augusta to Crystal Brook	4.82	4.59	4.58	6.83	6.23	6.29
Crystal Brook–Port Augusta	10.97	10.57	10.59	14.39	13.25	13.47
Port August to Tarcoola	6.15	5.92	5.92	6.99	6.51	6.52
Tarcoola to Port Augusta	4.88	4.63	4.58	5.22	4.90	4.83
Port Augusta–Tarcoola	11.03	10.55	10.50	12.22	11.42	11.35
Tarcoola to Kalgoorlie	5.14	4.90	4.93	6.00	5.51	5.53
Kalgoorlie to Tarcoola	4.20	3.94	3.91	4.58	4.22	4.16
Tarcoola–Kalgoorlie	9.33	8.85	8.84	10.58	9.73	9.69
Kalgoorlie–Koolyanobbing		not available		14.19	13.62	13.72
Koolyanobbing–Merredin		not available		14.48	14.14	14.12
Merredin–Northam		not available		16.19	16.33	16.14
Northam–Forrestfield/Kewdale		not available		19.42	20.90	20.88

Source: Rail track managers (ARTC, Brookfield Rail).

Note: Figures for intermodal freight were not available from Brookfield Rail on a comparable basis with ARTC.

Figure 12 Distance-weighted gross tonnage on North–South corridor, by line segment, 2009–10

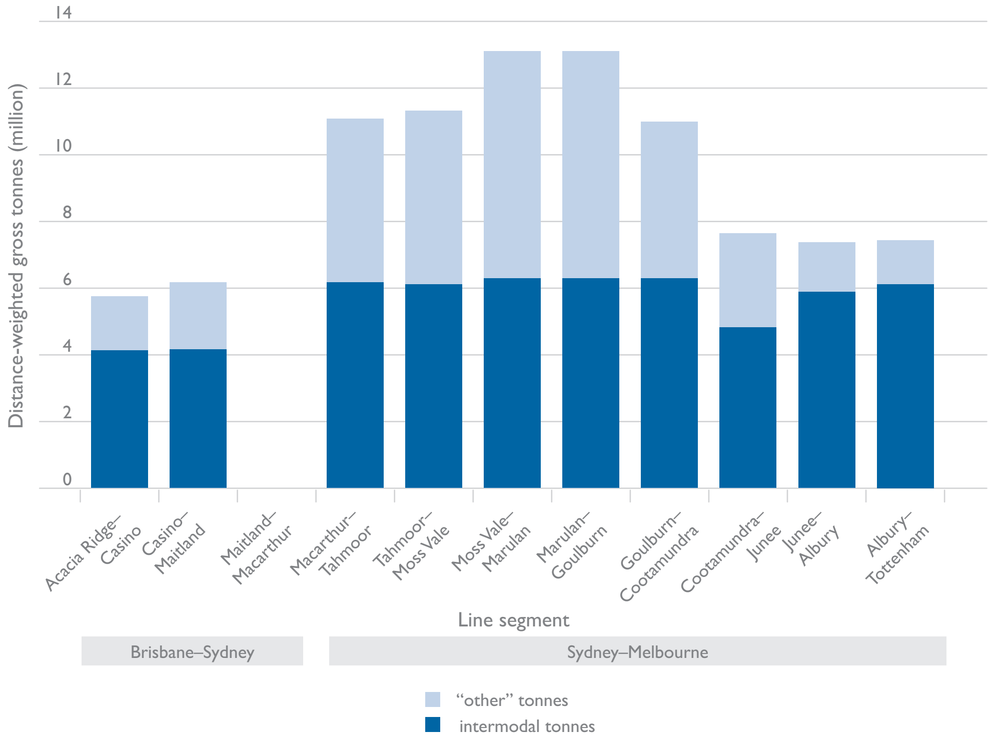


Figure 13 Distance-weighted gross tonnage on North–South corridor, by line segment, 2007–08 to 2009–10

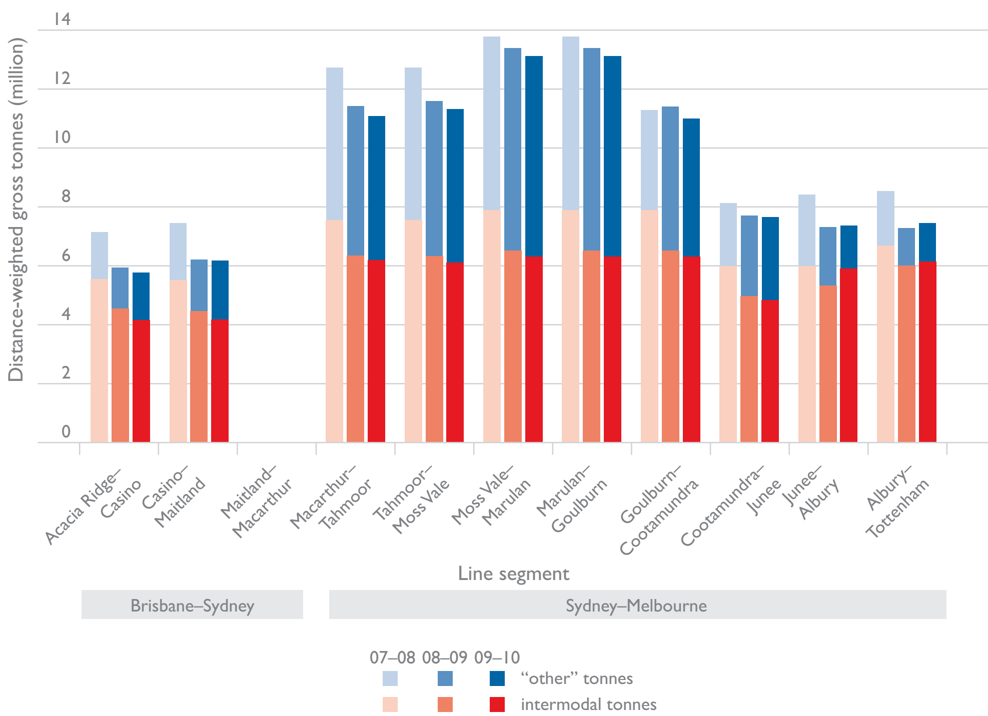


Figure 14 Distance-weighted gross tonnage on East–West corridor, by line segment, 2009–10

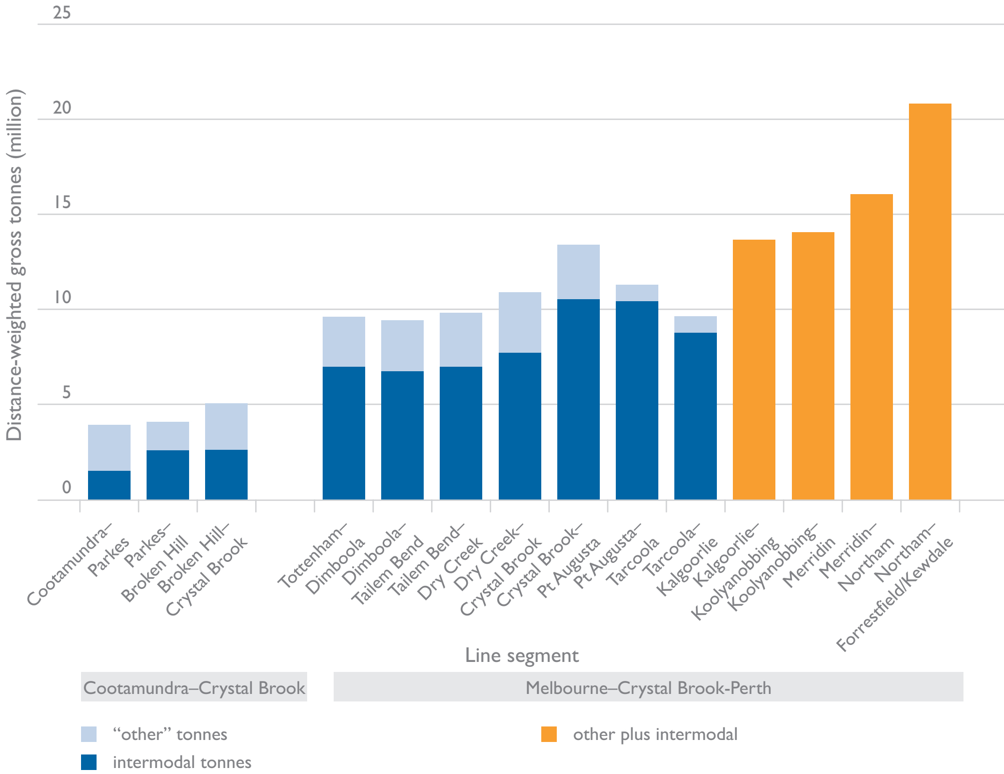


Figure 15 Distance-weighted gross tonnage on East–West corridor, by line segment, 2007–08 to 2009–10

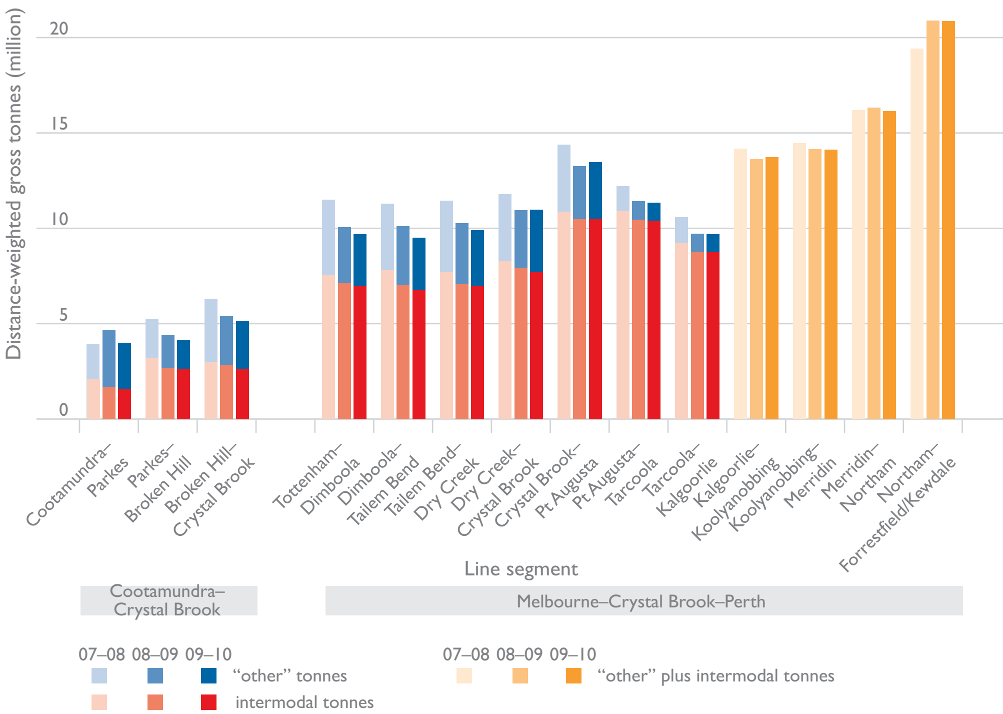
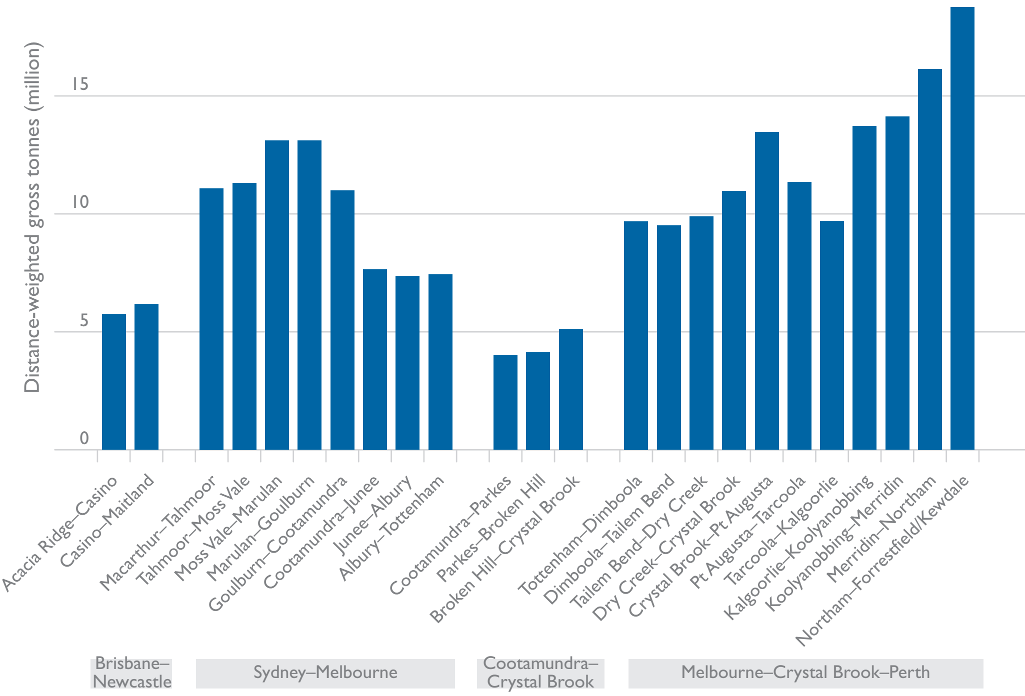


Figure 16 Distance-weighted gross tonnage on Defined Interstate Rail Network, by line segment, 2009–10



Source for Figure 12 to Figure 16: Rail track managers (ARTC, Brookfield Rail).

Note: Figures for intermodal freight were not available from Brookfield Rail on a comparable basis with ARTC. For data see Table 5 and Table 6.

Rail freight task by states of origin and destination

The rail freight task between and within states is presented, using data provided by above-rail train operators, or estimated from published material. The freight task is measured in terms of tonnes (Table 7) and net-tonne kilometres (Table 8). The freight task figures presented here are conventional net tonnes, excluding tare (non-payload) weight of the vehicle[3].

The largest rail freight flows in Australia are of bulk freight. Total rail freight was 259 billion net tonne kilometres in 2009–10, of which 28 billion net tonne kilometres was intermodal freight and 230 billion net tonne kilometres (89 per cent) was bulk freight.

3 In BITRE's *Rail freight performance indicators 2007–08 statistical* report, the weight of containers themselves were excluded from the payload, that is, the container weight was classed as being part of the tare weight. In this report the payload data has been obtained inclusive of the container weight. For comparative purposes, Table 7 and Table 8 present tonnages for 2007–08 including the container weight.

Bulk rail traffic is almost entirely intrastate—approximately 98 per cent in net tonne kilometre terms. The biggest bulk haulage task (defined in tonnes) is in WA, dominated by rail's movement of iron ore in the Pilbara region; it represents 60 per cent of Australia's total rail freight task (and two-thirds of the bulk rail freight task). Other sizeable intrastate bulk flows are recorded in Queensland (20 per cent of the total rail freight task) and NSW (7 per cent of the total rail freight task), where there are large coal movements.

Box 3 Measuring freight origins and destinations

This report presents the intermodal task performed, defined by the origin–destination of the goods. The data used to compile this freight task matrix are provided by train operators. The operators typically use billing information and goods dispatch records to compile their data.

A deficiency in these data sources arises when goods are interlined between operators. The correct origin–destination pair is unlikely to be recorded. For instance, if a wagon is conveyed from Melbourne to Darwin, Pacific National may shift the wagon to Adelaide, where it is interlined to Genesee & Wyoming's Darwin train. Pacific National's records will show the goods originating in Melbourne and destined for Adelaide while Genesee & Wyoming will record the goods as originating in Adelaide and being delivered to Darwin.

In aggregate, the tonne kilometres recorded by this method will be correct but the attribution of origin and destination may be incorrect. The implication of this data deficiency is that the implied *length* of reported interstate and intercity freight movement will be less than actually occurs. Also, the attribution to freight of the wrong origin (i.e., not the true origin) or the wrong destination (i.e., not the final destination) is probably not random: it is likely to occur in specific flows when service on a given line segment is undertaken by only one operator. For instance, on the Tarcoola–Darwin line, Genesee & Wyoming is the only operator so goods originating from eastern states (where Genesee & Wyoming does not regularly operate its own trains) must necessarily be interlined to Genesee & Wyoming from a second operator.

A related data deficiency arises when goods are transferred across gauges or trans-shipped. One example is Brisbane. Depending on how traffic from the southern states to north Queensland is handled when it arrives in Brisbane, the origin of the goods may be recorded as Brisbane (intrastate) rather than Victoria or NSW. That is, the freight originating from south of the Queensland border may be understated. Similarly, Tasmanian-bound goods on the mainland are recorded as having a Melbourne (rather than a Tasmanian) destination, from where they are conveyed by coastal shipping. That is, only the last mode (ship) is recorded for the interstate freight task. When those goods are shifted by rail within Tasmania, they will be recorded as being 'intrastate'.

A similar data deficiency may arise if freight moves across more than one division within the firm: if each division has its own billing system, the freight origin–destination pair may be the locations where the goods are transferred between the operating divisions. The consequence is origin–destination mis-reporting that is akin to when the goods are shifted across independent train operators.

In 2009–10, the largest interstate bulk flows were from NSW—to SA, Victoria and Queensland—and from SA to NSW. The main commodity of these movements is steel, which is shifted from NSW to Westernport (Victoria) and from Whyalla (SA) to Newcastle and Sydney. There are also large flows of ores and minerals, such as from near Broken Hill to Port Pirie and Port Adelaide.

The principal intermodal rail flows are on the East–West corridor, especially between Victoria and Western Australia. The largest flows are between origins and destinations far apart, reflecting the market in which rail is most competitive against road. There are relatively large shorter distance flows from New South Wales to Victoria and between Victoria and South Australia. The former may include onward movement of freight to Tasmania, and containerised agricultural commodities from Deniliquin and Tocumwal in southern New South Wales for export from Melbourne. The latter includes international land-bridging traffic between Melbourne and Adelaide.

Around 18 per cent of the intermodal freight task is intrastate. Queensland has the largest intrastate intermodal task, reflecting the long distance between Brisbane and the cities in northern Queensland, over which rail is relatively competitive with road for intermodal freight.

As with previous *Rail performance indicators* reports, some smaller train operators did not provide traffic data. Where those smaller operators had provided data in the past, then freight tonnage estimates for 2008–09 and 2009–10 were made on the basis of previous data prepared and checked against total tonnage data from ARTC. The smaller rail operators for which there was some estimation, either for 2008–09 or 2009–10, were P&O Trans Australia, El Zorro and Freightlink. Total traffic levels will remain understated to a small extent, however, because some small operators are yet to provide traffic data.

Table 7 Interstate and intrastate rail freight flows (thousand net tonnes)

Thousand net tonnes

		Intermodal								Bulk								Total							
		Destination								Destination								Destination							
2007–08		NSW	Vic	Qld	SA	WA	Tas	NT	Total	NSW	Vic	Qld	SA	WA	Tas	NT	Total	NSW	Vic	Qld	SA	WA	Tas	NT	Total
Origin	NSW	3 082	904	281	117	799	-	16	5 200	116 108	858	824	874	281	-	-	118 945	119 190	1 762	1 105	991	1 080	-	16	**124 145**
	Vic	298	483	828	1 027	1 329	-	31	3 995	187	2 097	61	355	71	-	-	2 772	485	2 580	889	1 382	1 400	-	31	**6 767**
	Qld	255	530	3 775	78	196	-	8	4 841	46	3	183 591	0	2	-	-	183 643	301	533	187 366	78	198	-	8	**188 484**
	SA	126	706	135	988	659	-	508	3 123	1 006	555	92	13 582	81	-	-	15 317	1 132	1 261	227	14 570	740	-	508	**18 440**
	WA	432	810	161	475	1	-	7	1 885	3	18	0	2	319 162	-	-	319 184	435	828	161	477	319 163	-	7	**321 069**
	Tas	-	-	-	-	-	na	-	na	-	-	-	-	-	1 690	-	1 690	-	-	-	-	-	1 690	-	**1 690**
	NT	-	-	-	346	-	-	128	475	-	-	-	-	-	-	1 274	1 274	-	-	-	346	-	-	1 402	**1 749**
	Total	4 194	3 434	5 179	3 031	2 983	na	698	19 519	117 350	3 531	184 568	14 813	319 598	1 690	1 274	642 826	121 544	6 965	189 747	17 844	322 581	1 690	1 972	**662 345**
		Destination								Destination								Destination							
2008–09		NSW	Vic	Qld	SA	WA	Tas	NT	Total	NSW	Vic	Qld	SA	WA	Tas	NT	Total	NSW	Vic	Qld	SA	WA	Tas	NT	Total
Origin	NSW	912	907	275	85	742	-	12	2 933	117 326	621	537	663	159	-	-	119 306	118 238	1 528	812	748	901	-	12	**122 239**
	Vic	309	522	711	629	1 265	-	28	3 465	177	723	48	478	64	-	-	1 490	486	1 245	759	1 107	1 329	-	28	**4 955**
	Qld	185	479	4 981	60	152	-	6	5 864	22	1	182 696	0	1	-	-	182 721	207	480	187 677	60	153	-	6	**188 585**
	SA	112	838	100	319	619	-	545	2 533	702	725	56	13 091	56	-	4	14 635	814	1 563	156	13 410	675	-	549	**17 168**
	WA	422	729	127	385	258	-	7	1 929	1	1	0	0	382 589	-	-	382 590	423	730	127	385	382 847	-	7	**384 519**
	Tas	-	-	-	-	-	450	-	450	-	-	-	-	-	2 009	-	2 009	-	-	-	-	-	2459	-	**2 459**
	NT	-	-	-	220	-	-	87	307	-	-	-	-	-	-	2 289	2 289	-	-	-	220	-	-	2 376	**2 596**
	Total	1 941	3 476	6 195	1 698	3 036	450	685	17 481	118 227	2 072	183 337	14 232	382 869	2 009	2 293	705 039	120 168	5 548	189 532	15 930	385 905	2 459	2 978	**722 520**
		Destination								Destination								Destination							
2009–10		NSW	Vic	Qld	SA	WA	Tas	NT	Total	NSW	Vic	Qld	SA	WA	Tas	NT	Total	NSW	Vic	Qld	SA	WA	Tas	NT	Total
Origin	NSW	1 014	1 208	240	89	757	-	12	3 320	128 647	293	624	664	181	-	-	130 410	129 661	1 501	864	753	938	-	12	**133 730**
	Vic	294	650	746	380	1 316	-	56	3 442	58	835	62	128	88	-	-	1 172	352	1 485	808	508	1 404	-	56	**4 614**
	Qld	203	510	4 302	54	141	-	6	5 216	59	0	206 321	0	2	-	-	206 382	262	510	210 623	54	143	-	6	**211 598**
	SA	98	489	134	345	583	-	519	2 168	641	158	50	16 884	55	-	6	17 794	739	647	184	17 229	638	-	525	**19 962**
	WA	427	708	116	469	70	-	9	1 800	0	0	-	0	440 086	-	-	440 087	427	728	116	469	440 156	-	9	**441 887**
	Tas	-	-	-	-	-	282	-	282	-	-	-	-	-	630	-	630	-	-	-	-	-	912	-	**912**
	NT	-	-	-	205	-	-	87	293	-	-	-	-	-	-	2 289	2 289	-	-	-	205	-	-	2 376	**2 582**
	Total	2 036	3 565	5 538	1 542	2 868	282	689	16 521	129 405	1 287	207 057	17 677	440 412	630	2 295	798 763	131 441	4 852	212 595	19 219	443 280	912	2 984	**815 284**

Note 1: In 2007-08 intrastate volumes were softer due to the effects of the drought on rural commodity exports, and changes in road: rail market share.

Note 2: For source and table notes, see Table 8.

Table 8 Interstate and intrastate rail freight flows (million net tonne-kilometres)

Million net tonne-kilometres

		Intermodal								Bulk								Total							
		Destination								Destination								Destination							
2007–08		NSW	Vic	Qld	SA	WA	Tas	NT	Total	NSW	Vic	Qld	SA	WA	Tas	NT	Total	NSW	Vic	Qld	SA	WA	Tas	NT	Total
Origin	NSW	485	644	295	232	3 141	-	29	4 827	16 311	655	838	676	1 107	-	-	19 587	16 796	1 299	1 133	908	4 248	-	29	**24 414**
	Vic	282	204	1 735	633	4 567	-	25	7 446	156	510	118	182	229	-	-	1 195	438	714	1 853	815	4 796	-	25	**8 641**
	Qld	266	1 114	4 228	215	1 062	-	21	6 905	49	6	40 839	0	8	-	-	40 903	315	1 120	45 067	215	1 070	-	21	**47 808**
	SA	226	860	372	317	1 691	-	931	4 396	1 785	527	261	1 824	192	-	-	4 588	2 011	1 387	633	2 141	1 883	-	931	**8 984**
	WA	1 733	2 816	821	1 254	1	-	19	6 643	12	59	1	11	105 048	-	-	105 130	1 745	2 875	822	1 265	105 049	-	19	**111 773**
	Tas	-	-	-	-	-	337	-	337	-	-	-	-	-	119	-	119	-	-	-	-	-	456	-	**456**
	NT	-	-	-	620	-	-	145	766	-	-	-	-	-	-	617	617	-	-	-	620	-	-	762	**1 383**
	Total	2 991	5 637	7 451	3 271	10 462	337	1 171	31 321	18 312	1 756	42 056	2 694	106 585	119	617	172 139	21 303	7 393	49 507	5 965	117 047	456	1 788	**203 460**
		Destination								Destination								Destination							
2008–09		NSW	Vic	Qld	SA	WA	Tas	NT	Total	NSW	Vic	Qld	SA	WA	Tas	NT	Total	NSW	Vic	Qld	SA	WA	Tas	NT	Total
Origin	NSW	248	591	263	149	2 827	0	21	4 099	17 360	436	538	426	690	-	-	19 450	17 608	1 027	801	575	3 517	-	21	**23 549**
	Vic	293	149	1 362	522	4 385	-	24	6 735	121	266	93	256	226	-	-	962	414	415	1 455	778	4 611	-	24	**7 697**
	Qld	179	923	5 513	166	756	-	17	7 554	22	2	45 063	0	1	-	-	45 089	201	925	50 576	166	757	-	17	**52 643**
	SA	205	736	274	56	1 634	-	1 381	4 285	1 299	666	151	1 790	125	-	0	4 032	1 504	1 402	425	1 846	1 759	-	1 381	**8 317**
	WA	1 687	2 537	648	1 021	313	-	19	6 226	2	4	0	1	136 736	-	-	136 743	1 689	2 541	648	1 022	137 049	-	19	**142 969**
	Tas	-	-	-	-	-	153	-	153	-	-	-	-	-	171	-	171	-	-	-	-	-	324	-	**324**
	NT	-	-	-	550	-	-	0	550	-	-	-	-	-	-	1,114	1,114	-	-	-	550	-	-	1 114	**1 664**
	Total	2 612	4 936	8 060	2 464	9 915	153	1 462	29 602	18 804	1 375	45 846	2 473	137 778	171	1 114	207 561	21 416	6 311	53 905	4 937	147 693	324	2 576	**237 163**
		Destination								Destination								Destination							
2009–10		NSW	Vic	Qld	SA	WA	Tas	NT	Total	NSW	Vic	Qld	SA	WA	Tas	NT	Total	NSW	Vic	Qld	SA	WA	Tas	NT	Total
Origin	NSW	267	565	264	159	2 928	-	32	4 215	18 065	311	615	444	767	-	-	20 202	18 332	876	879	603	3 695	-	32	**24 417**
	Vic	281	178	1 482	320	4 505	-	98	6 866	52	205	115	99	282	-	-	754	333	383	1 597	419	4 787	-	98	**7 620**
	Qld	291	1 032	4 152	150	713	-	20	6 358	62	0	50 731	0	5	-	-	50 799	353	1 032	54 883	150	718	-	20	**57 157**
	SA	180	445	368	59	1 560	-	1 315	3 926	1 213	196	138	1 954	130	-	2	3 633	1 393	641	506	2 013	1 690	-	1 317	**7 559**
	WA	1 702	2 459	587	1 228	45	-	32	6 053	1	1	-	1	153 942	-	-	153 944	1 703	2 460	587	1 229	153 987	-	32	**159 997**
	Tas	-	-	-	-	-	96	-	96	-	-	-	-	-	44	-	44	-	-	-	-	-	140	-	**140**
	NT	-	-	-	513	-	-	107	620	-	-	-	-	-	-	1,114	1,114	-	-	-	513	-	-	1 221	**1 734**
	Total	2 721	4 680	6 853	2 429	9 752	96	1 603	28 134	19 393	713	51 599	2 498	155 128	44	1 116	230 490	22 114	5 393	58 452	4 927	164 880	140	2 719	**258 624**

Sources: Asciano, Freightliner Australia, Genesee Wyoming Australia, QR National, SCT Logistics, and BITRE estimates (informed by data from ARTC and WestNet, and Resource Information Unit 2011).

Notes: This report presents the intermodal freight by origin and destination using data provided by train operators (except in the case of iron ore traffic, in which freight flows are estimated from mining output data), typically compiled from billing information and good dispatch records. Generally the numbers refer to the amount of freight carried between an origin and destination on a particular service, regardless of whether the freight is then carried on by another operator or mode. However, where goods are transferred between different operating units of the same operator, the origin or destination of goods may be recorded differently between operators.

Intermodal interstate market share

Table 9 shows estimates of the shares of rail, road and sea as a proportion of total freight between states for each state-pair, for 2009–10.

Rail and sea freight volumes are based directly on actual data, from rail and port operators respectively, and road volumes are estimates based on the ABS Survey of Motor Vehicle Use. Because these figures are for total interstate freight, they may not reflect the mode share in the markets for which road and rail directly compete. In particular, rail carries a higher proportion of inter-capital freight than of interstate freight in general. Unfortunately, data for inter-capital road freight is difficult to estimate.

The time series reported in earlier volumes of BITRE's rail freight performance indicators will now be published separately, when data on all three modes becomes available.

Rail's mode share is highest between the eastern states and Western Australia. The share of rail is smaller for north–south pairs, with the highest being 24 per cent of freight from Victoria to Queensland. This reflects rail's relative advantage over road on long distance routes, due to its lower line haul costs.

Table 9 Estimates of market shares of road, rail, and coastal shipping in the interstate intermodal freight task

		Market share, percentage, 2009–10								
		State/territory of destination								
State/territory of origin		NSW	Vic	Qld	SA	WA	TAS	NT	ACT	Total
NSW	Road share		94	95	92	13	0	82	100	81
	Rail share		5	3	7	62	0	18	0	14
	Coastal shipping share		0	2	1	25	100	0	0	5
Vic	Road share	96		69	87	4	0	25	100	65
	Rail share	3		26	8	77	0	74	0	26
	Coastal shipping share	1		5	5	19	100	1	0	9
Qld	Road share	95	75		75	15	0	88		79
	Rail share	4	20		11	44	0	3		13
	Coastal shipping share	1	5		14	41	100	9		8
SA	Road share	93	88	70		44		32		68
	Rail share	7	12	30		55		68		31
	Coastal shipping share	0	0	0		2		0		0
WA	Road share	35	13	38	60		0	91		39
	Rail share	64	85	60	40		0	6		59
	Coastal shipping share	1	3	2	0		100	2		1
TAS	Road share	0	0			0				0
	Rail share	0	0			0				0
	Coastal shipping share	100	100			100				100
NT	Road share	100	100	100	29	99				63
	Rail share	0	0	0	71	0				37
	Coastal shipping share	0	0	0	0	1				0
ACT	Road share	100	100							100
	Rail share	0	0							0
	Coastal shipping share	0	0							0
Total	Road share	88	76	82	76	17	0	54	100	69
	Rail share	11	20	15	20	62	0	44	0	24
	Coastal shipping share	1	4	3	4	21	100	2	0	6

Source: BITRE estimates.

Notes: (i) State pairs for which there are no significant freight flows have been left blank.

(ii) Econometric estimates of a time series from 1971 of intermodal State-to-State market shares of road, rail and coastal shipping are available in Excel spreadsheet format in BITRE (2012).

(iii) The term 'intermodal freight' has been used for consistency. Note, however, that much of the freight carried by road and ship is captive to those modes. In this context, 'intermodal' refers to non-bulk freight.

Access revenue yield

Access revenue is the infrastructure manager's income derived from train operators using the railway. ARTC's access charge has two components: a flagfall charge, which is a reservation charge for booking a train path on a given line segment, invariant with tonnage; and a variable charge, which varies directly with the train operator's gross tonne kilometres. Hence as tonnage on the train rises, the average access charge per tonne will decline.

This access charging regime provides an incentive for train operators to operate longer trains. In principle, operating longer trains enables infrastructure managers to achieve greater tonnage throughput, as there is a limit to the number of trains that can operate over the network. However, to have longer trains requires trackage that can deal with the length. In recent years, interstate network infrastructure has been expanded to take longer trains. If train operators respond to the access charging structure by running longer trains, effective freight costs per tonne will fall.

The indicator presented here is an index of the maximum access yield for the interstate network managed by ARTC, based on ARTC data and analysis. The indicator measures the changes (relative to the base year) in the maximum access revenue yield per gross tonne kilometre. Changes in this composite indicator may reflect changes in:

- real access charges (higher charges will increase the indicator);
- train operators' use of existing capacity (heavier/longer trains will lower the indicator); or
- enhancements in rail infrastructure and train operators' uptake of those enhancements (more uptake of improvements, through heavier trains, will lower the indicator).

As shown in Table 10, since 2007–08, average yield has fallen on two of the three North–South segments, but risen on three of the five East–West segments.

Table 10 Index of real maximum access revenue yield (2004–05 = 100)

	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10
North–South Corridor							
Border Loop – Newcastle		100.00	97.47	95.82	93.50	93.71	92.06
Macarthur–Albury		100.00	97.45	95.81	99.11	99.22	97.47
Albury–Tottenham	101.26	100.00	98.84	97.16	88.81	88.91	89.05
East–West Corridor							
Melbourne–Adelaide	101.23	100.00	98.84	97.64	99.41	99.37	99.45
Adelaide–Kalgoorlie	101.25	100.00	98.85	97.65	108.32	104.47	104.49
Cootamundra–Parkes		100.00	97.46	95.82	101.90	102.13	102.38
Parkes – Broken Hill		100.00	97.47	95.82	100.87	99.51	99.80
Broken Hill – Crystal Brook	101.24	100.00	98.83	97.63	113.62	114.02	114.36

Source: ARTC

Note: The table shows the access revenue yield ($ per gross tonne-kilometre) as an index with 2004–05 as the base year.

CHAPTER 4
Train indicators

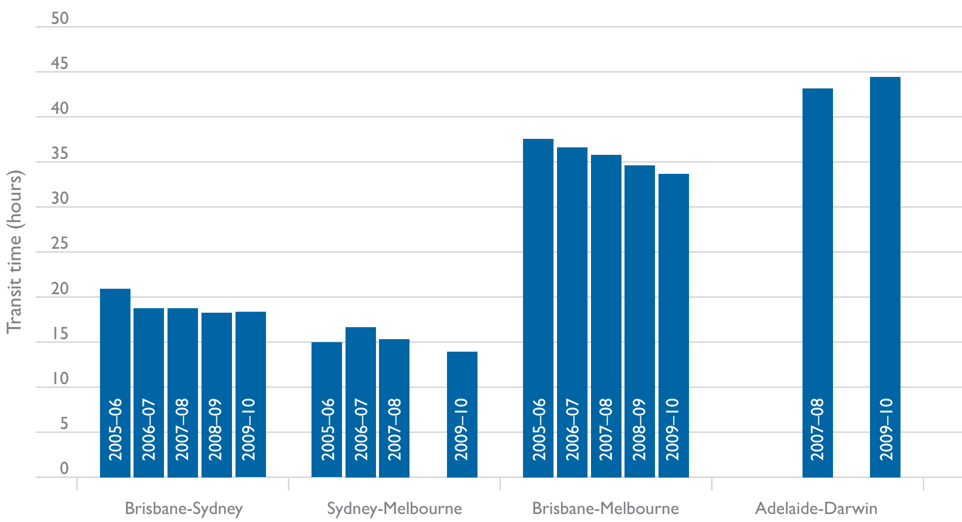
Scheduled intermodal transit time

The scheduled intermodal transit time indicator is the average timetabled transit time of intermodal trains that operated in the last week of June of each year. Figure 17 and Figure 18 present the average scheduled intermodal transit time for trains on seven city pairs, for the North–South and East–West corridors respectively. These data are detailed in Table 13.

The scheduled transit time is influenced by a number of factors including: the line speed; the number of stops en-route; the number and type of other trains on the line (particularly when the route has single track); operator dependent factors such as time spent in intermediate cities; and, for Sydney–Perth trains, the route used. As infrastructure enhancements are completed, a number of these factors are changing, resulting in lower transit times.

The scheduled transit times of Sydney–Melbourne, Brisbane–Sydney and Brisbane–Melbourne trains are continuing to fall. This is likely to be a result, in part, of improvements in signalling and construction of passing loops and passing lanes on the North–South corridor. Transit times on the East–West corridor are relatively unchanged since 2005–06.

Figure 17 **Average scheduled transit times, North-South and Central corridors, 2005–06 to 2009–10**

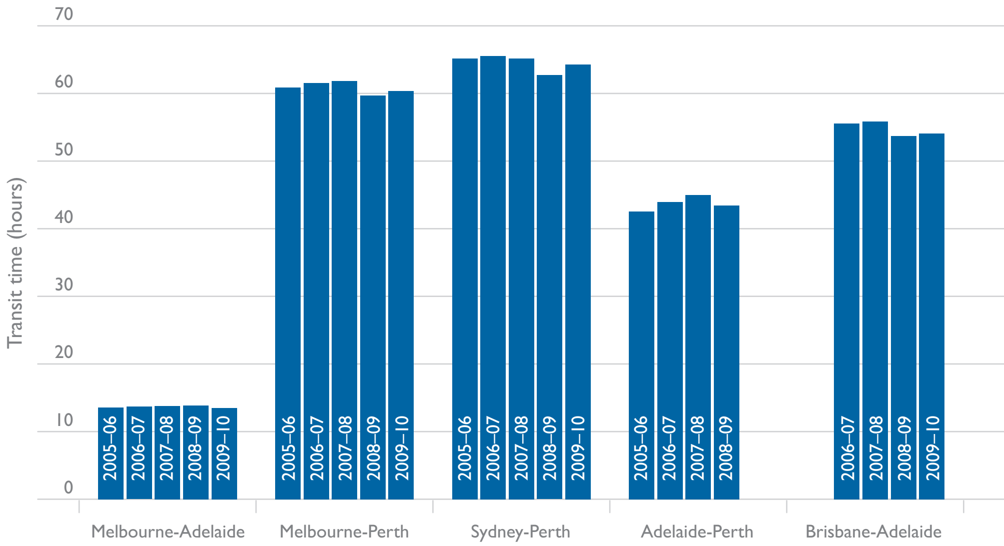


Note 1: No Sydney – Melbourne services were scheduled as in the last week of June 2009.

Note 2: Melbourne – Sydney and Sydney – Brisbane freight is generally conveyed on Melbourne – Brisbane trains.

Source: BITRE calculated average scheduled transit times from infrastructure manager (ARTC, RailCorp and Brookfield Rail—formerly WestNet) working timetables that were current for the last week of June of each year.

Figure 18 Average scheduled transit times, East-West corridors, 2005–06 to 2009–10



Note: No Adelaide–Perth trains were scheduled as in the last week of June 2010.

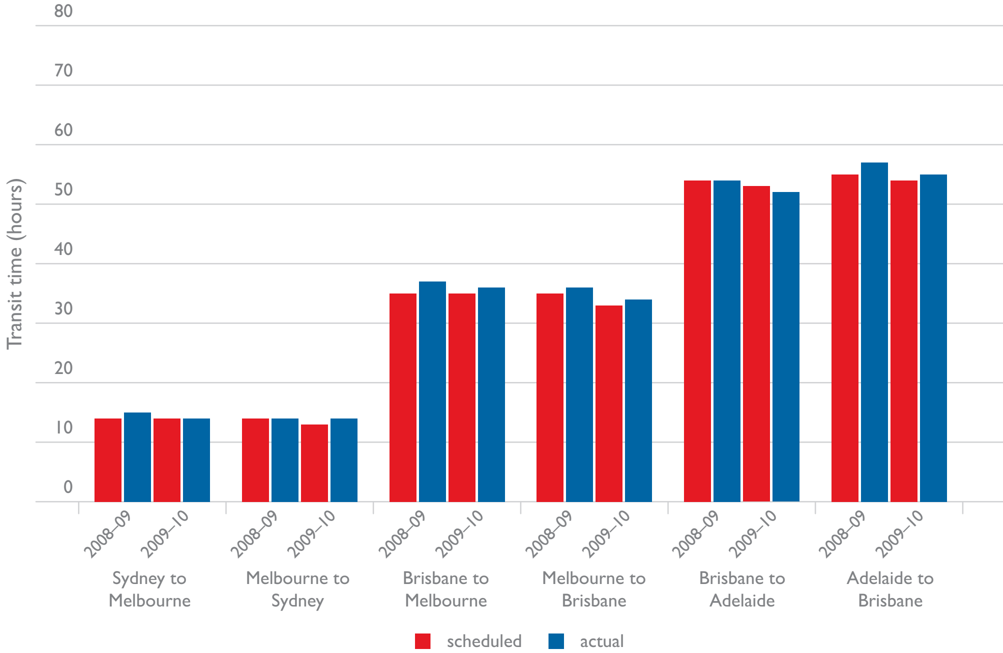
Source: BITRE calculated average scheduled transit times from infrastructure manager (ARTC, RailCorp and Brookfield Rail —formerly WestNet) working timetables that were current for the last week of June.

Actual intermodal transit time

This indicator measures the annual average actual transit time of intermodal trains by line segment. The analysis uses infrastructure managers' records, for a 12 month period, of recorded train arrival and departure times at city terminals. Figure 19 and Figure 20, present actual transit times based on this data. Scheduled transit times shown here differ from those in Figure 17 and Figure 18 as they cover the entire year.

The relatively high number of derailment incidents on the East–West corridor in 2008–09 means that actual times are significantly higher than scheduled times in that year. In 2009–10 fewer such incidents occurred, and the scheduled and actual transit times are closer together.

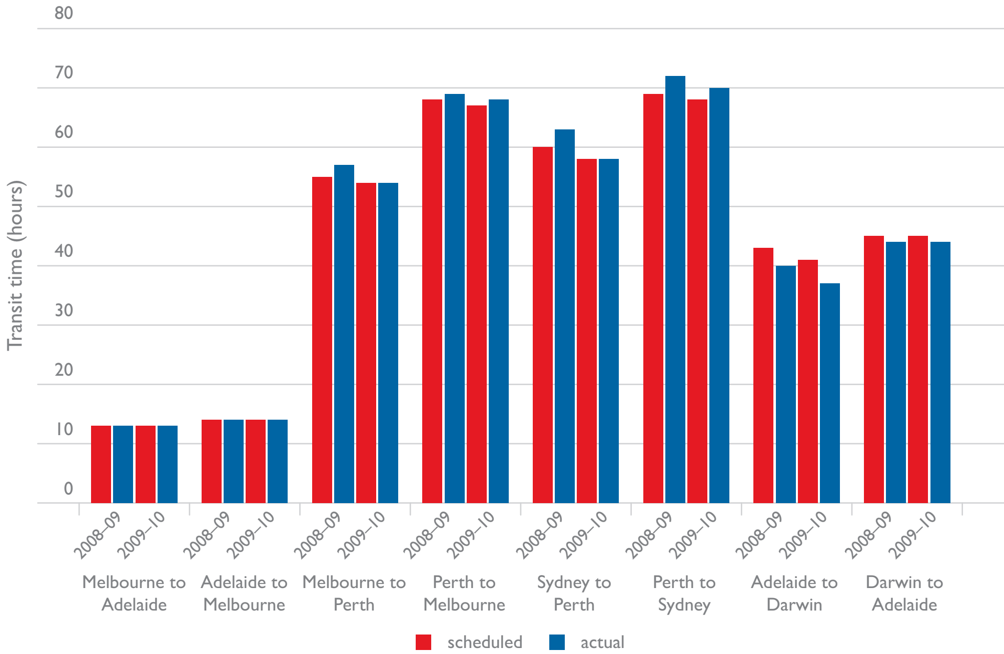
Figure 19 Average scheduled and actual transit times, North-South corridor 2008–09 and 2009–10



Note: Train services that may have operated during the year may not be scheduled to operate in June of each year. For example, there were Sydney to Melbourne services during 2008–09 but there were no scheduled services in the June 2009 working timetable. There was only one train service between Sydney and Brisbane in 2008–09, and there was insufficient data to accurately calculate average transit time for this city pair. For trains originating or terminating in Sydney, in many cases scheduled and actual running times were only recorded at some point on the outskirts. For these trains, the difference between actual and scheduled transit times may not include all delays within the Sydney urban area.

Source: BITRE calculations from infrastructure manager—ARTC, RailCorp, and Brookfield Rail (formerly WestNet)—working timetables and their records of actual train arrival and departure.

Figure 20 Average scheduled and actual transit times, East-West corridor by service, 2008–09 and 2009–10



Notes: Origin–destination times were adjusted for time zones and were 'normalised' to a given city origin or destination location. For example, times for trains terminating at Altona were adjusted to a Dynon arrival time using typical Dynon–Altona running times. Results are based on a subset of the total number of the relevant intermodal trains, because there are cases where infrastructure managers did not record train arrivals and departures for all trains. For trains originating or terminating in Sydney, in many cases scheduled and actual running times were only recorded at some point on the outskirts. For these trains, the difference between actual and scheduled transit times may not include all delays within the Sydney urban area.

Source: Average scheduled transit times have been calculated from infrastructure manager—ARTC, RailCorp, and Brookfield Rail (formerly WestNet)—working timetables current in the last week of each financial year.

Train service frequency

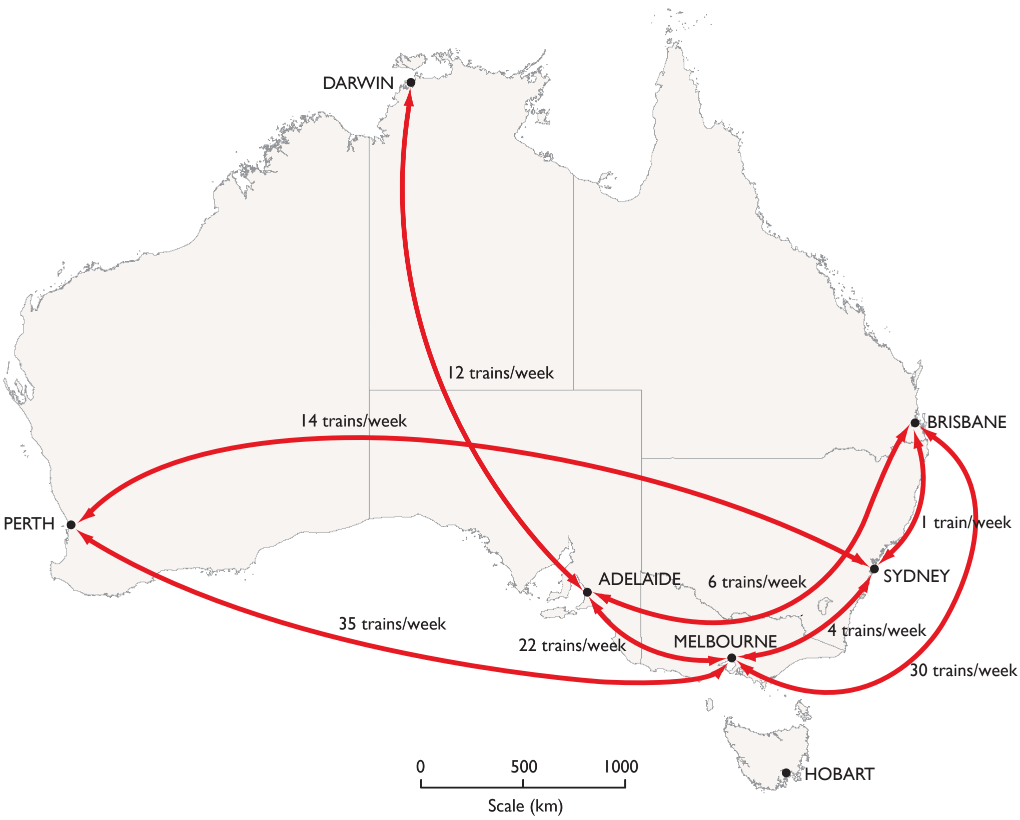
In this section, a number of indicators of train service frequency are presented.

Intermodal train services by city pair

The number of scheduled weekly intermodal trains that originated and terminated in the given city pairs, according to the timetables for June of each year, are shown in Table 11, and for June 2010 are shown in Figure 21. Note that these origins and destinations are those of trains, and not those of goods on the trains.

On the North–South corridor, since 2006, the number of scheduled intermodal trains have fallen. On the East–West corridor, the number of scheduled intermodal trains between Melbourne and Perth has increased, but decreases have occurred in the numbers of trains between Melbourne and Adelaide, between Adelaide and Perth, and between Sydney and Perth.

Figure 21 Number of intercapital intermodal services per week, June 2010



Note: Trains are excluded when they are listed in timetables but normally did not operate in June 2010.

Source: BITRE estimates based on data provided by infrastructure managers: ARTC, RailCorp and Brookfield Rail (formerly Westnet).

Table 11 Number of weekly intercity intermodal services and transit times by city pair

	Number of scheduled trains with pair origin–destination, end-June					Average transit time (hours)					
						June schedule		Scheduled		Actual	
	'06	'07	'08	'09	'10	09	10	08–09	09–10	08–09	09–10
North–South corridor											
Brisbane to Sydney	4	1	1	1	1	18.3	18.4	no data		no data	
Sydney to Brisbane	5	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a
Sydney to Melbourne	4	6	3	0	2	n/a	n/a	14.1	13.6	14.7	14.5
Melbourne to Sydney	6	6	3	0	2	n/a	n/a	14.0	13.1	14.2	14.1
Brisbane to Melbourne	19	18	16	17	15	35.4	34.4	35.4	34.8	36.9	35.5
Melbourne to Brisbane	18	18	17	17	15	33.8	32.9	34.9	33.1	36.1	34.0
Brisbane to Adelaide		5	5	3	3	53.7	52.9	54.4	53.4	54.5	52.5
Adelaide to Brisbane		5	4	3	3	53.9	55.2	55.4	54.4	56.9	54.7
East–West corridor											
Melbourne to Adelaide	17	17	17	17	11	13.2	13.5	12.6	12.6	12.9	12.9
Adelaide to Melbourne	17	17	17	17	11	14.4	13.8	13.8	13.8	14.2	13.8
Melbourne to Perth	14	15	16	15	18	54.2	56.8	54.8	53.9	57.3	53.9
Perth to Melbourne	14	15	16	15	17	65.2	63.9	67.8	67.4	69.0	67.7
Sydney to Perth	8	8	8	7	7	59.5	61.6	60.1	57.8	62.5	57.6
Perth to Sydney	8	8	8	7	7	65.9	67.0	69.2	68.2	72.2	69.8
Adelaide to Perth	0	0	2	2	0	42.7	42.7	43.2	41.1	40.3	37.3
Perth to Adelaide	0	0	2	2	0	44.2	44.2	45.3	45.3	44.2	43.7
Central corridor											
Adelaide to Darwin	no data		5	7	7		43.4	no data	43.3	no data	46.0
Darwin to Adelaide			5	6	6		45.5		45.5		47.5

Note: Actual or scheduled times were not available between Adelaide and Darwin for 2008–09, or between Brisbane and Sydney for either year. n/a is used where no trains with that origin/destination pair ran in that year.

Source: BITRE estimates based on data provided by infrastructure managers: ARTC, RailCorp, Brookfield Rail and Genesee & Wyoming Australia.

Weekly trains by line segment

The number of weekly interstate intermodal and steel trains on each line segment is presented in Figure 22 and Table 12. This is an indicator of the intensity of the usage of the interstate network. The most intensive usage of the network by interstate trains is the Crystal Brook – Spencer Junction segment, followed by segments between Melbourne and Adelaide. These line segments are almost entirely single track. The relatively busy Sydney-Cootamundra line segment is double-track but also carries a relatively high amount of passenger and bulk traffic.

On most segments, the number of steel trains is almost unchanged since 2007–08, while the number of intermodal trains has declined, particularly on the North–South corridor.

Figure 22 **Number of interstate intermodal and steel trains per week on interstate track, by line segment, June 2010**

Source: BITRE estimates based on data provided by infrastructure managers: ARTC, RailCorp and Brookfield Rail.

Table 12 Number of scheduled weekly interstate intermodal and steel trains, by line segment

	Intermodal					Steel				
Line segment	Jun–06	Jun–07	Jun–08	Jun–09	Jun–10	Jun–06	Jun–07	Jun–08	Jun–09	Jun–10
North–South corridor										
1. Brisbane–Sydney	50	47	43	41	37	11	14	12	12	12
2. Sydney–Melbourne										
Sydney to Cootamundra	61	68	59	50	49	23	21	21	21	19
Cootamundra to Melbourne	51	58	48	50	45	12	10	10	9	8
East–West corridor										
3. Sydney–Crystal Brook via Broken Hill										
Sydney–Parkes via Lithgow	6	6	5	8	9	0	0	0	1	0
Cootamundra–Parkes	10	10	11	10	9	11	11	11	12	11
Parkes–Crystal Brook	16	16	20	18	18	11	11	11	13	11
4. Melbourne–Crystal Brook										
Melbourne–Adelaide	66	74	75	70	63	12	10	11	10	8
Adelaide–Crystal Brook	38	40	46	47	47	13	12	10	10	10
5. Crystal Brook–Perth										
Crystal Brook–Port Augusta	54	56	66	65	65	13	23	17	23	21
Port Augusta–Tarcoola	54	56	66	64	65	6	6	7	6	6
Tarcoola–Perth	54	46	56	52	53	6	6	7	6	6

Source: BITRE estimates based on data provided by infrastructure managers: ARTC, Brookfield Rail (formerly WestNet), and RailCorp.

CHAPTER 5
Track indicators

The indicators presented in this section provide information on infrastructure quality and freight train flow patterns.

Permitted train length

The permitted train length is an important component of overall track capacity. On Australia's mostly single track this is often determined by the length of passing loops. Since the mid-1990s in particular, infrastructure managers have invested in longer passing loops across the interstate network. Permitted train length can also be constrained by track alignment and gradient.

Figure 23 summarises permitted train lengths on the interstate network as at June 2010, showing 'unrestricted' and 'restricted' lengths. The 'unrestricted' train length is the train length up to which operators can operate any scheduled service without reference to the track manager; the length is shorter than the prevailing standard loop length on the line segment. The 'restricted' train length is the maximum train length permitted on the line segment. (Under restricted access terms, trains that exceed the prevailing loop length can be operated by ensuring that trains that have to be passed can be accommodated within the prevailing loop length.)

Since 2007–08, passing loops have been constructed on the Cootamundra–Parkes section, this work allows unrestricted movement of 1 800 metre trains to operate between Sydney and Kalgoorlie via Parkes. The intention is that passing loops on the Melbourne–Adelaide line will also be upgraded to allow 1 800 metre trains without restrictions.

On the North–South corridor, the 1 500 metre allowable train length is now run 'unrestricted' between Brisbane and the NSW/Queensland border. The removal of this restriction means that 1 500 metre trains can now run 'unrestricted' for the entire length of the North–South corridor.

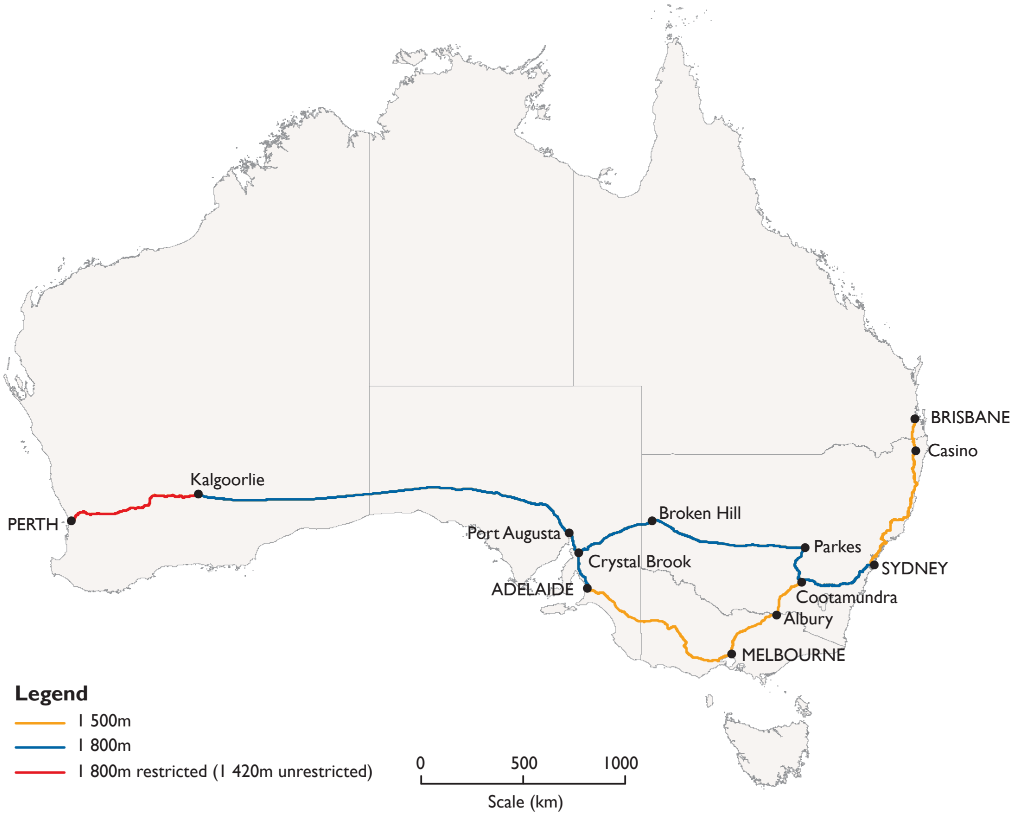
Double stacking capability

As with train length, the ability to double-stack containers on wagons is an important component of track capacity. In the Australian context, double-stacking capability refers to the ability to stack one hi-cube (9 feet 6 inch, or 2.896 metres high) container on top of another and to convey them within a low-floor (well) wagon. The top of the stack must be no higher than 6.5 metres above the top of the rail, and mass limits must not be exceeded.

Double-stacking is permitted west of Parkes and west of Adelaide. There are more restricted clearances on the North–South corridor, where loading clearances are restricted to single-stacking of hi-cube containers. The increasingly prevalent higher maxicube (10 feet 6 inch, or 3.20 metre) containers must be conveyed within the specialised low-floor well wagons.

The central corridor line accepts double-stacked containers and road freight vehicles (for the transport of oil) piggybacked on rail flat wagons.

Figure 23 Permitted train length, by line segment, June 2010



Source: ARTC, RailCorp and Brookfield Rail (formerly WestNet).

Track quality

The maintenance and standards of railway infrastructure are important to the operating performance of trains. The permitted track speed and the smoothness of the ride of the wagons are strongly influenced by the quality of the infrastructure, the maintenance regime and the underlying economic life of the infrastructure.

Figure 24 illustrates engineers' physical measures of average track condition by line segment. These indicators use a 'track quality index' (TQI). In reading the index, the interpretation is that the lower the number the higher the track quality.

The composition of the index varies between infrastructure managers, reflecting both differences in priority and different operational environments across the network. Therefore these index numbers should not be used to compare track conditions across line segments managed by different infrastructure managers. However, relative changes in TQIs can meaningfully be compared. Box 4 provides details of how these indices are calculated for each track manager.

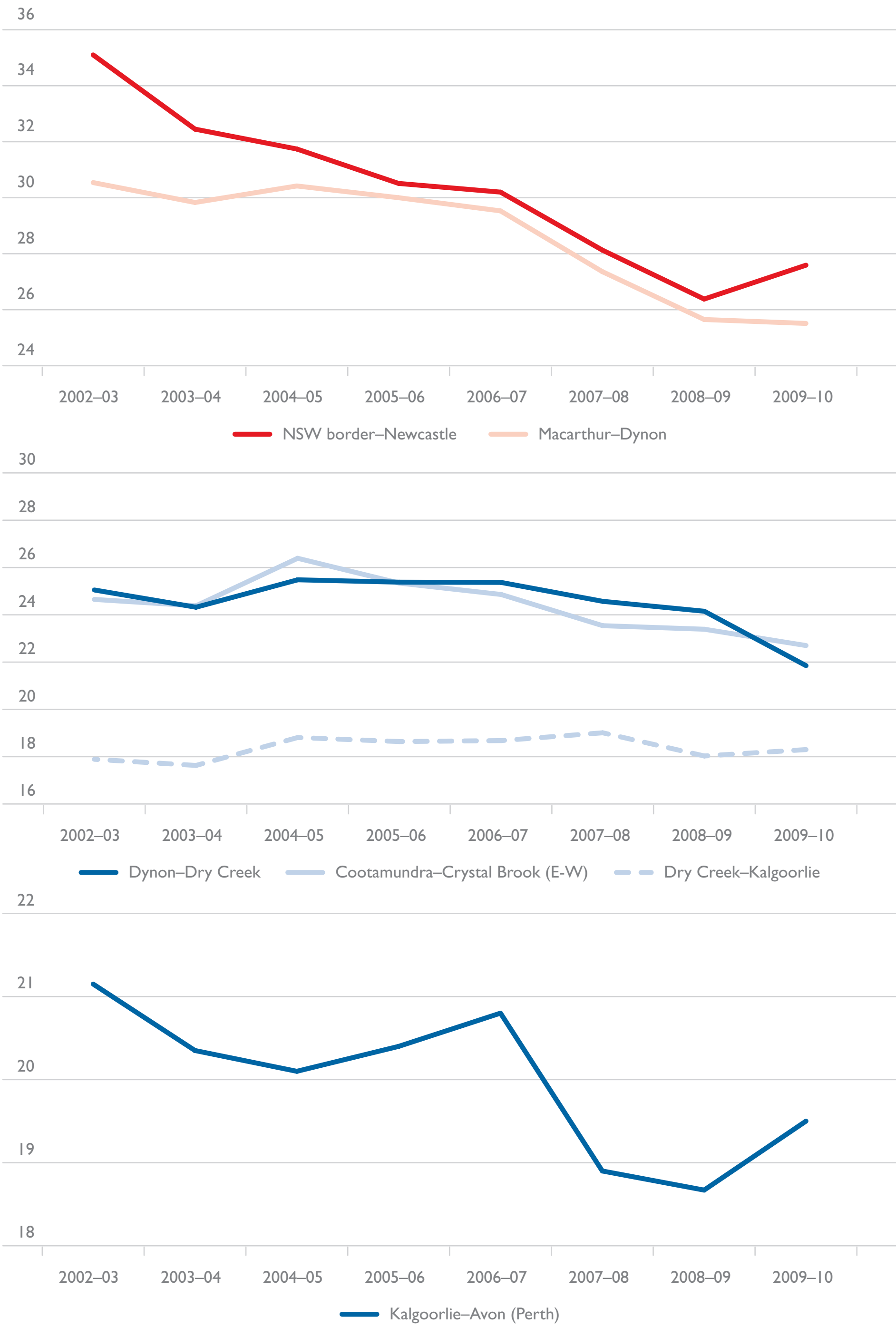
The charts are indicative of trends in track condition for a given line segment. In normal operating conditions, the track condition should not deteriorate appreciably between one year and the next.

Over the eight year period 2002–03 to 2009–10, the TQI values for most of the line segments have been trending down—that is, the track quality has been improving. The only exception to this general trend of improvement is the Dry Creek–Crystal Brook segment.

The speed of decline in track quality is influenced by a range of factors, including the quality of renewal material and work, the level and type of track usage, climatic and local geographical factors, and the skill and timeliness of ongoing maintenance work.

Investment has been undertaken to upgrade interstate track. The ARTC continues to invest heavily in raising the standards on the East–West corridor, including though extensive track renewal across most of the corridor. In particular, near-life-expired timber sleepers have been replaced with concrete sleepers on the North–South corridor and the Cootamundra–Parkes line.

Figure 24 Track Quality Index values (lower indices indicate better track)



Note: The charts cannot be used to compare track conditions across line segments managed by different infrastructure managers, as track quality is measured and reported differently across the network reflecting different infrastructure and operational environments. It was not possible to include the TQI for Brisbane–NSW border in this report, as measuring methodology has changed since ARTC's takeover of the track.

Source: ARTC, Brookfield Rail (formerly WestNet).

Box 4 Calculating track quality indices

For safety, maintenance, planning and regulatory reasons, infrastructure managers regularly measure the condition of their track. In essence, managers measure the extent to which the railway track deviated from the 'designated' (or 'true') alignment. Infrastructure managers can report a global indicator of track condition on a given line segment. ARTC (2006) published a 'track quality index' (TQI) as part of their Access Undertaking agreement with the Australian Competition and Consumer Commission. The TQI is a statistical measure calculated from the standard deviations of a number of different track geometry parameters. The TQI for a given line segment is taken as the average of the individual TQI sample readings. The parameters that are measured include rail placement, vertical and horizontal alignment, and twist.

On a regular basis on the intercapital city network, infrastructure managers operate a train with a 'track geometry measuring car'. The carriage is equipped with instruments that measure and record a range of different geometric parameters. There is a variety of track geometry measuring cars in Australia and hence a number of different means of measuring and analysing the parameters that make up the TQI. Further, track quality is reported as a composite measure of the different geometric parameters; this composite measure can differ between systems depending on the parameters used.

The following are the track quality measurements and indicators for the national network:

The ARTC TQI, standardised across the ARTC network, consists of:

- gauge;
- twist (short), measured over 2 metres
- vertical irregularities ('top'), deviation over a 20 metre inertial reading (average of left and right rail), and
- horizontal line irregularities ('versine'), 5/10 metre chord emulation (average of left and right rail).

These are based on average of Standard Deviations over 100 metre sections.

The TQI measured on the standard gauge line west of Kalgoorlie includes:

- crosslevel
- twist (long), measured over 14 metres or twist (short) over 2 metres
- vertical rail irregularities ('rail surface'), deviation over a 20 metre chord, and
- horizontal rail irregularities ('versine').

TQI results for different line sections can only be compared when, in their compilation, identical parameters are used.

Train flow patterns

Train flow indicators provide information about the flow of trains across the network. The average train speed between two cities depends on infrastructure factors such as: the prevailing line speed; interactions with other trains (including signalling); revenue-earning activities such as loading or unloading goods; and operational factors such as changing crews and refuelling. Flows are being improved by infrastructure investment and renewal such as new or improved signalling, additional long passing loops, and passing lanes.

Table 13 summarises three related indicators of train flow for the primary line segments: train dwell time; number of train stops; and average train speed. These indicators are now discussed.

Dwell time

The dwell time indicator shows the time trains are scheduled to spend 'dwelling' (stationary) in railway yards and passing loops. Reasons for dwelling include waiting for other trains to pass or overtake, attaching or detaching wagons, changing train crews or refuelling. Such activities mean than trains will always incur some dwell time.

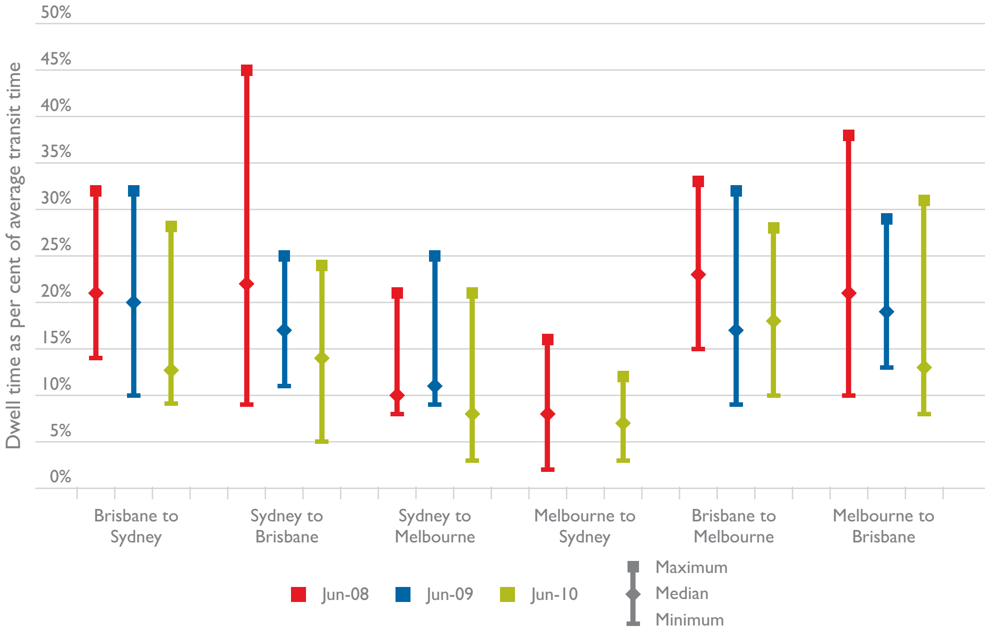
Figure 25 and Table 13 present dwell time for intermodal trains on the North-South corridor. The numbers are based on working freight timetables current at the ends of June 2009 and June 2010. Figure 25 shows the minimum, median and maximum dwell time as a proportion of scheduled transit time, for all intermodal trains on selected line segments. For example, for trains travelling from Brisbane to Sydney, the dwell time ranged from 9 per cent to 31 per cent of total scheduled transit time, with a median of 16 per cent.

Compared with 2007–08, dwell time in 2009–10 was lower on all North–South segments. To some extent, this is likely to reflect new passing loops and passing lanes (short stretches of double track) between Brisbane and Melbourne. The reductions in transit time discussed earlier are driven by these reductions in dwell time, with the time trains spend moving being almost unchanged.

Figure 26 and Table 13 present dwell time on the East–West corridor up to June 2010. Since 2007–08, dwell time has fallen significantly between Melbourne and Adelaide, but is almost unchanged between Parkes and Crystal Brook, and has risen slightly between Adelaide and Perth. Both of these patterns could relate to changes in the number of trains on these corridors. Westbound trains average 14 per cent of their time stationary, while eastbound trains average 25 per cent.

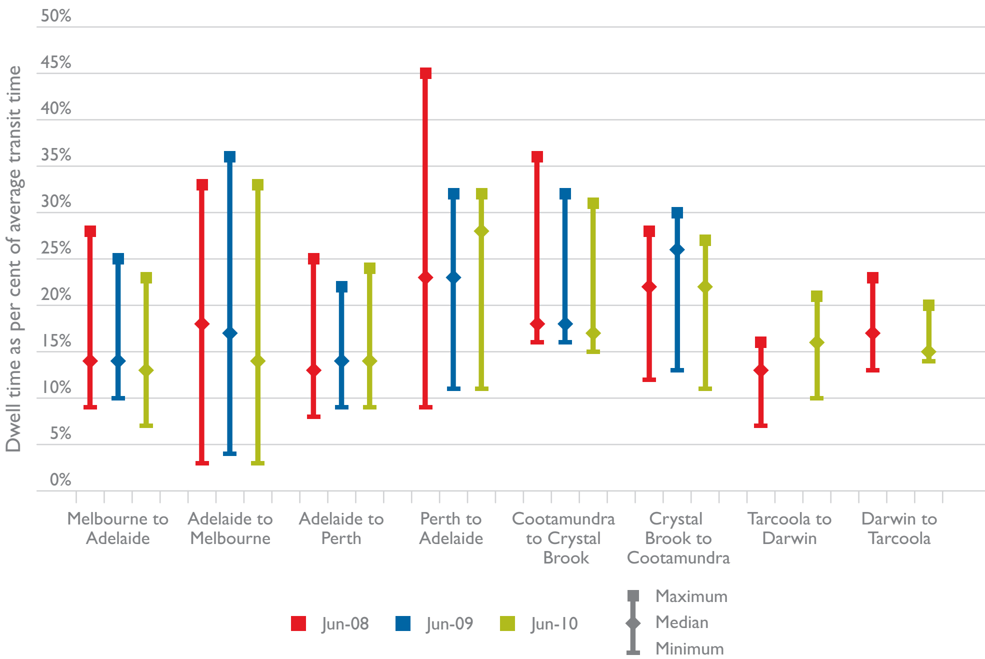
On the central corridor, trains from Tarcoola to Darwin have increased their dwell time, possibly relating to increased usage of this track.

Figure 25 Intermodal train scheduled dwell times on North–South corridor, as a percentage of scheduled transit times



Source: BITRE calculations from working timetables provided by infrastructure managers: ARTC, Brookfield Rail (formerly WestNet), GWA, QR Network Access and RailCorp.

Figure 26 Intermodal train scheduled dwell times on East–West and Central corridors, as a percentage of scheduled transit times



Source: BITRE calculations from working timetables provided by infrastructure managers: ARTC, Brookfield Rail (formerly WestNet), GWA, QR Network Access and RailCorp.

Table 13 also presents the dwell time per stop. When trackage is heavily used, passing loops are closely spaced so as to reduce the amount of time that a train has to wait for a train coming in the opposite direction. For this reason, the average dwell time per stop on the North–South corridor is low, at 14 to 28 minutes. With increases in the proportion of passing loops, passing lanes and double track, the dwell time per stop is declining.

Number of stops

The infrastructure investment that is underway is reducing the number of stops. For example, on the Brisbane–Sydney segment, the average number of stops has fallen from 14 in 2007–08 to 9 in 2009–10, and on the North–South corridor overall it has fallen from 19 in 2007–08 to 14 in 2009–10. Table 13 presents the average number of intermodal train stops for each line segment.

Average speed

Average train speed is an overall measure of physical railway performance—both train and infrastructure. As with other train pattern indicators, average speed is partly determined by train operator factors such as locomotive power and whether the operator picks up and drops off freight en route. Prevailing speeds also reflect a range of infrastructure-based factors, including the number of stops (especially when there are intermediate cities such as Sydney to traverse), track alignment and condition.

Table 13 shows the average scheduled speed for intermodal trains on seven line segments. The highest average speed for freight trains is 71 kilometres per hour from Melbourne to Sydney, and the lowest is 54 kilometres per hour in both directions between Sydney and Brisbane. This is faster than the average of 50 kilometres per hour for this route in 2007–08, due to infrastructure improvements.

Table 13 Scheduled intercapital intermodal train flow patterns, by line segment

Line segment/direction	Number of weekly intermodal trains		Average speed (km/h)		Average number of stops		Average scheduled transit time (mins)		Average dwell time (mins)		Percentage dwell time (per cent)		Dwell time per stop	
	Jun–09	Jun–10	Jun–09	Jun–10	Jun–09	Jun–10	Jun–09	Jun–10	Jun–09	Jun–10	Jun–09	Jun–10	Junv09	Jun–10
North-South corridor														
Brisbane to Sydney	21	19	53	53	10	9	1125	1119	218	198	19%	18%	22	23
Sydney to Brisbane	20	18	53	51	8	8	1103	1150	193	162	17%	14%	23	19
Sydney to Melbourne	20	20	63	64	5	4	913	906	121	80	13%	9%	27	22
Melbourne to Sydney	20	20	68	68	4	4	849	850	70	54	8%	6%	17	14
Brisbane to Melbourne	20	18	55	56	15	13	2152	2108	444	397	21%	19%	30	31
Melbourne to Brisbane	20	18	56	57	13	13	2063	2044	372	345	18%	17%	29	28
East-West corridor														
Melbourne to Adelaide	35	32	64	63	7	6	779	786	116	102	15%	13%	17	18
Adelaide to Melbourne	35	31	58	59	7	6	864	850	165	148	19%	17%	24	24
Adelaide to Perth	17	18	67	66	15	14	2410	2429	372	378	15%	16%	24	26
Perth to Adelaide	17	17	60	59	18	18	2684	2698	642	668	24%	25%	36	38
Cootamundra to Crystal Brook	4	4	68	68	9	10	1112	1113	239	227	21%	20%	26	24
Crystal Brook to Cootamundra	5	6	59	65	10	10	1278	1164	273	251	21%	22%	28	26
Central corridor														
Tarcoola to Darwin	no	6	no	72	no	5	no	1878	no	288	no	15%	no	58
Darwin to Tarcoola	data	6	data	69	data	6	data	1970	data	319	data	16%	data	55

Source: ARTC, Brookfield Rail (formerly WestNet), GWA, RailCorp

APPENDIX A
Significant railway events

Date	Description of event
July 1991	The Federal Government and the State Governments of Queensland, New South Wales, Victoria and Western Australia agreed that a newly-formed National Rail Corporation would take over the operation of interstate rail services from the states.
April 1993	National Rail began third-party access freight operations on interstate track.
1995	Traffic on Trans Australia Railway disrupted for six weeks due to flooding.
June 1995	Completion of standardisation of Melbourne–Adelaide broad gauge with new standard gauge line; main line re-routed from Ballarat, with conversion of North Geelong–Cressy–Ararat–Adelaide line to standard gauge.
July 1995	SCT Logistics, an Australian logistic company, commenced first private train service, Melbourne–Perth.
June 1996	TNT (later Toll), a multi-national freight forwarding company, began operating freight trains, Melbourne–Perth.
July 1996	State Rail Authority was split four ways. Rail Access Corporation started managing infrastructure; Rail Services Australia undertook track maintenance; FreightCorp operated freight trains, and residual State Rail Authority operated passenger trains.
July 1996	Inter-Government Agreement was reached to legislate the terms for national safety and accreditation process.
October 1996	The first of 120 of National Rail Corporation's new 4 000 horse power locomotives entered service.
May 1997	Patrick Corporation commenced land-bridging container train service between Port Adelaide and Port of Melbourne.
1997	Standard gauge line to Fisherman Islands (Port of Brisbane) opened.
October 1997	Great Southern Railway consortium purchased Pax Rail, the Australian National Railways' passenger business (consisting of The Overland, The Ghan and the Indian Pacific).
November 1997	Australian Transport Network consortium purchased Tasrail, the Australian National Railways' Tasmanian operation.
November 1997	Genesee & Wyoming purchased SA Rail, the Australian National Railways' SA intrastate network.
July 1998	ARTC commences management of Australian National's infrastructure (assets of Australian National's Track Access Unit) and took up a lease of Victorian interstate rail network between Albury, Melbourne and the South Australian border.
February 1999	V/Line freight business was sold, and intrastate country track leased for 45 years, to RailAmerica, trading as Freight Australia.
Mid 1999	Victorian passenger rail and tram services were franchised to National Express, Connex and Yarra Trams.
December 1999	Passenger train accident at Glenbrook, NSW.
December 2000	Consortium of Wesfarmers and Genesee & Wyoming purchased Westrail.
January 2002	Consortium of Patrick and Toll purchased National Rail and FreightCorp, forming Pacific National.

Date	Description of event
December 2002	National Express surrendered its Melbourne urban and V/Line passenger service provision contracts.
January 2003	Passenger train accident, Waterfall, NSW.
January 2004	Darwin line opened and first freight train arrived in Darwin.
February 2004	Pacific National purchased Australian Transport Network-Tasrail.
May 2004	In the May budget, under AusLink I, the Australian Government made a $540 million one-off grant to the ARTC for infrastructure upgrading on the Brisbane-Sydney corridor.
September 2004	Pacific National purchased Freight Australia.
September 2004	ARTC commenced 60 year lease of interstate rail network in New South Wales and a management contract of NSW's country rail network.
September 2005	Pacific National announced that it intended to withdraw most of its rail freight services in Tasmania, leaving only two bulk haul operations.
February 2006	QR purchased ARG's WA freight business; Babcock & Brown purchased ARG's WestNet infrastructure; and Genesee & Wyoming took full control of ARG's SA operations.
March 2006	Australian Competition and Consumer Commission (ACCC) approved Toll takeover of Patrick.
October 2006	SCT Logistics commenced freight service between Parkes and Perth.
November 2006	Opening of Sandgate flyover, enabling unimpeded movement of coal trains between Hunter Valley and Kooragang Island.
December 2006	Pacific National won a contract extension with BlueScope Steel and OneSteel (Arrium) for seven years, to shift steel products around the country.
January 2007	Tasmanian government resumed financial responsibility for the state's commercial rail infrastructure; day-to-day infrastructure management remains with Pacific National.
January 2007	New Wagga Wagga bridge opened.
February 2007	CRT ceased its Altona North-Port of Melbourne shuttle.
February 2007	ACCC approved SCT Logistics' purchase of train assets (including nine locomotives) from Pacific National, as part of Toll's takeover of Patrick.
March 2007	Australian Government announced $78 million funding of remedial work on AusLink section of Tasmanian railway system with $40 million more from the Tasmanian Government and commitment by Pacific National to spend $38 million on locomotive and wagon upgrades.
April 2007	ACCC approves the split of Toll Holdings, with new company Asciano Ltd, which included Pacific National and Patrick Portlink assets.
April 2007	Victorian government bought back leased interstate track from Pacific National, giving control of the network to V/Line Passenger.
October 2007	Opening of 58 km Lang Hancock Railway between Hope Downs and existing Rio Tinto railway.
November 2007	QR National commenced new thrice-weekly Melbourne-Perth service, incorporating the weekday P&O Melbourne-Adelaide operation.
November 2007	Asciano Ltd announced end of grain and intrastate intermodal services in Tasmania, Victoria and NSW, to take effect from early 2008.
January 2008	El Zorro began broad gauge grain train competition in Victoria, the first in that state.
March 2008	Pacific National began withdrawal of freight services in Victoria, following earlier (Nov. 2007) announcement of closure of operations.
May 2008	Fortescue Metals Group's 260 km Cloudbreak railway in the Pilbara opened.
June 2008	Pacific National announced cessation of its Tasmanian train operations, later indicating it would sell the business.
Early 2009	Construction began on Southern Sydney Freight Line
July 2009	Freightliner commences Australian operations, hauling cotton in NSW

Date	Description of event
December 2009	Establishment of TasRail
June 2010	Genesee & Wyoming Australia agree to purchase former FreightLink assets.
June 2010	Acquisition of South Spur Rail Services by P&O Trans Australia, and renaming of P&O Trans Australia to Qube Rail.
October 2010	Specialised Bulk Rail, owned by SCT Logistics, commenced bulk operations.
November 2010	Flotation of QR National.
January 2011	Commissioning of Fortescue's Christmas Creek railway
January–February 2011	Severe cyclone damage and flooding in Queensland, disrupting train services and coal exports
December 2011	Opening of Newlands–Goonyella coal railway in Queensland
Late December 2011–late February 2012	Darwin line cut north of Katherine due to cyclone-induced flooding
January 2012	John Holland assumed management of NSW's Country Regional Network
7 January 2012	Semi-centennial (50 years) of opening of standard gauge between Albury and Melbourne, enabling through running of trains between Sydney and Melbourne
14 September 2012	Centenary of commencement of construction of Trans Australia Railway

Source: Compiled by BITRE.

APPENDIX B

Rail performance indicators reported elsewhere

Indicator	Frequency	Coverage	What it measures	Data source
		Train indicators		
Train cancellation rate	Monthly	Urban Melbourne	A measure of passenger train service reliability	Metro Trains Melbourne
Train punctuality	Monthly	Urban Melbourne	A measure of passenger train service punctuality	Metro Trains Melbourne
Train services operated (numbers of trains)	Quarterly	North–South, East–West corridors	An indicator of train services actually provided on the network	ARTC Annual Reports
Passenger train km operated	Biannual	Network, by jurisdiction	An indicator of network usage	ATSB, Australian Rail Safety Occurrence Data
Freight train km operated	Biannual	Network, by jurisdiction	An indicator of network usage	ATSB, Australian Rail Safety Occurrence Data
		Track infrastructure indicators		
Track quality (ARTC interstate)	Quarterly	ARTC sections of North–South and East–West corridors	An indicator of the quality of the track over time	ARTC Annual Reports
Track quality—km (and proportion) of temporary speed restrictions	Quarterly	ARTC sections of North–South and East–West corridors	An indicator of the current maintenance and upkeep of the infrastructure	ARTC web site
Track and civil infrastructure irregularities per thousand km of track	Biannual	Network, reported by jurisdiction	An indicator of track standards	ATSB, Australian Rail Safety Occurrence Data
		Railway indicators		
Derailments per million train km	Biannual	Network, reported by jurisdiction	An indicator of train and track performance (and other safety-related indicators are reported in the same publication)	ATSB, Australian Rail Safety Occurrence Data
		Train assets		
Locomotive fleet size	Annual	Network	An indicator of the above-rail network train-haulage capacity	ARA Australian Rail Industry Report
Wagon fleet size	Annual	Network	An indicator of the above-rail network freight-haulage capacity	ARA Australian Rail Industry Report

Indicator	Frequency	Coverage	What it measures	Data source
Locomotive age profile	Annual	Network	A measure of the investment in above-rail, productivity-enhancing assets	ARA Australian Rail Industry Report
Wagon age profile	Annual	Network	A measure of the investment in above-rail, productivity-enhancing assets	ARA Australian Rail Industry Report
Train flow patterns				
Average speed, actual and capable ("network availability")	Quarterly	ARTC sections of North–South and East–West corridors	A guide to network capability	ARTC web site
Freight task indicators (tonnage, gtk and mode share)				
Gross-tonne km (all commodities)	Monthly	North–South and East–West corridors	An indicator of the rail freight task performed on interstate corridors	ARTC Annual Reports
Gross-tonne km (intermodal/steel)	Quarterly	North–South and East–West corridors	An indicator of rail's intermodal and steel freight task performed	ARTC Annual Reports
Gross tonne-km x commodity	Annual	National	An indicator of the type of commodities hauled by rail	ARA Australian Rail Industry Report
Tonnage x commodity	Annual	National	An indicator of the type of commodities hauled by rail	ARA Australian Rail Industry Report
Hunter Valley coal tonnage	Monthly	Hunter Valley	An indicator of trends in Hunter Valley coal traffic	ARTC Annual Reports
Wagons per train	Daily	Melbourne—Adelaide	An indicator of trends in East–West freight	Gheringhap Loop train sightings
Reliability indicators				
Number and proportion of "healthy" ("on time") services	Quarterly	North–South and East–West corridors	A measure of the performance of train service delivery	ARTC Annual Reports
Number and proportion of "unhealthy" (delayed) and Force Majeure services	Quarterly	North–South and East–West corridors	A measure of the performance of train service delivery	ARTC Annual Reports
Reasons for delays	Quarterly	North–South and East–West corridors	Attribution of reasons for service quality (reliability) deficiencies	ARTC Annual Reports
Minutes of delay per hour of transit time, by above- and below-rail manager	Quarterly	By interstate line segment of North–South and East–West corridors	Quantification of reasons for delay for service quality (reliability) deficiencies	ARTC web site
Viability indicators				
Long-run economic cost recovery (ARTC interstate track)	Annual and projections	By interstate line segment of North–South and East–West corridors	An indicator of railway infrastructure viability	ARTC web site (floor and ceiling revenue limits)
Annual labour costs	Annual	National	An indicator of one element of railway costs	ARA Australian Rail Industry Report
Other				
Energy intensity by mode	Annual	National	An indicator of trends in absolute and relative average train energy efficiency	ARA Australian Rail Industry Report

Abbreviations

ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
ARA	Australasian Railway Association
ARTC	Australian Rail Track Corporation
ATSB	Australian Transport Safety Bureau
BITRE	Bureau of Infrastructure, Transport and Regional Economics
GTK	Gross tonne kilometres
m.ntk	Million net tonne kilometres
NTK	Net tonne kilometres
SMVU	Survey of Motor Vehicle Use
TQI	Track Quality Index

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