OFFICE OF THE
national rail
safety regulator

RAIL SAFETY REPORT 2015–2016

(Front Image)
Transperth train,
Western Australia

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Nullarbor Plain,
Western Australia

THE REGULATOR'S MESSAGE

How safe are Australia's railways? It's a question I ask myself on a daily basis.

The Office of the National Rail Safety Regulator's (ONRSR) Rail Safety Report 2015–2016 is our organisation's formal answer to that question. Our fourth annual record of safety performance across the Australian rail industry, for the first time it includes data and insights from Western Australia following the start of ONRSR operations in that state in November 2015.

Establishing our presence in the west was another significant step forward for rail safety in this country and, as I write, we are making very encouraging progress toward welcoming Queensland into the ONRSR fold and realising our aspiration to be a truly national rail safety regulator.

It is important too to recognise that with progress of the administrative elements of the national reform, come the genuinely game-changing opportunities to harness our collective experience and expertise and apply it to the core business of playing our part in making our nation's railways safe. For us a key aspect is applying the rail safety data notified by industry through a framework of risk-based regulation — an important area we devote several pages to in the report.

In time I am very confident that collective approaches between the regulator and industry can drive development of the smart systems that will allow us to one day view the rail safety landscape from unique angles and with unprecedented foresight.

For now, this report is our latest snapshot in time charting performance, pitfalls and priorities alike.

While it presents rail as a fundamentally safe sector and highlights important advances, it also identifies where time and resources must be devoted to address shortcomings. Most notably it reinforces the need to stay focused on the four key safety priorities ONRSR identified in 2014–2015:

1. Track condition
2. Track work — competency and communication
3. Rolling stock maintenance
4. Road Rail Vehicle (RRV) safety

These may seem like the basics, and generally speaking they are, but like any pursuit in life and in business, we must get the basics right.

In sharing this year's Rail Safety Report, I trust it will once again serve as an invaluable resource for the rail industry and help all of us with a stake in rail safety to retain that important sense of assured vigilance.

How safe are Australia's railways? I firmly believe we should take great pride in knowing they are safe but never shirk from our collective responsibility for making them even safer.

Sue McCarrey
National Rail Safety Regulator

ABBREVIATIONS

ALCAM
Australian Level Crossing Assessment Model

ALTRAC
Light Rail consortium, which includes Acconia, Transdev Sydney, Alstom Transport Australia and Capella Capital

ATSB
Australian Transport Safety Bureau

CBD
Central Business District

ITSR
Independent Transport Safety Regulator (NSW)

NCR
Non-Conformance Report

OC-G1
Occurrence Classification Guideline

ONRSR
Office of the National Rail Safety Regulator

ON-S1
Occurrence Notification Standard

REPCON
Rail Voluntary and Confidential Reporting Scheme

RIM
Rail Infrastructure Manager

RISSB
Rail Industry Safety and Standards Board (Australia)

RRV
Road Rail Vehicle

RSNL
Rail Safety National Law

RTO
Rail Transport Operator

SFAIRP
So Far As Is Reasonably Practicable

SPAD
Signal Passed At Danger (without authority)

TfNSW
Transport for New South Wales

TSV
Transport Safety Victoria

OFFICE OF THE NATIONAL RAIL SAFETY REGULATOR (ONRSR)

Our vision

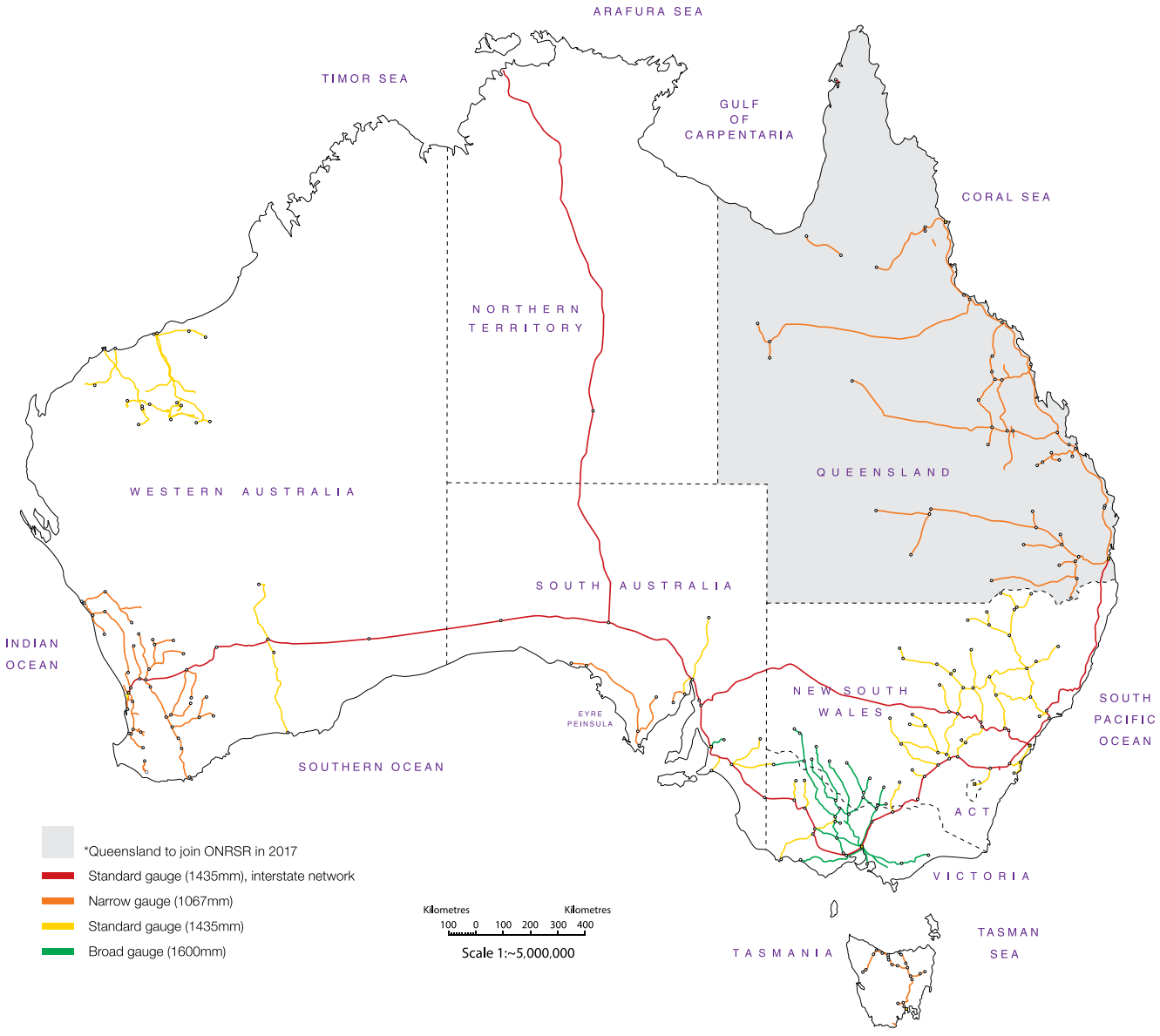
SAFE RAILWAYS FOR AUSTRALIA

Our values

INTEGRITY, RESPECT, INDEPENDENCE, DILIGENCE, EXCELLENCE

FIGURE 1:

Major Inter and Intrastate Freight Networks Administered under the Rail Safety National Law as of 30 June 2016.



Functions

The functions of ONRSR are legislated in the Rail Safety National Law (RSNL)[1] and described in ONRSR's Statement of Intent[2]. In summary they include:

- working with Rail Transport Operators, rail safety workers and others involved in railway operations to improve rail safety nationally;
- facilitating and providing advice, education and training in relation to rail safety;
- conducting research, collecting and publishing information relating to rail safety; and
- monitoring, investigating and enforcing compliance with the RSNL.

Role

ONRSR performs its functions under a co-regulatory framework, in which responsibility for regulation and safety is shared between industry, government and ONRSR. The principle of shared responsibility is underpinned by specific duties defined under the RSNL. In particular, section 52 states a Rail Transport Operator must ensure, so far as is reasonably practicable (SFAIRP), the safety of its railway operations. This duty is consistent with the principles of safety risk management generally where those responsible for safety risks must ensure all reasonably practicable measures are in place to protect people from the harm that may arise.

Coverage

At the start of the 2015–2016 financial year ONRSR had responsibility for rail safety regulation in the jurisdictions of South Australia, New South Wales, Tasmania, Northern Territory, Victoria[3] and Australian Capital Territory. ONRSR's coverage expanded on 2 November 2015 when the RSNL was enacted in Western Australia.

The scope of ONRSR's regulatory responsibility as of 30 June 2016 is shown in Figure 1. Of the 197 accredited Rail Transport Operators within Australia, 159 (81%) are accredited by ONRSR. In addition to accredited railways, ONRSR has registered 199 Rail Infrastructure Managers (RIM) of private sidings. They are exempt from the requirement to be accredited (in relation to rail infrastructure-related operations in these sidings) but they must be registered or hold an exemption from registration under the RSNL. They operate under the same safety duties that apply to accredited Rail Transport Operators.

Rail safety regulatory approach

The RSNL defines the functions of ONRSR but does not describe the way in which ONRSR will deliver them. ONRSR's aim, as defined in its Corporate Plan[4], is to enhance and promote safety through effective risk-based regulation.

Risk-based regulation is the application of a systematic decision making framework, which prioritises regulatory activities and informs decision outcomes, based on an assessment of risks to rail safety. It involves:

- Developing an understanding of the risks to the safety of railway operations in Australia;
- Determining which of these risks ONRSR is able to influence through its regulatory activities; and
- Designing and prioritising regulatory activities and outcomes in a way that best maintains and improves rail safety.

Applying a risk-based approach to regulation has parallels to the RSNL's requirement for Rail Transport Operators to apply a risk-based approach to safety management. It also enables ONRSR to focus resources on the basis of risk and to improve the effectiveness of regulatory interactions.

ONRSR uses various sources of intelligence to inform its risk-based decision making, including notifiable occurrence data, investigation reports from the Australian Transport Safety Bureau (ATSB), Rail Voluntary and Confidential Reporting Scheme (REPCON) reports, Rail Transport Operator safety performance reports and the outcomes of audits, inspections and other regulatory activities.

[1] RSNL refers to the Rail Safety National Law (South Australia) Act 2012 and Rail Safety National Law (WA) Act 2015

[2] Office of the National Rail Safety Regulator, Statement of Intent 2016 to 2019, ONRSR, Adelaide, June 2016

[3] Victorian light rail operators and some Tourist and Heritage operators continue to be regulated under local Victorian law, administered by Transport Safety Victoria (TSV)

[4] Office of the National Rail Safety Regulator, Corporate Plan 2016 to 2019, ONRSR, Adelaide, June 2016

The role of this report

ONRSR's Rail Safety Report provides a summary of rail safety performance in the 2015–2016 financial year. This performance is described in terms of safety statistics based on rail safety occurrences notified to ONRSR, and intelligence gathered through regulatory activities. ONRSR also summarises some of the key areas that have been the focus of regulatory attention. Analysis of these sources provides the focus areas for compliance and safety improvement in the coming year.

This report is designed to consider rail safety from a national perspective rather than to single out individual operators or specific incidents. It is an ongoing function of ONRSR to work with individual Rail Transport Operators on issues that pertain specifically to them. ONRSR does, however, highlight specific examples of incidents where they demonstrate issues considered relevant to the wider industry.

Sydney Trains, New South Wales

SCOPE AND METHODS

The scope and methods used for the presentation of data are described in Appendix C. The general approach is outlined below.

Geographic coverage

Except where explicitly stated, all descriptions and statistics in this report apply only to those railways within ONRSR's area of operation in the 2015–2016 financial year — South Australia, New South Wales, Tasmania, Northern Territory, Victoria, Australian Capital Territory and Western Australia.

Reporting period

A minimum reporting period of 1 July 2015 to 30 June 2016 applies to this report with the exception of data related to Western Australia which is included from the date ONRSR commenced regulatory oversight in this state — 2 November 2015 — until 30 June 2016. A longer period of data is considered where appropriate and available for analysis.

Operations

The analysis covers all railway operations within the aforementioned geographic bounds with the exception of Victoria. All tramways operating in Victoria, including the metropolitan tram operator in Melbourne and several tourist and heritage railways are regulated under Victorian local law and are therefore not subject to the RSNL.

Data sources

The information presented in this report is principally based on notifiable occurrences — the initial written advice of a rail safety incident that a Rail Transport Operator submits to ONRSR in accordance with section 121 of the RSNL.

Definitions

Most statistical summaries in this report are based on the incident definitions of the national occurrence classification guideline (OC-G1, 2013).[5] Some statistics are based on definitions specific to this report to support a more meaningful risk-based analysis of critical events, and in such cases these definitions are presented.

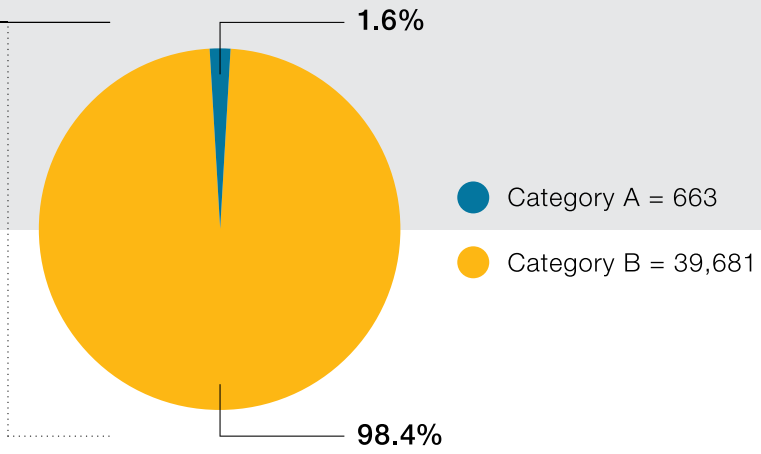
[5] Office of the National Rail Safety Regulator, Classifying Notifiable Occurrences. Occurrence Classification Guideline (OC-G1), Version 1.1, ONRSR, Adelaide, March 2013

RAIL SAFETY STATISTICAL SUMMARY

1 Statistical Overview

40, 344

Reportable Incidents

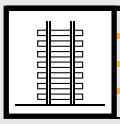


a Fatalities

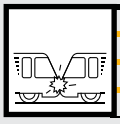
b Network Statistics

- Track km **34,202**
- Passenger Train km **102.7 million**
- Freight Train km **52.5 million**
- Passenger journeys **650 million+**
- Level crossings **23,000+**

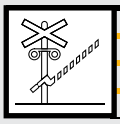
2 Key Occurence Categories



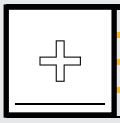
Running Line Derailments = 52
Passenger train = 8
Freight rolling stock = 30
infrastructure maintenance rolling stock = 14



Running line collisions between trains and with rolling stock = 6
Between in-service passenger trains = 1
Between in-service passenger train and other train = 1
Not involving in-service passenger train = 4

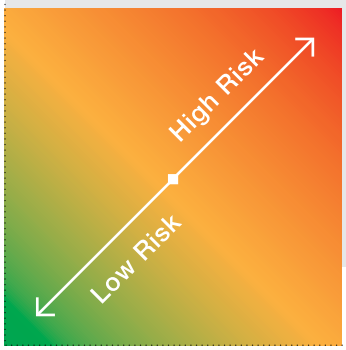


Level crossing collisions = 27
Passenger train = 15
Freight train = 8
Other train = 4



Other Key Categories
Passenger train fires = 30
Broken rails = 353
Signals passed at danger without authority = 205

3 Risk-Based Regulatory Decision Making



8

Tier 1 risk-based decisions

4 Regulatory Activities

04 National priority projects

- Road rail vehicle safety
- Track work – competency and communication
- Rolling stock maintenance
- Track condition

05 Safety improvement projects

- Investigation reports
- Track worker safety
- Risk management
- Human factors integration
- Fatigue risk management

278 Audits and inspections

Semaphore and Fort Glanville Tourist Railway, South Australia

A large part of ONRSR's regulatory intelligence is gained from the thousands of rail safety occurrences reported each year. The RSNL in conjunction with ONRSR's occurrence notification standard[6] defines the types of events that must be notified to ONRSR and what information should be reported.

Some of these events lead to an immediate response by ONRSR while others are categorised and analysed over time to build a picture of rail safety performance in the rail industry. This performance provides insight into which safety areas require focus by ONRSR and which sectors and individual operators should be the subject of this focus.

Notifiable occurrences are an important input to ONRSR's risk-based regulatory approach. The type of events, their frequency and their actual or potential consequences assist ONRSR in understanding the rail safety risks that exist in the industry. Some events result in more significant consequences or have the potential for greater risk, and these events are the focus for presentation of occurrence statistics in this report.

The statistics presented in the following sections focus primarily on the events of the 2015–2016 financial year. The report continues a number of charts that have been published in previous years which show the last five years' performance. ONRSR has conducted benchmarking against international performance and highlighted selected events judged as the more serious in the year, from ONRSR's review.

As a national body, ONRSR presents the information in this chapter at a national level but includes jurisdictional breakdowns in Appendix A. This appendix also includes track kilometres and train kilometres for railway operations broken down by jurisdiction.

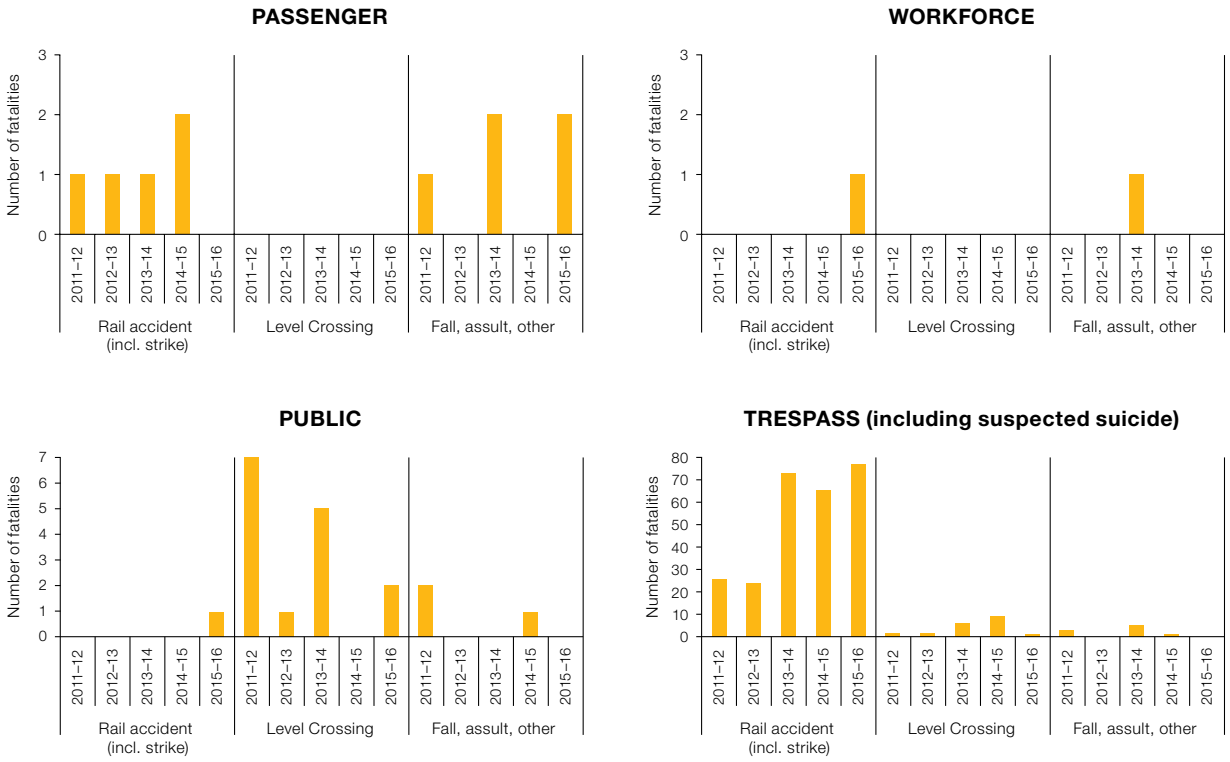
Appendix B includes the national rates of some of the more serious types of occurrences reported.

[6] Office of the National Rail Safety Regulator, Reporting Notifiable Occurrences. Occurrence Notification Standard (ON-S1), Version 1.1, ONRSR, Adelaide, March 2013

FIGURE 2:

Railway fatal injury, July 2011 to June 2016

All rail operations regulated under RSNL as of 30 June 2016 (Victorian data from 2013–2014 onwards, ACT from 2014–2015, WA from 2 November 2015). Non-passenger level crossing fatalities are classed as public if neither trespass nor suicide is suspected. Suspected suicide at level crossing is coded as trespass.



RAILWAY RELATED INJURY

Injury data provides a reliable and direct measure of harm associated with some railway safety hazards.

There were 84 fatalities in the 2015–2016 financial year on railways regulated under the RSNL. These consisted of:

- 72 incidents involving members of the public (suspected suicide);
- six trespassing members of the public struck by trains;
- three fatalities involving members of the public not suspected of suicide or trespass;
- two fatalities from passengers falling on escalators; and
- one worker who was struck by a train.

Appendix A1 presents summary statistics, segmented by jurisdiction.

Approximately 450 people were recorded as receiving a serious injury on rail premises in the 2015–2016 financial year. More than 80% of these related to slips, trips and falls.

The five-year history of fatality on railways is summarised in Figure 2.

TABLE 1:

Railway fatality — ONRSR, Great Britain and United States

Fatalities involving passengers, workforce, public and trespass (excluding suspected suicide). These ONRSR statistics include ACT from 2014–2015, and WA from 2 November 2015.

		2013–14	2014–15	2015–16	3 Years
ONRSR (SA, NSW, NT, TAS, VIC, ACT, WA)	Fatalities	19	9	12	40
	Train km (million)	118.2	115.7	155.3	389.2
	Rate	0.161	0.078	0.077	0.103
Great Britain (GB)	Fatalities[1]	37	39	45	121
	Train km (million[2]	552.6	558.5	556.7	1667.8
	Rate	0.067	0.070	0.081	0.073
United States (US)	Fatalities[3]	744	811	826	2381
	Train km (million)[3]	1060.6	1067.1	982.3	3109.9
	Rate	0.701	0.760	0.841	0.766

[1] Source: Rail Safety and Standards Board, Annual Safety Performance Report 2015/16, RSSB, UK, 2016

[2] Source: Office of Rail and Road, National Rail Trends (NRT) Portal (accessed 25 October 2016) http://dataportal.orr.gov.uk/

[3] Source: Federal Railroad Administration Office of Safety Analysis: online database query (accessed 25 October 2015) http://safetydata.fra.dot.gov

TABLE 2:

All fatalities and injuries by passengers, workforce and public, excluding trespass or suspected suicide, July 2015 to June 2016

Railway operations within SA, NSW, TAS, NT, VIC, ACT and WA from 2 November 2015 regulated under the RSNL. Excludes fatality associated with trespass or suspected suicide.

Date	Description	Location
18/07/2015	A pedestrian was waiting at the Church Street level crossing for a train to pass. Once this train passed, the pedestrian crossed and was struck by a train travelling in the opposite direction.	Church St level crossing, Brighton, VIC
30/07/2015	A person was reported to have stumbled off the platform and was subsequently struck by a train.	Emerson Station, SA
23/09/2015	A road-train truck struck a freight train at a level crossing. The truck driver was killed in the collision.	Tullamore Rd, Narwonah, NSW
25/03/2016	A passenger fell down an escalator at Murdoch Station, suffering multiple injuries. The passenger later died from the injuries sustained.	Murdoch Station, WA
03/05/2016	A passenger fell from an escalator and died due to the injuries sustained.	Subiaco Station, WA
18/06/2016	A track worker (signal maintainer) was struck and fatally injured at Clyde by a passing passenger train.	Clyde, NSW

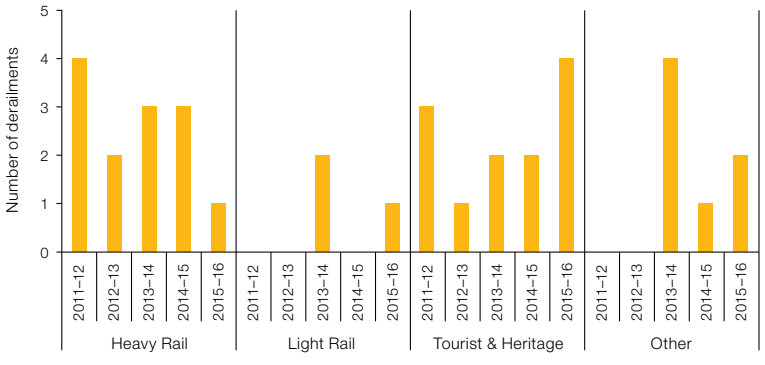


FIGURE 3:

Passenger train running line derailment July 2011 to June 2016

All railway operations regulated under RSNL (Victorian data from 2013–2014 onwards, ACT from 2014–2015, and WA from 2 November 2015). Includes derailments on non-running lines affecting the safety of running lines. "Other" here comprises empty heavy rail passenger trains.

TABLE 3:

Passenger train running line derailments July 2015 to June 2016

Railway operations within SA, NSW, TAS, NT, VIC, ACT, WA from 2 November 2015 regulated under the RSNL.

Date	Description	Location
08/09/2015	A heritage railcar with no passengers on board derailed owing to a broken axle.	Stirling North, SA
12/09/2015	A heritage train with no passengers on board derailed.	Gemmells, SA
21/12/2015	An empty suburban passenger train exiting a siding derailed at a set of points, blocking the main line.	South Geelong, VIC
06/02/2016	A metropolitan passenger train derailed. One passenger was reported to have been taken to hospital, with approximately 200 passengers detrained between stations.	Near Rushall Station in Fitzroy North, VIC
20/03/2016	A wagon attached to a heritage passenger train derailed. No injuries were reported.	Mornington, VIC
16/04/2016	A heritage tram derailed. No injuries were reported.	Whiteman Park Village, WA
17/05/2016	While docking from sidings to a platform, a suburban passenger train derailed after passing a signal at stop without authority, resulting in the main line being fouled. No passengers were on board.	Southern Cross Station, VIC
12/06/2016	A heritage passenger carriage derailed when leaving the museum. No injuries to passengers were reported.	Cobdogla Main Line, SA

A comparison of the rate of fatality between ONRSR-regulated railways and selected overseas railways is summarised in Table 1. The ONRSR-based data in Table 1 is a subset of the fatalities summarised in Figure 2 to align with the overseas data definitions. For example, for the purpose of benchmarking, local data excludes suspected suicide as these are also excluded from overseas data.

The comparison is most valid for the GB statistics because information on individual GB incidents is available to confirm consistency of scope with local data. GB is also a suitable benchmark to compare with ONRSR data because of its comparatively high rail safety performance compared with the other 27 member states of the European Union. The US data is less reliable because of definitional uncertainties.

The fatality rate for ONRSR's area of operation over the three-year period (0.103 fatalities per million train km) is higher than that of GB (0.073) but well below that of the US (0.766). A review of the US figures by individual incident type suggests the rate reflects a significantly higher proportion of trespass and level crossing-related fatalities in the US compared to the figures within ONRSR's area of operation.

PASSENGER TRAIN DERAILMENT

Passenger train derailment risk is characterised by rare events that have the potential to result in catastrophic outcomes, owing to the large numbers of passengers exposed to harm.

There were eight running line passenger train derailments in the 2015–2016 financial year on railways regulated under the RSNL.

These accidents involve a range of passenger train operations, as follows:

- one derailment involved an in-service heavy rail passenger train;
- one derailment involved a light rail passenger tram;
- four derailments involved tourist and heritage trains (all four occurred on isolated lines); and
- two derailments involved empty heavy rail passenger trains

Appendix A2 presents summary statistics, segmented by jurisdiction.

The five-year history of passenger train derailment is summarised in Figure 3.

A summary of passenger train derailments is presented in Table 3.

FIGURE 4

Freight train running line derailments July 2011 to June 2016

All railway operations regulated under RSNL (Victorian data from 2013–2014 onwards, ACT from 2014–2015, and WA from 2 November 2015). Includes derailments of freight trains and freight rolling stock on non-running lines affecting the safety of running lines.

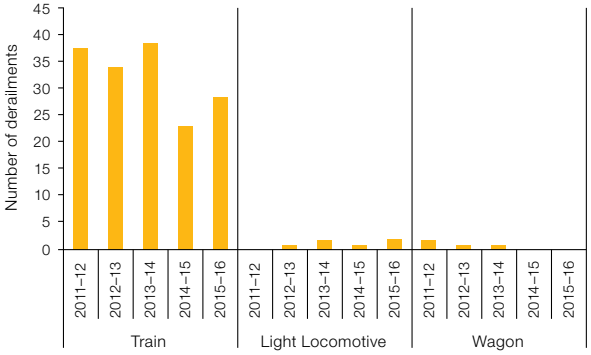


TABLE 4

Passenger train running line derailments ONRSR and Great Britain

Heavy rail in-service passenger trains only, including tourist and heritage mainline operations. Includes derailments on non-running lines affecting the safety of running lines. These ONRSR statistics include ACT from 2014–2015, WA from 2 November 2015.

		2013–14	2014–15	2015–16	3 Years
ONRSR (SA, NSW, NT, TAS, VIC, ACT, WA)	Derailments	4	4	5	13
	Train km (million)	82.9	82.3	102.7	267.9
	Rate	0.048	0.049	0.049	0.049
Great Britain (GB)	Derailments[1]	0	0	3	3
	Train km (million)[2]	510.6	517.5	521.8	1549.9
	Rate	0	0	0.006	0.002

[1] Source: Rail Safety and Standards Board, Annual Safety Performance Report 2015/16, RSSB, UK, 2016

[2] Source: Office of Rail and Road, National Rail Trends (NRT) Portal (accessed 25 October 2016) http://dataportal.orr.gov.uk/

A comparison of the rate of mainline passenger train derailment between ONRSR regulated railways and the mainline railway of GB is summarised in Table 4.

The ONRSR data in Table 4 are a subset of the derailments summarised in Figure 3, and only includes heavy rail derailments together with mainline tourist and heritage passenger operations.

The passenger train derailment rate for Australian operations over the past three years (0.049 per million train km) is over 20 times higher than that of GB (0.002 per million train km). This result arises from GB having no passenger train derailments for two years running from 2013–2015.

FREIGHT TRAIN DERAILMENT

Freight train derailment risk is generally observed to have a higher frequency of occurrence but a lower consequence of event in comparison to passenger train derailment. However, depending on the location of the freight train derailment, there is potential for post-derailment interaction with other trains, including passenger trains, or members of the public in the vicinity of the rail corridor, in which cases the consequences can be higher.

There were 30 running line derailments involving freight rolling stock in the 2015–2016 financial year:

- 28 freight train derailments; and
- 2 light locomotive derailments.

Appendix A3 presents summary statistics, segmented by jurisdiction.

The five-year history of freight train derailment is summarised in Figure 4.

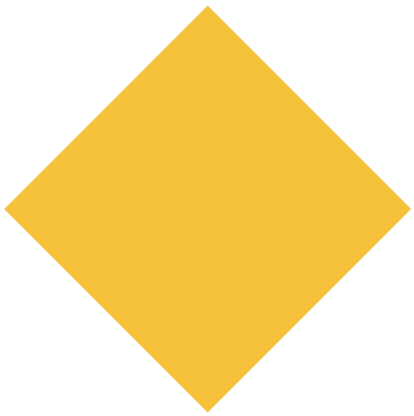
A summary of some of the more significant freight train derailments follows.

TABLE 5

Selected freight train running line derailments, July 2015 to June 2016

Railway operations within SA, NSW, TAS, NT, VIC, ACT and WA from 2 November 2015 regulated under the RSNL.

A comparison of the rate of mainline freight train derailment between ONRSR regulated railways and the mainline railway of GB is summarised in Table 5. The local data in Table 5 are a subset of derailments summarised in Figure 4.



Date	Description	Location
06/08/2015	A freight train derailed near Nala, Tasmania. The train was travelling from Boyer to Burnie when 18 wagons derailed.	Nala, TAS
28/08/2015	A loaded freight train derailed the 19th wagon as a result of a wheel failure. There were no injuries, but the derailment caused damage to over 590 metres of track including 963 sleepers.	Pangela, NSW
31/10/2015	The rear three wagons of a freight train completely derailed and were significantly damaged. The fourth last wagon derailed its rear platform, but remained upright. About 1,500m of track was significantly damaged. There were no injuries reported.	Near Marla, SA
09/11/2015	A freight train consisting of two locomotives and 20 wagons derailed. The trailing wagon derailed and approximately 1,500m of track was damaged. There were no injuries reported.	Nunga (near Ouyen), VIC
03/12/2015	Twenty-four wagons on a freight train derailed causing the closure of both the East and West Newman Main Lines.	Port Hedland, WA
04/12/2015	A freight train derailed during a severe storm. Thirty-nine vehicles derailed, with 12 overturned. A fire started within one refrigerated food van and burned itself out. The derailment damaged approximately 550 metres of track. There were no physical injuries to the train drivers, but the two relief drivers were badly shaken when the crew van rolled on its side.	Rawlinna, WA
15/12/2015	A freight train derailed 58 wagons in the lead of an empty 236 wagon train on the Tom Price Line. No injuries were reported.	Tom Price Line, WA
20/12/2015	A freight train stopped on account of the driver seeing dust being stirred up behind the locomotive. Upon investigation it was found that a bogie had collapsed under the 20th wagon. There were no injuries but the derailment caused damaged to approximately 2,000m of track including 4,000 sleepers.	Gunningbland, NSW
29/12/2015	A freight train derailed near the Williams Street level crossing in Ouyen, Victoria. Twelve wagons derailed resulting in significant damage to the wagons, the level crossing and track either side of the crossing. There were no injuries reported.	Ouyen, VIC
19/1/2016	An empty freight train derailed the leading bogie of the 67th wagon in a train of 94 wagons. The bogie continued in a derailed state for about 750m until the wheels of the bogie struck the metal plates of Rosemount Road level crossing and re-railed. The crew of the train remained unaware of the incident and continued until alerted by Train Control owing to failed signalling equipment caused by the derailment.	Denman, NSW
21/4/2016	Both locomotives, a crew van and approximately six wagons of a freight train derailed, with the locomotives and crew van coming to rest on their sides. One crew member travelling in the crew van received injuries which required medical treatment.	Rawlinna, WA
30/05/2016	A freight train derailed twelve wagons, resulting in significant damage to the wagons and the track. There were no injuries reported.	Kutunga, VIC

DERAILMENT NOT INVOLVING PASSENGER OR FREIGHT ROLLING STOCK

In the 2015 –2016 financial year there were 14 derailments associated with rolling stock used for track maintenance, and no serious injuries were reported for any of these incidents. These events tend to occur at low speed and on track closed to normal traffic. Approximately 70% of these derailments involved Road Rail Vehicles (RRVs).

TABLE 6

Freight train running line derailments — ONRSR and Great Britain

Includes derailments on non-running lines affecting the safety of running lines. Excludes light locomotives. These ONRSR statistics include ACT from 2014–2015, WA from 2 November 2015.

		2013–14	2014–15	2015–16	3 Years
ONRSR (SA, NSW, NT, TAS, VIC, ACT, WA)	Derailments	39	23	28	90
	Train km (million)	35.3	33.4	52.5	121.2
	Rate	1.105	0.689	0.533	0.742
Great Britain[1]	Derailments[1]	8	14	6	28
	Train km (million)[2]	42.0	41.0	34.9	117.9
	Rate	0.190	0.341	0.172	0.238

[1] Source: Rail Safety and Standards Board, Annual Safety Performance Report 2015/16, RSSB, UK, 2016
[2] Source: Office of Rail and Road, National Rail Trends (NRT) Portal (accessed 25 October 2016) http://dataportal.orr.gov.uk/

TABLE 7

Selected Derailments Not Involving Passenger or Freight Rolling Stock July 2015 to June 2016

Railway operations within SA, NSW, TAS, NT, VIC, ACT and WA from 2 November 2015 regulated under the RSNL.

Date	Description	Location
25/07/2015	A Road Rail Vehicle derailed while travelling between 70–75 km/h. Some damage was sustained to all wheels on the vehicle.	Denman, SA
14/08/2015	A Road Rail Vehicle derailed at the expansion joints on the entrance to a viaduct. The vehicle was travelling at low speed when the front axle left the track. No injuries were sustained and there was no visible damage to the machine.	Seaford Line, SA
01/01/2016	A Fire Patrol Trolley arrived at Gembrook Station after completing its journey behind a passenger train. After the locomotive of the train had shunted, the trolley driver drove the trolley towards the siding at the station but did not realise that the diesel locomotive was foul of the siding. This resulted in a low speed collision between the trolley and stationary locomotive and a minor derailment. There were no injuries reported or significant damage to either vehicle.	Gembrook, VIC
10/01/2016	A Road Rail Vehicle hit a cow and derailed, damaging the vehicle. There were no injuries.	Marryat, SA
13/05/2016	A regulator and tamper travelling as one unit derailed, resulting in damage to 175 concrete sleepers and two breaks in the rail.	Homebush, NSW

COLLISIONS BETWEEN TRAINS AND WITH ROLLING STOCK

Collisions between trains and with rolling stock are some of the more potentially serious rail safety events. The likelihood and consequences of collisions vary according to factors such as the systems used to manage train movement (for example, signal-based, train order working) and the types of trains involved. A major determinant of risk is the involvement of a passenger train because of the potential exposure of large numbers of passengers to harm.

There were six running line collisions involving rolling stock in the 2015–2016 financial year, on railways regulated under the RSNL. These consisted of:

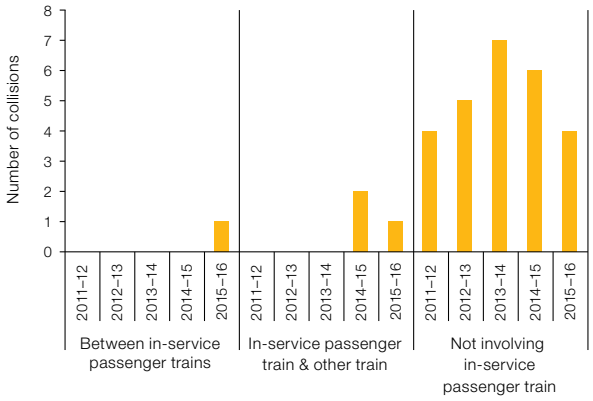
- one minor collision between in-service passenger trains; (see table 8)
- one collision between a runaway tramcar and tourist and heritage tram;
- one collision between a loco and wagons;
- one collision between a freight train and banker locomotive;
- one collision between RRVs; and
- one collision between two infrastructure maintenance vehicles.

Appendix A4 presents summary statistics, segmented by jurisdiction. The five-year history of running line collisions is summarised in Figure 5.

FIGURE 5

Running line collisions July 2011 to June 2016

All rail operations regulated under RSNL (Victorian data from 2013–2014 onwards, ACT from 2014–2015, WA from 2 November 2015). Includes collisions on non-running lines affecting the safety of running lines. Excludes trains striking or being struck by out of gauge equipment on trains on adjacent lines. Passenger trains include tourist and heritage trains on mainlines and isolated lines.



The running line collisions involving in-service passenger trains and not involving in-service passenger trains, for the 2015–2016 financial year, are summarised in Table 8 and Table 9, respectively.

TABLE 8

Collisions involving in-service passenger trains July 2015 to June 2016

Railway operations within SA, NSW, TAS, NT, VIC, ACT and WA from 2 November 2015 regulated under the RSNL.

Date	Description	Location
15/05/2016	An unmanned tram rolled away for approximately 300 metres from a museum and struck another tram that was in service on a heritage tramway. No injuries were reported.	Loftus, NSW
16/06/2016	The mirrors of passing passenger trains struck. One train was stationary, the other moving out of the station.	Williamstown Station, VIC

TABLE 9

Collisions not involving in-service passenger trains July 2015 to June 2016

Railway operations within SA, NSW, TAS, NT, VIC, ACT and WA from 2 November 2015 regulated under the RSNL.

Date	Description	Location
14/07/2015	A ballast regulator track maintenance vehicle waiting at a signal was struck in the rear by a tamper track maintenance vehicle. The tamper was travelling at 15 km/h at time of collision. Minor damage to the vehicles was reported.	Greta, NSW
13/09/2015	A freight train stopped suddenly due to a signal change on approach resulting in assisting banker engines colliding with the rear of the train.	Ardglen, NSW
18/11/2015	A locomotive travelling from the mainline into a siding struck a wagon standing on the main line, resulting in minor damage to the locomotive.	Combara, NSW
10/02/2016	A Road Rail Vehicle ran into the rear of a freight train. No injuries were reported.	Grass Valley, Midland - Kalgoorlie Line, WA

LEVEL CROSSING COLLISION

Level crossings are the primary means by which the general public may legitimately traverse the rail corridor and they present a unique set of safety hazards.

There are at least 23,000 level crossings in Australia. Approximately 93% are road crossings with the remainder solely for pedestrian use.

There were 27 level crossing collisions between trains or trams and road vehicles in the 2015–2016 financial year on railways regulated under the RSNL. They consisted of:

- 15 collisions involving passenger trains;
- eight involving freight trains;
- two involving trams; and
- two involving RRVs/track maintenance vehicles.

Appendix A6 presents summary statistics, segmented by jurisdiction.

Of the 27 level crossing collisions in the 2015–2016 financial year: 24 involved trains colliding with motor vehicles, one involved a tram and a bicycle, one involved a tram and a motor vehicle and one collision involved a RRV and a motorcycle.

The five-year history of level crossing collisions between train and road vehicle is summarised in Figure 6.

FIGURE 6

Level crossing collisions
July 2011 to June 2016

Level crossing collisions between train and road vehicle, July 2011 to June 2016. All rail operations regulated under the RSNL as of 30 June 2016 (Victorian data from 2013–2014 onwards, ACT from 2014–2015, WA from 2 November 2015). Includes bicycles which are defined as road vehicles in the national occurrence classification scheme. “Other train” consists of infrastructure maintenance rolling stock, light engines, trams and tourist and heritage trains on isolated railways.

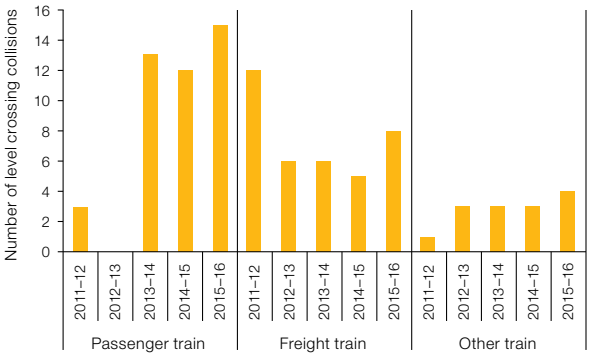


TABLE 10

Selected level crossing collisions with road vehicles July 2015 to June 2016

Railway operations within SA, NSW, TAS, NT, VIC, ACT and WA from 2 November 2015, regulated under the RSNL.

Date	Description	Location
15/07/2015	A cyclist passenger alighted from a tram at Taverners Hill station, turned in front of the tram to traverse the pedestrian walkway and was struck, receiving injuries.	Taverners Hill Light Rail Stop, NSW
06/08/2015	Passenger train travelling at approximately 115 km/h collided with a motor vehicle that was reported to have disobeyed warning equipment. The level crossing had boom barrier protection. No injuries to train crew or passengers were reported. The motor vehicle driver was taken to hospital for observation. Minor damage to the locomotive of the train was reported.	Yarrawonga Rd, Benalla, VIC
28/08/2015	A motor vehicle towing a trailer drove into the side of a passenger train at a level crossing protected by stop signs. No injuries to the train crew or passengers were reported.	Sandhill Rd, Stratford, VIC
31/08/2015	A passenger train collided with a stationary motor vehicle that had driven onto the track from the level crossing. No injuries were reported, with the occupants having exited the vehicle prior to the collision. The crossing barriers had been working before the incident.	Princes Highway, Unanderra, NSW
02/09/2015	A motor vehicle foul of the level crossing was struck by a passenger train. It was reported that an elderly couple abandoned the vehicle upon level crossing activation, and that efforts to contact the train driver prior to impact were unsuccessful. No injuries were reported.	Dendy St (New St), Brighton, VIC
23/09/2015	A road-train truck struck a freight train at a level crossing controlled by flashing lights and audible warning devices. The truck driver was killed in the collision.	Tullamore Rd, Narwonah, NSW
01/10/2015	A cyclist was struck by a passenger train on the railway crossing and seriously injured.	Main St, Pakenham, VIC
02/10/2015	It was reported that a motor vehicle failed to stop at a crossing and ran into the side of a passenger train, causing minor damage to the train. The motor vehicle driver was transported to hospital for observation. The crossing was protected by boom barriers.	Murray Valley Hwy, Echuca, VIC
24/10/2015	A motor vehicle struck a passenger train at a crossing controlled by flashing lights and audible warning devices. No injuries to the train crew or passenger were reported. Minor damage to the train and railway infrastructure was reported and the motor vehicle driver was taken to hospital for observation.	Locksley Rd, Nagambie, VIC
05/03/2016	A passenger train struck a motor vehicle at a crossing protected by boom barriers, which were reported as operating at the time of the collision. No injuries were reported.	Munro St, Coburg, VIC
10/03/2016	A passenger train struck a motor vehicle at a crossing protected by boom barriers, which were reported as operating at the time of the collision. No injuries were reported.	Warragul Rd, Mentone, VIC
18/03/2016	A motor vehicle crashed through boom gates and collided with a passenger train. No injuries were reported.	Liddiard Rd, Traralgon, VIC

The Ghan, Northern Territory

Date	Description	Location
24/03/2016	A freight train stuck a motor vehicle towing an empty horse float at a crossing protected by flashing lights. A minor injury to the motor vehicle driver was reported.	Martin Pelusey Rd, Waterloo, WA
31/03/2016	A motorcyclist collided with a Road Rail Vehicle. The level crossing equipment was unable to activate on account of the insulated nature of the Road Rail Vehicle failing to activate signalling circuits. The driver of the Road Rail Vehicle gave way to vehicles, switched on warning lights and sounded horn before proceeding across the level crossing. No injuries were reported.	Sheffield Rd, Spreyton, TAS
21/04/2016	A motor vehicle collided with a freight train at a crossing protected with stop signs. Two occupants in the car suffered critical injuries and were evacuated by helicopter to hospital. Another injured motor vehicle occupant, and the shocked train crew, were also transported to hospital for medical treatment.	Henry's Lane, Moorland, NSW
13/05/2016	A passenger train struck a motor vehicle at a crossing protected by stop signs. No injuries were reported.	Platform Rd, Kellys Plains, NSW
01/06/2016	A passenger train struck a motor vehicle at a crossing protected by boom barriers, which were reported as operating at the time of the collision. No injuries were reported.	Main Rd West (Main Rd East), St Albans, VIC

WORKFORCE STRUCK BY ROLLING STOCK

One of the largest risks to railway workers is being struck by rolling stock while working in the rail corridor. On 18 June 2016 a track worker was struck and killed by a passenger train at Clyde (NSW). On 2 October 2015 a track worker was struck and suffered serious injuries in Laverton (Victoria). Both events have been subject to ATSB investigations (with the Clyde, New South Wales investigation still underway) and also led to ONRSR compliance investigations.

Track Work Competency and Communication was identified as a national priority for ONRSR in the previous Rail Safety Report. This area remains a focus and is covered in more detail on page 36.

FIRE

There were approximately 600 fires in the 2015–2016 financial year on railways regulated under the RSNL. These consisted of:

- line side fires (approximately 75% of notifications). The majority were grass and rubbish fires either within or adjacent to the rail corridor
- train fires (approximately 13% of notifications). Most of these involved arson on metropolitan passenger trains. Freight train fires were associated primarily with locomotive faults; and
- fires on or adjacent to stations (approximately 12% of notifications). These generally involved small fires in bins, station toilets or sleeper fires adjacent to platforms.

The vast majority of fires result in no injuries. There were no fatalities or serious injuries due to fires reported for the 2015–2016 financial year.

The five-year history of passenger train fires is summarised in Figure 7 (note, Victoria data is included from 2013–2014 onwards and WA data is included from 2 November 2015 onwards). There were 30 passenger train fires in the 2015–2016 financial year. This represents a significant drop in numbers from the previous year (74). A number of factors are likely to have contributed to this reduction in fires including additional cleaning requirements to reduce combustible materials on trains, and increasingly modern train fleets with updated fire retardation properties and enhanced security surveillance.

FIGURE 7

Passenger train fires July 2011 to June 2016

SA and NSW data for full period, Victorian data is included from 2013–2014 onwards, WA data from 2 November 2015 onwards. Data shown is that classified as OC-G1 top event category Fire — on train.

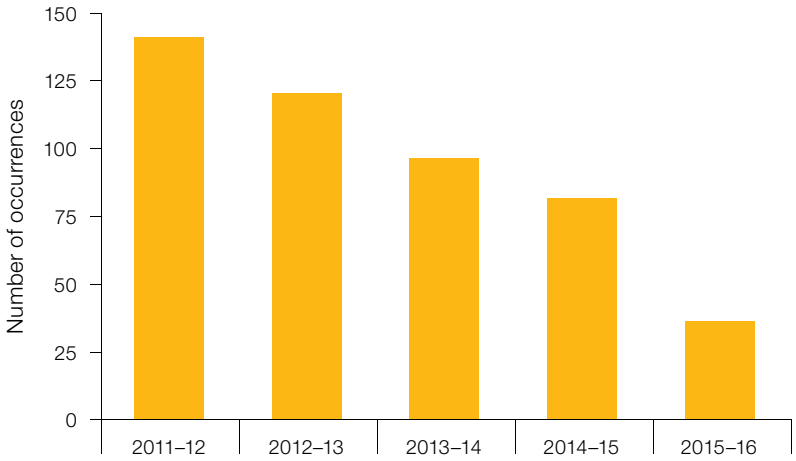


TABLE 11

Selected passenger train fires July 2015 to June 2016

Railway operations within SA, NSW, TAS, NT, VIC, ACT, and WA from 2 November 2015, regulated under the RSNL.

Date	Description	Location
01/7/2015	Passengers were evacuated due to an electrical fire within the alternator of a railcar.	Elizabeth Station, SA
17/8/2015	A smoke alarm was activated due to a chair being set alight on a passenger train. No injuries reported.	St Mary's, NSW
26/11/2015	Passengers were evacuated and the fire brigade called as a result of smoke being emitted from a train carriage.	Katoomba, NSW
09/06/2016	A small fire in the electrical cabinet within the buffet area of a passenger train occurred. No injuries were reported.	Coffs Harbour, NSW

Katoomba Station,
New South Wales

FIGURE 8

Broken rail
July 2011 to June 2016

SA and NSW data for full period, Victorian data is included from 2013–2014 onwards, WA data from 2 November 2015 onwards. Data shown is that classified as OC-G1 top event category broken rail — detected outside maintenance inspection

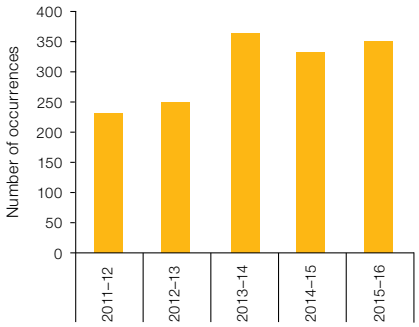
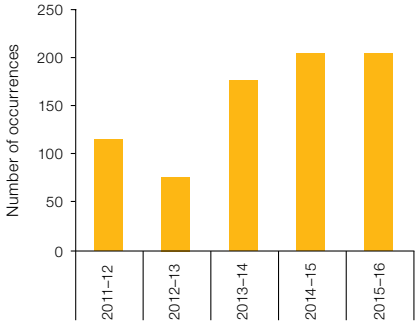


FIGURE 9

Signal passed at danger without authority — passenger train
July 2011 to June 2016

SA and NSW data for full period, Victorian data is included from 2013–2014 onwards, WA data from 2 November 2015 onwards. Data shown is that classified as OC-G1 top event categories; Driver misjudged, completely missed while running; and start against signal. Excludes tourist and heritage operators.



OTHER RISKS

Infrastructure irregularities are a significant contributor to train derailment risk, noting these consist of a wide range of failures including rail breaks, track misalignment, points failures and track obstructions. The frequency of broken rail occurrences is summarised as one indicator of train derailment risk. The five-year history of broken rails is presented in Figure 8.

SIGNALS PASSED AT DANGER WITHOUT AUTHORITY

Instances of passenger trains exceeding the limit of their authorised movement, are considered important precursors to collisions. On signalled systems these occurrences are notified as a signal passed at danger without authority (SPAD). SPADs are also an important precursor to derailments. The five-year history of passenger train SPADs is summarised in Figure 9.

TRAIN COLLISION WITH OTHER OBJECTS

Collisions between trains and track obstructions are a possible cause of derailment. For the vast majority of collisions with objects, however, these incidents represent hazards and events that pose no direct threat to safety and have little chance of escalation. These events often include instances of collision with vegetation and rubbish being blown onto the track, or the illegal dumping of household items.

Within the large pool of minor incidents notified there exists a small number of events representing the precondition for escalation to a more serious consequence. These include larger or high mass objects fouling tracks such as road vehicles, entire trees and landslips. In 2015–2016, six collisions between trains (excluding trams) and motor vehicles at locations other than level crossings were reported, though fortunately none of these events resulted in a derailment.

Significant bad weather events can also result in landslips and track washaways, which pose a risk to rail operations. Such a weather event on 5 June 2016 in NSW resulted in three separate washaway and landslide events and collisions with passenger trains. Minor damage to a train was reported in one of these three incidents and emergency services had to be called to another.

Examples of some other potentially serious occurrences of collisions between trains and objects are shown in Table 12.

The five-year level of broken rails is high and one of ONRSR's regulatory priorities is to address track condition as a contributor to derailments.

TABLE 12

Selected collisions between trains and objects July 2015 to June 2016

Railway operations within SA, NSW, TAS, NT, VIC, ACT and WA from 2 November 2015 regulated under the RSNL.

Date	Description	Location
06/07/2015	A heritage rail car with passengers on board collided with buffer stops and derailed at Coles Beach, Devonport. The buffer stops were pushed approximately eight metres. There were no injuries reported.	Coles Beach, TAS
21/07/2015	A freight train being shunted was pushed back through a dead end resulting in the last wagon being significantly damaged, with the body of the wagon lifted off the bogies.	Port Pirie Yard, SA
17/10/2015	A passenger train ran over two golf buggies that had been placed on the track. The buggies became stuck and the train was unable to move.	East Grange Station, SA
15/11/2015	A heritage tram approaching a temporary terminus stop travelling at approximately 5 km/h through a public reserve failed to stop and collided with a temporary construction fence. No injuries were reported, with minor damage to the tram.	St Kilda, SA
16/12/2015	A freight train became disabled on a viaduct after striking metal plates blown onto the line during a storm. Crew had to be evacuated by emergency services and the train was recovered the next day.	Boggabri, NSW
19/12/2015	A passenger train struck formwork at a worksite. Minor injuries to a worker on site was reported.	Telarah, NSW
06/02/2016	A freight train travelling at 30 km/h struck debris on the track. The debris was found to be part of a retaining wall.	Hanbury Jct, NSW
01/04/2016	A passenger train struck a large rock that had fallen from a cliff, resulting in damage to the train.	Cowan, NSW
17/05/2016	A passenger train collided with metal grates, boulders and debris placed on the track, resulting in extensive damage to the train.	Narara, NSW
14/06/2016	A passenger train struck a sheet of sound baffling hanging from a tunnel entrance. No damage was reported.	Woollahra, NSW

2015–2016 A YEAR IN REVIEW

The summary statistics presented in the previous chapter provide a snapshot of the rail industry's safety performance over the last year. This information not only provides an insight into how safe the industry is, it also acts as a key source of regulatory intelligence that ONRSR uses to direct effort and resources inline with its risk-based approach to regulation.

This chapter presents a summary of ONRSR's approach to risk-based regulation and an update on the four areas ONRSR set as national priorities last year. This section also provides an update on two other areas of regulatory attention which ONRSR prioritises by risk — regulatory attention to major rail projects and safety improvement initiatives.

RISK-BASED REGULATION IN ONRSR

Risk-based regulation is an approach to regulation in which regulatory effort is commensurate with risk and scope for improvement. It is the application of a systematic framework that prioritises regulatory activities and deployment of regulators' resources on an evidence-based assessment of risk.[8] Rather than focussing on prescriptive rules, risk-based regulation places assessment, quantification and monitoring of risk at the heart of regulatory design and implementation. While regulators have always made regulatory design, implementation and allocation choices, partly to manage limited resources, risk-based regulation formalises and provides consistent structure to the decision making process.[9]

Administering the Rail Safety National Law using a risk-based approach to regulation means that key decisions within ONRSR, such as the setting of national priorities and the development of the annual compliance and inspection work program, are informed by an assessment of risks to rail safety. This involves:

- developing an understanding of the risks to the safety of railway operations in Australia;
- prioritising these risks and determining which risks ONRSR is able to influence through its regulatory activities; and
- designing and prioritising regulatory activities and outcomes in a way that best maintains and improves rail safety.

ONRSR'S RISK-BASED DECISIONS

ONRSR's Framework for Risk-based Regulation categorises regulatory decisions into one of three tiers of importance: Tier 1 decisions, which are those with the greatest potential to impact rail safety and are therefore the primary focus of risk-based regulation; Tier 2 decisions, which are of a secondary focus; and Tier 3 decisions, which do not generally impact rail safety. This is depicted in Figure 10.

[8] Adapted from Baldwin, R & Black, J (2007), 'Really responsive regulation', Law, Society and Economy Working Papers 15/2007, London School of Economics, London and Black, J (2010a), 'Risk-based regulation', Presentation to the Future of Legal Regulation Conference, Birkbeck College, London, 14 June.

[9] Adapted from Sparrow, M (2000), The regulatory craft, The Brookings Institution, Washington DC.

FIGURE 10

Decision Tiers of Regulatory Importance

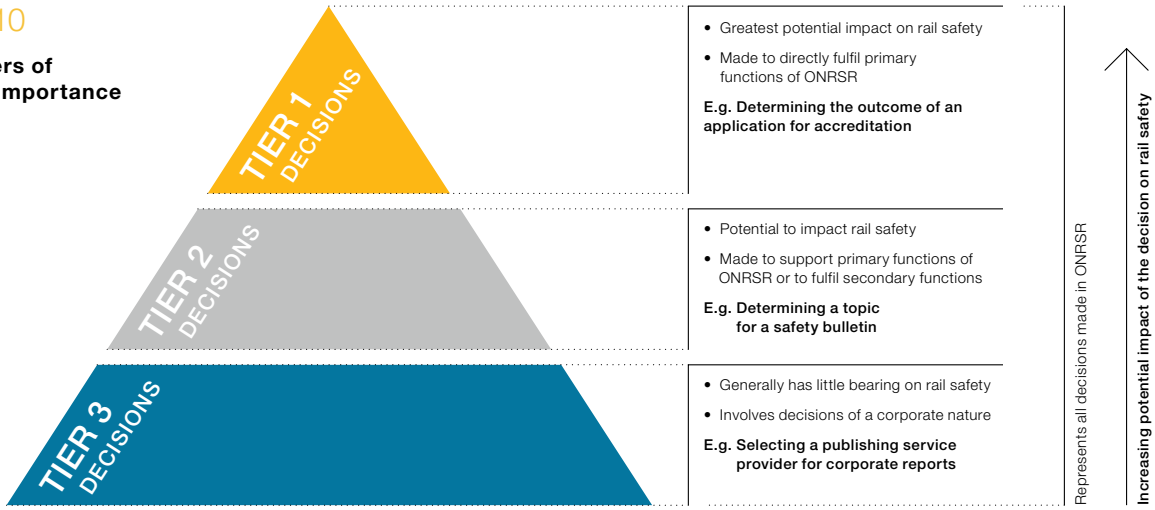
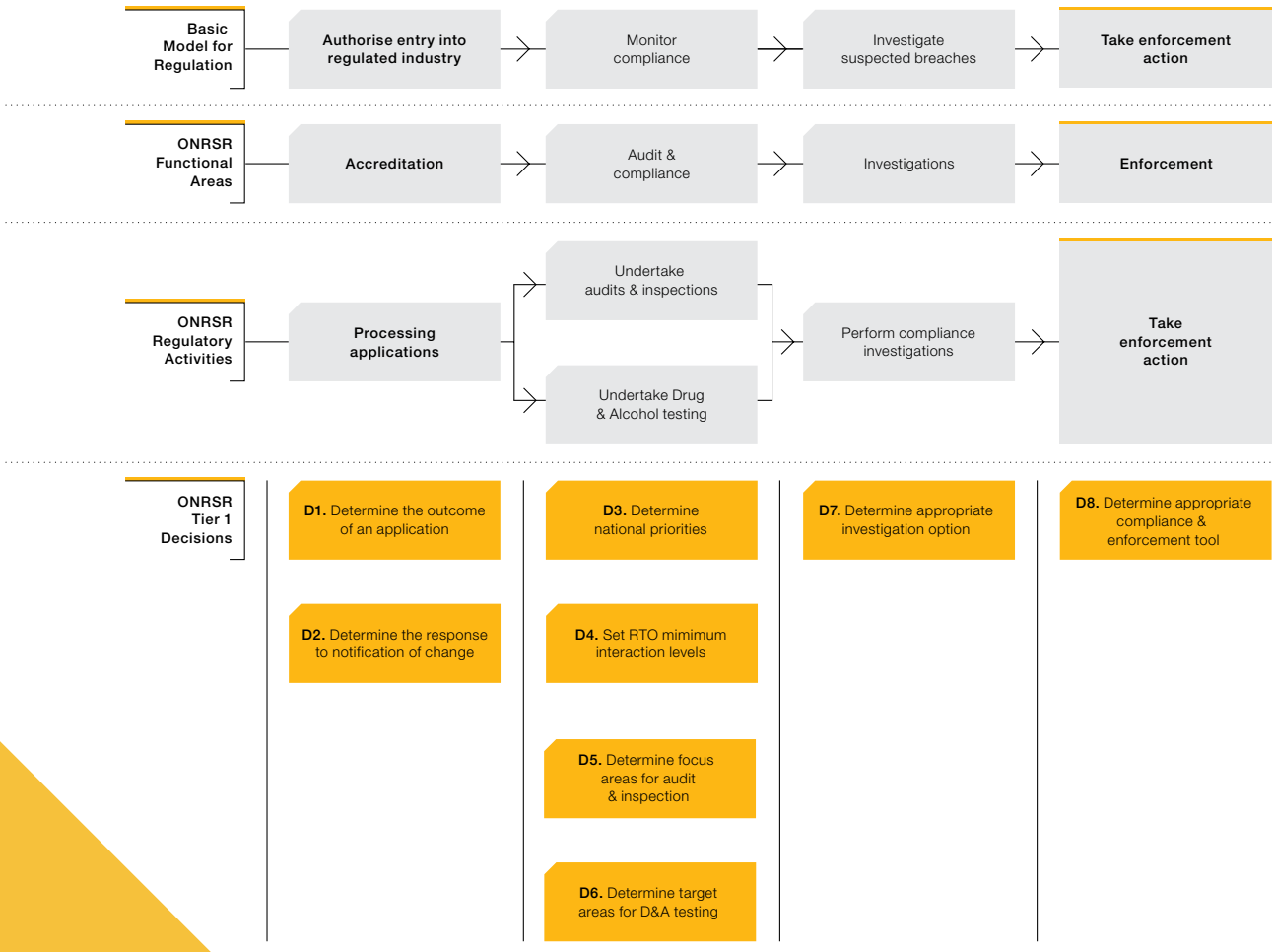


FIGURE 11

Positioning ONRSR's Tier 1 Decisions



The framework identifies eight Tier 1 decisions and sets out the risk-based requirements to be undertaken during the decision-making process for each. The eight Tier 1 decisions made by ONRSR are listed in Figure 11, which illustrates the position of each decision in the wider model of regulation.

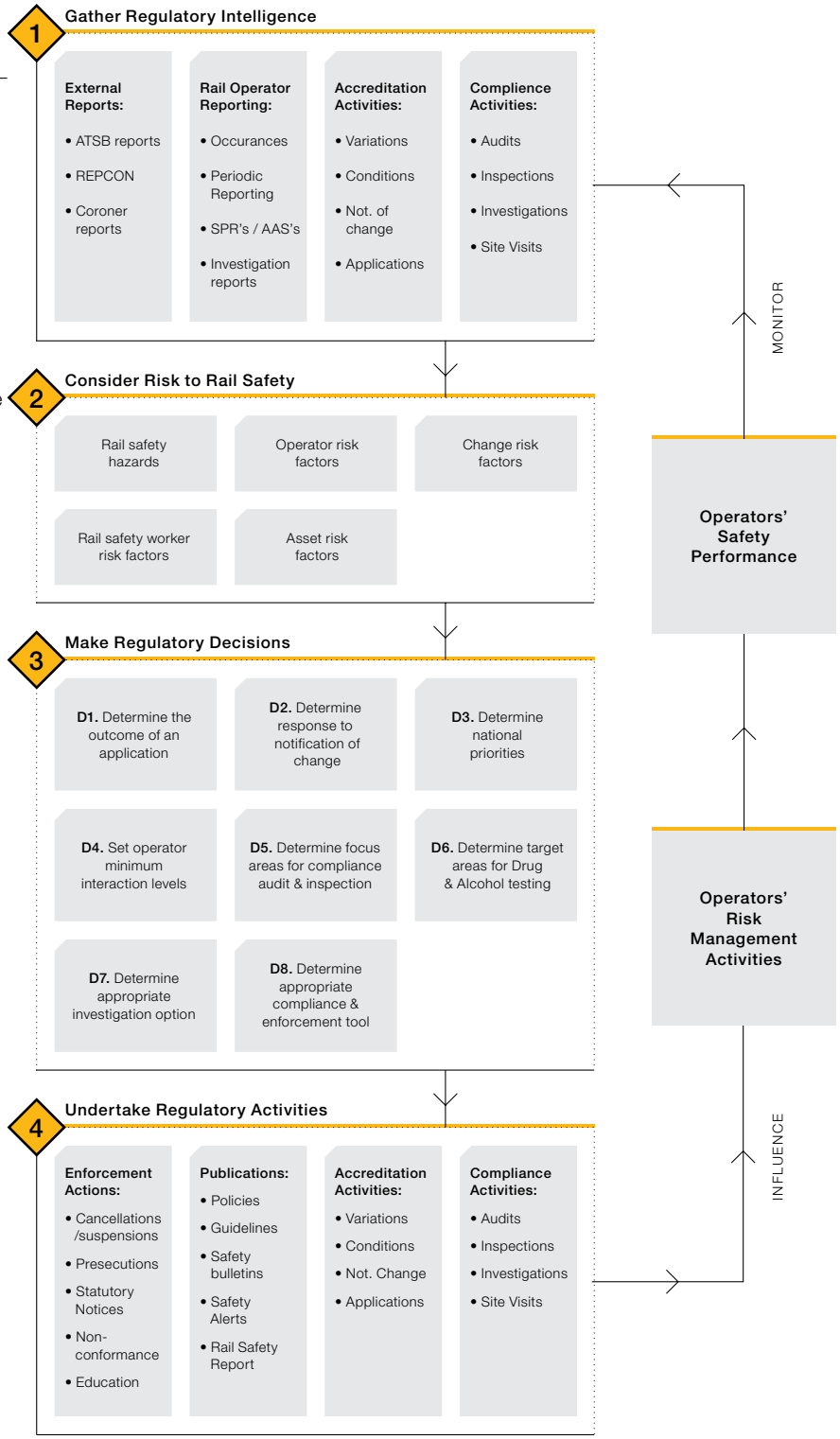
ONRSR'S MODEL FOR RISK-BASED REGULATION

ONRSR applies a four-stage method for risk-based regulation. These stages are illustrated in Figure 12 and are summarised below:

- **Stage 1**
  Gather regulatory intelligence
  ONRSR gathers regulatory intelligence from a variety of sources, including operator reporting, third party reports, and through its regulatory interactions with industry. This allows ONRSR to monitor operators' safety performance.
- **Stage 2**
  Consider risks to rail safety
  By analysing and drawing upon the regulatory intelligence it gathers, ONRSR is able to build a picture of risks to rail safety across the industry. This includes, for example, understanding safety risk profiles of operators and the risks associated with capital investment projects.
- **Stage 3**
  Make regulatory decisions
  Based on the understanding of risks to rail safety from Stage 2, ONRSR is able to make informed regulatory planning and implementation decisions to best drive and influence risk reduction across industry.
- **Stage 4**
  Undertake regulatory activities
  ONRSR implements the decisions and plans formulated in Stage 3, by interacting with industry using a variety of tools and measures, ranging from publication of guidelines to enforcement actions.

FIGURE 12

ONRSR's Model for Risk-based Regulation



Steam locomotive,
Australian Capital Territory

RISK-BASED REGULATION CASE STUDY

Setting Minimum Interaction Levels for Operators (D4)

The minimum frequencies with which ONRSR undertakes audit and inspection activities on accredited operators are known as Minimum Interaction Levels. These levels are set annually as part of the development of the National Audit and Compliance Work Program.

The general principle behind the setting of Minimum Interaction Levels is that the greater the level of rail safety risk an operator exposes the community to, the greater that operator's Minimum Interaction Level will be.

ONRSR assigns risk scores to each operator by assessing a series of quantitative and qualitative risk factors across four categories:

- **Inherent Risk**
  Score assigned based on the current size, scope and complexity of an operator's railway operations.
- **Dynamic Risk**
  Score assigned based on the level of operational, organisational or asset change either recently completed, or currently underway, with the potential to affect the safety of the operator's rail operations.
- **Compliance Risk**
  Score assigned based on the operator's recent performance during regulatory interactions.
- **Occurrence Risk**
  Score assigned based on the operator's safety performance, determined through analysis of notifiable occurrence statistics.

The risk scores are then combined with input from subject matter experts to set Minimum Interaction Levels for each operator. This is a key input into ONRSR's annual work program.

INDUSTRY RISK MODEL

ONRSR's risk-based approach to regulation is underpinned by regulatory intelligence gathered by ONRSR from internal and external sources. The development of an industry risk model is a key element which is expected to present a new and important source of regulatory intelligence. Once complete, it is expected that the model will help guide industry and regulatory decision making and enable a shared understanding of safety priorities, reinforcing co-regulation.

NATIONAL PRIORITIES

Four national priorities were selected by ONRSR in 2015 and have been the focus of regulatory attention over the last 12 months. While individually unique, each of the priorities shares specific characteristics — the topics require sustained regulatory focus of at least 1 year, the issues affect railways across the country and the areas are those where compliance and enforcement methods are appropriate regulatory responses.

The four priorities are:

1. **TRACK CONDITION;**
2. **TRACK WORK - COMPETENCY AND COMMUNICATION;**
3. **ROLLING STOCK MAINTENANCE; AND**
4. **ROAD RAIL VEHICLE (RRV) SAFETY**

While progress has been made with all of the priorities, further work is required to achieve the safety outcomes set. Each of the priorities will be retained moving into 2017. What follows is further information on why the priority was chosen, what the specific focus for ONRSR is and what progress has been made to date.

TRACK CONDITION

Track condition was selected as a national priority after a review of literature and available occurrence data identified a number of higher risk issues with the potential for derailment. These were: broken rails, track geometry (including wide gauge), misalignments (heat buckles), and broken (defective) joints. Initial concerns were supported by a review of ATSB Investigation reports, which identified poor track condition as the most common causal factor of the derailment events investigated.

Further analysis of the investigation reports identified a number of precursors and contributing factors, including;

a. Degraded track condition not detected

i. Limitations of ultrasonic testing and over-reliance on ultrasonic testing

ii. Inaccuracy of recorded location by inspection vehicle

iii. Inadequate inspection method

iv. Insufficient inspection regime or inspection regime not adhered to

v. Inability to inspect rail and fasteners due to being covered — for example at level crossings

vi. Rough rides not being reported

vii. Vintage rail in use without adequate inspection regime/ replacement strategy

b. Degraded track condition not corrected

i. Series of track geometry irregularities, causing undesirable harmonic response in rail vehicles

ii. Rough ride reports not being verified before next train

iii. Defects past intervention levels being mitigated by speed restrictions — acceptance of low speed derailments

iv. Defects with monitoring status being left untreated until reaching emergency status

v. Insufficient or inadequate rail creep management

c. Adverse weather

i. Hot weather controls not implemented or adhered to

ii. Insufficient guidance on hot weather speed restrictions

iii. Insufficient or inadequate adverse weather management

To tackle this national priority, ONRSR is reviewing track standards and the inspection regimes applied by Rail Transport Operators to verify these regimes through compliance inspection of those operators responsible for managing rail infrastructure. The principal focus of these inspections is on track stability, track geometry /rail management and general track condition.

As part of the project there has been active engagement between ONRSR and RTOs, which has resulted in improvements being identified and implemented in relation to track stability management.

ONRSR's focus in 2015–2016 included compliance inspections and activities on lateral track stability and summertime maintenance. The inspections used a number of factors, such as tight radius curves, opposing gradients and other intelligence to determine the locations to be targeted.

To date the program has resulted in a number of Non-Conformance Reports (NCRs) being issued and findings, which include the following:

a. Lack of sufficient monitoring/ auditing of compliance to standards;

b. Lack of sufficient monitoring/ auditing for the implementation of track asset management systems;

c. Insufficient clarity of management responsibilities, accountabilities, authorities and limits of authority (from provisioning centre/ maintenance depot level to head office);

d. Insufficient management oversight and verification of maintenance documentation to satisfy ONRSR that risk controls implemented have been suitably reviewed prior to their implementation;

e. Insufficient objective evidence around the elimination and minimisation of risks 'So Far As Is Reasonably Practicable' (SFAIRP) in respect to management of the track buckling risk; and

f. Ineffective training and assessment of field staff in respect to summertime maintenance practices.

ONRSR is working with the operators involved in addressing these issues and work on this priority with other operators continues.

The objective of the project is to promote, enhance and increase safety in relation to track condition.

Outcomes stemming from the program include:

a. An aligned understanding between ONRSR and operators in relation to risks associated with adverse track conditions.

b. A more detailed understanding of RIM's implementation of systems/ procedures/processes surrounding effective and adequate management of adverse track conditions.

c. A more detailed understanding of RIM's implementation of systems/ procedures/processes surrounding the effective management of track geometry and rail defects.

d. Regulatory reporting (Compliance Inspection) detailing any potential observations, non-conformances and improvements to the responsible RIM.

Rusted dog spike,
Old Ghan Railway,
Northern Territory

TRACK WORK — COMPETENCY AND COMMUNICATION

During the 2014–2015 financial year there were over 400 occurrence reports relating to track work safe working breaches notified to ONRSR, with rail safety worker competence and safety critical communication a recurring theme. An analysis of the data available to ONRSR identified the following common safety factors associated with worksite occurrences:

- protection types being insufficient or incorrect;
- protection location being incorrectly positioned (worksite being incorrectly defined);
- protections being incorrectly removed; and
- worksite location being incorrectly identified.

These issues were considered significant enough to warrant inclusion as a national priority.

ONRSR established an internal project to improve its understanding of how operators are addressing ongoing track safety worker occurrences and to promote, enhance and increase track worker safety through inspection or audit activities. The project principally focuses on verifying field operations by undertaking track work safety related inspection/audit activities to sample and test the in-the-field application of appropriate safe working systems and to confirm whether workers hold the appropriate competencies both on track and at network control.

The outcomes and learnings from these activities will be summarised and used as an input into a safety improvement project that is currently in development.

The inspection/audit activities have been selected based on the intelligence and knowledge available on specific operators with at least one inspection of each rail transport operator that undertakes or manages on-track rail safety workers on the major rail networks within ONRSR jurisdictions. The inspection/audit activities are not limited to workers of accredited operators and may also cover labour hire companies and training organisations as the circumstances require. ONRSR is also reviewing the role of the industry track worker cards and associated training management in assisting with the management of worker competency.

ONRSR's Rail Safety Officers are requesting and reviewing operator investigations into track worker safety occurrences that exhibit the common safety factors associated with worksite occurrences. This will allow ONRSR to become better informed as to how operators are addressing track worker safety related occurrences and, where necessary, facilitate more appropriate investigative or corrective outcomes.

To date a number of inspections/audits have been completed in 2016 with compliance reports completed by ONRSR Rail Safety Officers identifying operator specific issues.

There has been positive engagement between rail safety officers and operators during the compliance activities undertaken thus far and learnings have been identified by all parties. These learnings will assist the ONRSR in planning and conducting future activities and for operators, this will progress the intended safety outcomes from the program which include:

- a reduction in track worker related incident(s) and occurrences,
- a greater understanding by operators surrounding track worker safety risks and;
- operators' implementation of systems/procedures/processes to deliver effective and adequate management of track worker safety risks.

ROLLING STOCK MAINTENANCE

Rolling stock maintenance was selected as a national priority after a significant number of rolling stock component failures had been reported during 2014–2015. Furthermore, an audit of maintainers (both accredited operators and third party organisations) yielded poor results across all sectors.

There is also an increasing trend of contractors performing maintenance activities, which warrants monitoring. In particular, ensuring that the accredited operators' systems for maintenance and safety management are fully applied by it's contractors, some of which are not accredited. Poor maintenance has the potential to lead to safety critical rolling stock component failures.

The intended safety outcomes from the program include:

- A reduction in specific rolling stock related irregularities;
- An aligned understanding gained by ONRSR, operators and third party maintainers surrounding risks associated with rolling stock maintenance practices and defect management systems; and
- A more detailed understanding of operators' implementation of systems/procedures/processes surrounding effective and adequate management of rolling stock including contractor maintenance.

ONRSR's focus during scheduled inspections, audits and interactions with operators and maintainers includes:

- Effectiveness of operators' defects management system with a focus on the contractual agreement between the operator and maintainer and the records of the maintainer;
- Operators' internal trend monitoring and post occurrence/defect engineering investigations;
- Auditing/monitoring of non-accredited rolling stock maintainers — typically, there is a low level of auditing by some operators of the process control records of the maintainer. Therefore, the operator's audits must include the process control aspects which, in turn, must reflect the standards defined in contracts between the operator and the maintainer;
- Data analysis of out of course/in-service faults and failures; and
- Follow up of Notification of Change submissions which involve the introduction of new rolling stock or revised rolling stock maintenance practices, including those submissions implemented by a maintainer on behalf of an operator.

To date ONRSR has undertaken audit and compliance inspections on accredited RTOs and organisations undertaking maintenance services on rolling stock safety critical equipment for accredited RTOs. The project has provided the rolling stock maintenance service providers with an improved understanding of their obligations under Section 53 of the RSNL (general Duties), and the requirements to comply with the RTO's Safety Management System, whilst also developing communication channels between ONRSR and the maintainers. So far the key issues identified by ONRSR inspections being followed-up with the rolling stock maintenance service providers are:

- Failure to establish standards for performing maintenance services.
- Lack of adequate processes for the review and amendment of technical documents.
- Lack of internal monitoring, with maintenance practices differing from the requirements contained in the technical documentation.
- Insufficient/ineffective monitoring of a contractor's performance by the accredited railway organisations.

ONRSR is working with these rolling stock maintenance service providers to correct these issues.

ROAD RAIL VEHICLE SAFETY

RRV Safety has been a focus for ONRSR for some time. When identifying its national priorities last year, ONRSR noted that whilst some improvements had been made across industry in regard to RRV safety, the overall level of improvement was disappointing and more work was needed to improve industry wide performance in this area. It was determined that RRV safety would remain a national priority focus for ONRSR during 2016.

In reviewing the outcomes of the 2014–2015 focus on RRV safety, it became apparent there was a clear need for further guidance for parts of industry on key issues such as roles, responsibilities and expectations of designers, manufacturers/modifiers, suppliers (vehicles and componentry), certifiers, contractors, operators and RIMs. As a result, the continued focus on RRV safety throughout 2016 saw ONRSR publish and disseminate guidance material to industry entitled; 'A guide to Road Rail Vehicles and the Law'.

Following confirmation last year that RRV safety would remain a national priority, ONRSR assembled a multi-disciplinary team to undertake further work in this area. This team consisted of staff with knowledge of the RSNL requirements for RRV safety, technical knowledge of rolling stock and in particular experience of RRVs.

During the 2015–2016 financial year, ONRSR has adjusted its approach towards improving RRV safety. Building on the work to date, ONRSR has designed the current project with a focus on RIMs, with particular attention given — but not limited to — procurement, network access (acceptance of RRVs on to the relevant network), Rail Safety Worker competency, general engineering and operational systems safety requirements.

During 2015–2016, ONRSR conducted inspections aligned to the above scope and objectives. The inspections were conducted in order to ensure compliance with both the RSNL and the operator's Safety Management System, whilst focusing on RRV operations and ensuring operators had considered and addressed risks associated with RRV operations. Throughout the inspections, ONRSR initiated various enforcement options such as further education, the issuing of non-conformances, Improvement Notices and Prohibition Notices.

The inspections conducted thus far have indicated the following common themes amongst RIMs and contractors:

- RRVs owned by contractors appear to be generally maintained to a lesser standard than those owned by the RIMs;
- Pre-operational checklists sampled during inspections do not allow the RRV Operator to identify whether the RRV is fit for purpose (i.e. It is difficult to identify pass/fail requirements due to the way the checklists are compiled);
- A high percentage of pre operational checklists sampled during the inspections had missing data/ information (required to be completed by the RRV Operator);
- A large number of RRV Operator competencies and health assessment verification processes are not adequately conducted at work sites prior to commencing works (numerous RRV RTOs were unable to identify that they were competent to the relevant training requirements);
- Mechanical condition of all RRV's sampled varied moderately;
- Maintenance plans and procedures for RRVs have generally been compliant, however, contractor maintenance plans appear to be maintained to a lesser standard;
- Identification of various RRVs not possessing a risk assessment located within the machine; and
- Numerous site risk assessments failed to identify certain controls unique to the relevant sites.

Whilst deficiencies were identified throughout the RRV inspection phase, it was evident that operators had responded positively to guidance material circulated by ONRSR. Furthermore, the contribution from industry when developing guidance material, namely; 'A guide to Road Rail Vehicles and the Law', resulted in a better product, and has been beneficial to the industry as a whole.

What has been refreshing to see throughout the campaign was the considerable effort and contribution from industry to work with ONRSR to improve RRV safety and better manage the risks associated with operating RRVs. This highlights what can be achieved when ONRSR and industry collaborate with the sole objective of enhancing rail safety.

SAFETY IMPROVEMENT

ONRSR works with the rail industry to drive national improvements in safety through a series of safety improvement and education initiatives. These initiatives complement the compliance and enforcement activities and measures, which are focussed towards individual operators.

During 2015–2016, three priority safety areas were identified for safety improvement. These areas continue to be the focus moving forward, and are as follows:

- **Investigation reports** working with industry to achieve a consistent high standard in their investigation reports. RTO investigation reports are an opportunity to better understand how an incident occurred, prevent a reoccurrence and act upon safety lessons;
- **Track worker safety** supporting industry to work together in a targeted way to reduce worksite incursions, which are an area of concern for ONRSR and all stakeholders due to the continued high number of incidents; and
- **Risk management** supporting industry to improve risk management through a better understanding, and application, of risk management approaches.

The **investigation reports** project is developing materials to assist the rail industry when undertaking investigations within their organisation. These materials will outline ONRSR's expectations of internal investigation reports, which the regulator can request to see or direct to be prepared. Some anticipated benefits of this project include;

- encouraging a consistent standard of investigations and the resulting reports;
- improving safety learnings from investigation reports; and
- supporting interactions with ONRSR when an operator investigation is requested.

The **track worker safety** project will use causal factors, identified during compliance activities undertaken with individual operators during 2015–2016, to develop an industry-wide safety improvement initiative in 2017.

Work is continuing on both these projects in the 2016–2017 financial year, with work to also commence in 2017 on the safety improvement project targeting risk management.

Other ongoing projects include **human factors integration** and **fatigue risk management,** which initially focussed on improving understanding and shared practice with industry participants. These projects are now developing materials to assist Rail Safety Officers to better support industry.

Murwillumbah
Railway line (disused),
New South Wales

MAJOR PROJECTS

Throughout 2015–2016, ONRSR continued to see a growing number of major rail projects under development or construction across Australia. A common driver behind most is an increase in rail capacity, particularly for passenger travel in major cities. The challenge of meeting this task sees novel technology being deployed on increasing numbers of projects. ONRSR remains committed to supporting the safe introduction of new practices and technologies while ensuring that industry manages the new safety issues these may introduce.

The delivery of major projects not only brings operational benefits across the rail industry but also opportunities for safety improvement. The introduction of new technology (for example, automatic train protection) can provide a step change improvement in the control of a railway's existing safety risks. Additionally, the enhanced rigour required for the safety assurance of such systems can improve the safety capability of the rail industry as a whole.

Complex major projects require systematic management of safety risks. Safety requirements must be clearly understood, assurance activity must be planned, and verification and validation delivered. Bringing it all together safely is a key part of effective systems integration across multi-disciplinary projects. ONRSR's minimum expectations for safety assurance and accreditation activity for major projects are described in its Major Project Guideline. First published in 2014, ONRSR is encouraged by the broad adoption of this guideline by the majority of Australia's significant projects.

ONRSR has introduced its guideline to all major project entities in the participating jurisdictions. It welcomes the proactive manner in which the majority of projects have embraced its concepts. ONRSR believes that a consistent, robust and visible approach to safety assurance for Australia's major rail projects underpins safe outcomes and enables safety assurance activity to be delivered effectively and efficiently.

One area that has seen notable improvement is the willingness of major projects to appoint an independent safety assessor to support their safety assurance activities. Aligned with ONRSR's co-regulatory approach, the major project guideline sets an expectation that independent safety assessment is performed by major projects.

Done well, independent safety assessment can challenge projects to question their own approaches to safety and provide a catalyst for safety improvement. There is widespread recognition of the value in assessing safety during the design stages of a project where benefits can readily be achieved prior to potentially expensive changes during construction.

ONRSR welcomes the acceptance and use of independent safety assessment by major projects across Australia. On many projects, it is encouraging to see the rigour of safety assessment being applied and the resulting safety benefits.

In 2015–2016, ONRSR engaged with a number of major projects, including:

- Sydney Metro with TfNSW;
- Sydney Metro Northwest with Metro Trains Sydney;
- Sydney CBD & South East Light Rail with the ALTRAC Partnership;
- Automatic Train Protection with TfNSW;
- New Intercity Fleet with TfNSW and NSW Trains;
- Canberra Light Rail with Canberra Metro Operations; and
- Melbourne Metro Rail Project with the Melbourne Metro Rail Link Authority and Metro Trains Melbourne.

Significant regulatory activity with major projects during the year included:

- Working with Metro Trains Sydney to support their ongoing construction activity on the Sydney Metro Northwest project;
- Working with the ALTRAC Partnership to support their ongoing construction activity on the Sydney CBD & South East Light Rail project;
- Working with Canberra Metro Operations to progress their application for accreditation to commence construction activity on the Canberra Light Rail project; and
- Working with the Melbourne Metro Rail Authority as they progress their preparations to deliver Melbourne's metro rail tunnel.

APPENDIX A

DATA TABLES

APPENDIX A1

Railway fatal injury, 2011–2012 to 2015–2016 (Figure 2)

Passenger		SA	NSW	NT	TAS	VIC	ACT	WA	Total
Rail accident (incl. strike)	2011–12	0	1	0	0	n/a	0	n/a	**1**
	2012–13	0	1	0	0	n/a	0	n/a	**1**
	2013–14	0	1	0	0	0	0	n/a	**1**
	2014–15	0	1	0	0	1	0	n/a	**2**
	2015–16	0	0	0	0	0	0	0	**0**
Level crossing	2011–12	0	0	0	0	n/a	0	n/a	**0**
	2012–13	0	0	0	0	n/a	0	n/a	**0**
	2013–14	0	0	0	0	0	0	n/a	**0**
	2014–15	0	0	0	0	0	0	n/a	**0**
	2015–16	0	0	0	0	0	0	0	**0**
Fall, assault, other	2011–12	0	1	0	0	n/a	0	n/a	**1**
	2012–13	0	0	0	0	n/a	0	n/a	**0**
	2013–14	0	1	0	0	1	0	n/a	**2**
	2014–15	0	0	0	0	0	0	n/a	**0**
	2015–16	0	0	0	0	0	0	2	**2**

Workforce		SA	NSW	NT	TAS	VIC	ACT	WA	Total
Rail accident (incl. strike)	2011–12	0	0	0	0	n/a	0	n/a	**0**
	2012–13	0	0	0	0	n/a	0	n/a	**0**
	2013–14	0	0	0	0	0	0	n/a	**0**
	2014–15	0	0	0	0	0	0	n/a	**0**
	2015–16	0	1	0	0	0	0	0	**1**
Level crossing	2011–12	0	0	0	0	n/a	0	n/a	**0**
	2012–13	0	0	0	0	n/a	0	n/a	**0**
	2013–14	0	0	0	0	0	0	n/a	**0**
	2014–15	0	0	0	0	0	0	n/a	**0**
	2015–16	0	0	0	0	0	0	0	**0**
Fall, assault, other	2011–12	0	0	0	0	n/a	0	n/a	**0**
	2012–13	0	0	0	0	n/a	0	n/a	**0**
	2013–14	0	1	0	0	0	0	n/a	**1**
	2014–15	0	0	0	0	0	0	n/a	**0**
	2015–16	0	0	0	0	0	0	0	**0**

Public		SA	NSW	NT	TAS	VIC	ACT	WA	Total
Rail accident (incl. strike)	2011–12	0	0	0	0	n/a	0	n/a	**0**
	2012–13	0	0	0	0	n/a	0	n/a	**0**
	2013–14	0	0	0	0	0	0	n/a	**0**
	2014–15	0	0	0	0	0	0	n/a	**0**
	2015–16	1	0	0	0	0	0	0	**1**
Level crossing	2011–12	3	1	1	1	1	0	n/a	**7**
	2012–13	1	0	0	0	n/a	0	n/a	**1**
	2013–14	0	0	0	1	4	0	n/a	**5**
	2014–15	0	0	0	0	0	0	n/a	**0**
	2015–16	0	1	0	0	1	0	0	**2**
Fall, assault, other	2011–12	0	2	0	0	n/a	0	n/a	**2**
	2012–13	0	0	0	0	n/a	0	n/a	**0**
	2013–14	0	0	0	0	0	0	n/a	**0**
	2014–15	0	1	0	0	0	0	n/a	**1**
	2015–16	0	0	0	0	0	0	0	**0**

Trespass		SA	NSW	NT	TAS	VIC	ACT	WA	Total
Rail accident (incl. strike)	2011–12	3	23	0	0	n/a	0	n/a	**26**
	2012–13	2	22	0	0	n/a	0	n/a	**24**
	2013–14	3	37	0	0	33	0	n/a	**73**
	2014–15	1	27	0	0	37	0	n/a	**65**
	2015–16	3	25	0	0	47	0	2	**77**
Level crossing	2011–12	0	2	0	0	n/a	0	n/a	**2**
	2012–13	1	1	0	0	n/a	0	n/a	**2**
	2013–14	0	0	0	0	6	0	n/a	**6**
	2014–15	2	1	0	0	6	0	n/a	**9**
	2015–16	0	0	0	0	1	0	0	**1**
Fall, assault, other	2011–12	0	3	0	0	n/a	0	n/a	**3**
	2012–13	0	0	0	0	n/a	0	n/a	**0**
	2013–14	0	3	0	0	2	0	n/a	**5**
	2014–15	0	0	0	0	1	0	n/a	**1**
	2015–16	0	0	0	0	0	0	0	**0**

APPENDIX A2

Passenger train running line derailment 2011–2012 to 2015–2016 (Figure 3)

		SA	NSW	NT	TAS	VIC	ACT	WA	Total
Heavy rail	2011–12	1	3	0	0	n/a	0	n/a	**4**
	2012–13	0	1	1	0	n/a	0	n/a	**2**
	2013–14	0	2	0	0	1	0	n/a	**3**
	2014–15	0	2	0	0	1	0	n/a	**3**
	2015–16	0	0	0	0	1	0	0	**1**
Light rail	2011–12	0	0	0	0	n/a	0	n/a	**0**
	2012–13	0	0	0	0	n/a	0	n/a	**0**
	2013–14	0	2	0	0	0	0	n/a	**2**
	2014–15	0	0	0	0	0	0	n/a	**0**
	2015–16	0	0	0	0	0	0	1	**1**
Tourist & Heritage	2011–12	1	0	0	2	n/a	0	n/a	**3**
	2012–13	1	0	0	0	n/a	0	n/a	**1**
	2013–14	0	0	0	2	0	0	n/a	**2**
	2014–15	1	0	0	1	0	0	n/a	**2**
	2015–16	3	0	0	0	1	0	0	**4**
Other	2011–12	0	0	0	0	n/a	0	0	**0**
	2012–13	0	0	0	0	n/a	0	0	**0**
	2013–14	1	2	0	0	1	0	0	**4**
	2014–15	0	1	0	0	0	0	0	**1**
	2015–16	0	0	0	0	2	0	0	**2**

APPENDIX A3

Freight train running line derailment, 2011–2012 to 2015–2016 (Figure 4)

		SA	NSW	NT	TAS	VIC	ACT	WA	Total
Train	2011–12	8	24	3	2	n/a	0	n/a	**37**
	2012–13	4	22	2	6	n/a	0	n/a	**34**
	2013–14	7	15	2	3	11	0	n/a	**38**
	2014–15	6	9	2	2	4	0	n/a	**23**
	2015–16	3	10	0	2	7	0	6	**28**
Light Engine	2011–12	0	0	0	0	n/a	0	n/a	**0**
	2012–13	0	1	0	0	n/a	0	n/a	**1**
	2013–14	0	1	0	0	1	0	n/a	**2**
	2014–15	0	1	0	0	0	0	n/a	**1**
	2015–16	0	2	0	0	0	0	0	**2**
Wagon	2011–12	1	1	0	0	n/a	0	n/a	**2**
	2012–13	0	1	0	0	n/a	0	n/a	**1**
	2013–14	0	1	0	0	0	0	n/a	**1**
	2014–15	0	0	0	0	0	0	n/a	**0**
	2015–16	0	0	0	0	0	0	0	**0**

Steam train near Molonglo Gorge,
Australian Capital Territory

APPENDIX A4

Running line collisions, 2011–2012 to 2015–2016 (Figure 5)

		SA	NSW	NT	TAS	VIC	ACT	WA	Total
Between In-Service Passenger Trains	2011–12	0	0	0	0	n/a	0	n/a	**0**
	2012–13	0	0	0	0	n/a	0	n/a	**0**
	2013–14	0	0	0	0	0	0	n/a	**0**
	2014–15	0	0	0	0	0	0	n/a	**0**
	2015–16	0	0	0	0	1	0	0	**1**
In-Service Passenger Train & Other Train	2011–12	0	0	0	0	n/a	0	n/a	**0**
	2012–13	0	0	0	0	n/a	0	n/a	**0**
	2013–14	0	0	0	0	0	0	n/a	**0**
	2014–15	0	0	0	0	2	0	n/a	**2**
	2015–16	0	1	0	0	0	0	0	**1**
Not Invloving In-Service Passenger Train	2011–12	1	3	0	0	n/a	0	n/a	**4**
	2012–13	1	3	0	1	n/a	0	n/a	**5**
	2013–14	0	3	0	0	4	0	n/a	**7**
	2014–15	1	3	0	0	2	0	n/a	**6**
	2015–16	0	3	0	0	0	0	1	**4**

APPENDIX A5

Railway crossing collision between train and road vehicle, 2011–2012 to 2015–2016 (Figure 6)

		SA	NSW	NT	TAS	VIC	ACT	WA	Total
Passenger Train	2011–12	0	3	0	0	n/a	0	0	**3**
	2012–13	0	0	0	0	n/a	0	0	**0**
	2013–14	1	0	0	0	12	0	0	**13**
	2014–15	1	1	0	0	10	0	0	**12**
	2015–16	0	2	0	0	13	0	0	**15**
Freight Train	2011–12	3	6	1	2	n/a	0	0	**12**
	2012–13	1	4	0	1	n/a	0	0	**6**
	2013–14	2	1	0	1	2	0	0	**6**
	2014–15	1	3	0	1	0	0	0	**5**
	2015–16	1	3	0	0	2	0	2	**8**
Other Train	2011–12	1	0	0	0	n/a	0	0	**1**
	2012–13	1	1	0	0	n/a	0	0	**2**
	2013–14	0	0	0	0	2	0	0	**2**
	2014–15	1	0	0	0	1	0	0	**2**
	2015–16	2	1	0	1	0	0	0	**4**

APPENDIX A6

Track and Train KM, July 2015 to June 2016
WA track and train km from 2 November 2015

Category	SA	NSW	NT	TAS	VIC	ACT	WA	Total
Passenger Train kilometres (million km)	6.2427	46.6873	0.1869	0.0448	35.2775	0.0036	14.2951	**102.7**
Freight Train kilometres (million km)	7.3321	19.1547	1.2519	0.7311	3.7360	0.0013	20.3346	**52.5**
Total km of track managed	4716	9793	1738	909	5726	16	11305	**34202**

APPENDIX B

NORMALISED SUMMARY OF MAIN DATA

This appendix provides the key data from the body of the report in normalised form to present a national rate for ONRSR jurisdictions of SA, NT, TAS, NSW, VIC, ACT, WA.

Figure 2

Passenger Fatalities (all)	0.020 per million Passenger Train kms
Workforce Fatalities (all)	0.006 per million Train kms
Public Fatalities (all)	0.041 per million Train kms
Trespass Fatalities (all)	0.502 per million Train kms

Figure 3

Heavy Rail Passenger train running line derailment	0.010 per million Passenger Train kms
Light Rail Passenger train running line derailment	0.010 per million Passenger Train kms
Tourist and Heritage Passenger train running line derailment	0.039 per million Passenger Train kms
Other Passenger train running line derailment	0.020 per million Passenger Train kms

Figure 4

Freight train running line derailment	0.533 per million Freight Train kms
Light engine freight train running line derailment	0.038 per million Freight Train kms

Figure 5

Running Line Collision between in-service passenger trains	0.010 per million Passenger Train kms
Running Line Collision between in-service passenger train & other train	0.006 per million Train kms
Running Line Collision not involving in-service passenger train	0.076 per million Freight Train kms

Figure 6

Level crossing collision between passenger train and road vehicle	2.576 per thousand public road level crossings*
Level crossing collision between freight train and road vehicle	1.374 per thousand public road level crossings*
Level crossing collision between other train and road vehicle	0.687 per thousand public road level crossings*

* Numbers of public road level crossings sourced from the Australian Level Crossing Assessment Model (ALCAM) for SA, NT, TAS, NSW, VIC, ACT and WA

APPENDIX C

SCOPE AND METHODS

GEOGRAPHIC COVERAGE

Descriptions and statistics in this report generally apply only to railways within the states and territories regulated under the RSNL as of 30 June 2016 — South Australia, New South Wales, Tasmania, Northern Territory, Victoria, the Australian Capital Territory and Western Australia.

RAILWAY OPERATIONS

The analysis covers all railway operations in each state and territory administered under the RSNL. Nine Victorian railways continue to be regulated under local Victorian law administered by Transport Safety Victoria (TSV). These comprise the metropolitan tram operator and 8 standalone tourist and heritage railways.

REPORTING PERIOD

A minimum reporting period of 1 July 2015 to 30 June 2016 applies to this report. For Western Australia, data was available from 2 November 2015 — the date that ONRSR took up regulatory responsibility for the state. Longer term data was used when available, for example, to examine incident trends over time.

DATA AND SOURCES

Notifiable occurrence data is largely based on reports submitted to ONRSR by Rail Transport Operators in accordance with section 121 of the RSNL and Rail Safety National Law National Regulations 2012 (SA) and Rail Safety National Law (WA) Regulations 2015 (National Regulations). Data collected by previous state regulators prior to ONRSR and used in this report were collected under different legislative regimes. The sources of notifiable occurrence records were:

- South Australia — ONRSR collected data from 20 January 2013 onwards; the Department of Planning, Transport and Infrastructure (DPTI) data prior
- New South Wales — ONRSR collected data from 20 January 2013 onwards; the Independent Transport Safety Regulator (ITSR) data prior
- Tasmania — ONRSR collected data from 20 January 2013 onwards; the Department of Infrastructure, Energy and Resources (DIER) data prior
- Northern Territory — ONRSR collected data from 20 January 2013 onwards; Department of Lands and Planning (DLP) data prior
- Victoria — ONRSR collected data from 19 May 2014 onwards; Transport Safety Victoria (TSV) data prior
- The Australian Capital Territory — ONRSR collected data from 20 November 2014 onwards
- Western Australia — ONRSR collected data from 2 November 2015 onwards

Activity data (for example, train kilometres travelled) is based on monthly returns supplied by Rail transport Operators in accordance with section 120(3) of the RSNL. The specific information to be provided is defined in clause 56 of the National Regulations.

DEFINITIONS

Most of the statistics in this report are based on the top event occurrence category definitions of the national occurrence classification guideline, OC-G1 2013. Data collected by previous state and territory regulators were classified under similar but different classification standards.

Some report-specific definitions are used and these are generally described in the body of the report. Noteworthy cases are:

Non-fatal injury
the national occurrence guideline defines two categories of non-fatal injury:

- serious injury — requiring admittance to hospital; and
- minor injury — requiring medical attention but not hospital admission.

The quality of injury coding varies markedly within and between sources for reasons including:

- absence of injury-related data items, for example, severity, description, person type;
- reduction of non-fatal injury to presence /absence;
- little or no information on the nature of the injury and/or the medical attention received;
- use of alternative severity criteria such as occupational-type injury scales ('lost time injury');
- confusion over concepts such as health-related condition versus energy-related damage / injury; and
- different conventions applied for a given injury in the absence of admission information.

Serious and minor injury
When these terms are used they have the same meaning as the definition in the national occurrence classification scheme (noting judgement is required in some cases).

Strike
Is a train or rolling stock colliding with a person.

Data comparability
Issues of consistency are relevant both within the report and between this report and other information products, for example, the former ATSB safety statistics bulletin.

Internal consistency
Statistics for a given incident category may differ between sections of this report because definitions and 'top event' conventions vary according to need. For example, some benchmarking statistics have different definitions to ONRSR and hence the scope of ONRSR incidents used in these comparisons have been aligned to the benchmarking definitions.

Comparability with other sources
The data within this report may differ to other sources that utilise the same data sources and coding specifications. This will be due in part to the specific data collection and preparation methods used for this report, which included identification and correction of errors in historical data.

Past and future releases
The statistics presented in this report may be subject to future change as ONRSR develops and refines its systems for data capture, validation and reporting.

[11] For example, whether or not the person was admitted to hospital which is the basis for defining serious injury

[12] Australian Transport Safety Bureau, Australian Rail Safety Occurrence Data, 1 July 2002 to 30 June 2012, ATSB Transport Safety Report, RR-2012-00, ATSB, Canberra, 2012

Old Ghan train,
Alice Springs,
Northern Territory

Black Squid Design

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