

RAIL SAFETY REPORT 2016-2017



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SAFE RAILWAYS FOR AUSTRALIA

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THE REGULATOR'S MESSAGE



I'm frequently amazed by the seemingly endless procession of new technologies that are constantly changing the way we live, work and do business. The boundaries are being pushed ever further by entities and individuals alike, and the Australian rail industry is no exception.

Over the last 12 months we have seen significant advances in next generation systems, be it the evolution of the driverless train or the shift towards a wireless world and communication-based train control. This year, more than ever, the Office of the National Rail Safety Regulator (ONRSR) has faced new challenges, been asked new questions and been reminded just how exciting and important the work we do really is.

But amid the growing clamour to be smarter, faster, bigger and better is the ever present need to be safe.

ONRSR's Rail Safety Report 2016-2017 documents the safety performance of rail transport operators across this dynamic and increasingly high tech landscape. In keeping with the evolutionary theme, it is the first such record produced since the passage of *Rail Safety National Law* (RSNL) in Queensland which gave ONRSR jurisdiction in every Australian state and territory.

The report paints a picture of an industry properly engaged with its safety responsibilities and cognisant of the fact that even the most advanced new systems must still be underpinned by old fashioned human vigilance. Reassuringly, the statistics presented in the pages that follow demonstrate that Australia's rail networks

remain among the safest in the developed world. But, of course there are also the none-too subtle reminders that accidents happen.

ONRSR is committed to continuous improvement and through this report I hope you will get a clear picture of how we use increasingly valuable data to progress the rail safety cause. By finding the right balance between what online systems and reports tell us and what we see, touch and feel out in the field, we have detailed our national priorities. While these priorities are not our exclusive front line focus, they will be very much the foundation of our risk-based regulatory approach in the short to medium term.

Once again every effort has been made to produce an important industry resource that complements the ongoing guidance and advice ONRSR provides. Whether you are embracing the very latest in technology or just doing things the way they've always been done, I'm confident that when considered carefully the information within this report can not only pose important questions but also provide really effective solutions.

Progress is indeed inevitable and only by embracing innovation will we make the next game-changing advances. But progress cannot come at any cost. Only a safer rail industry is a better rail industry.

Sue McCarrey
National Rail Safety Regulator

KEY ACRONYMS

ALCAM

Australia 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 Guideline

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

ABOUT THE OFFICE OF THE NATIONAL RAIL SAFETY REGULATOR

OUR VISION

Safe railways for Australia

OUR VALUES

Integrity, Respect, Independence, Diligence and Excellence

FUNCTIONS

The functions of ONRSR are legislated in the *Rail Safety National Law (RSNL)*¹ and described in ONRSR's Statement of Intent². 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
- 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, governments 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 2016–2017 financial year ONRSR had responsibility for rail safety regulation in the jurisdictions of South Australia, New South Wales, Tasmania, Northern Territory, Victoria, Australian Capital Territory and Western Australia.

Although outside the scope of this report, ONRSR's coverage expanded on 1 July 2017 when the RSNL was enacted in Queensland. The scope of ONRSR's regulatory responsibility from 1 July 2017 is shown in Figure 1.

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, 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
- designing and prioritising regulatory activities and outcomes in a way that best maintains and improves rail safety.

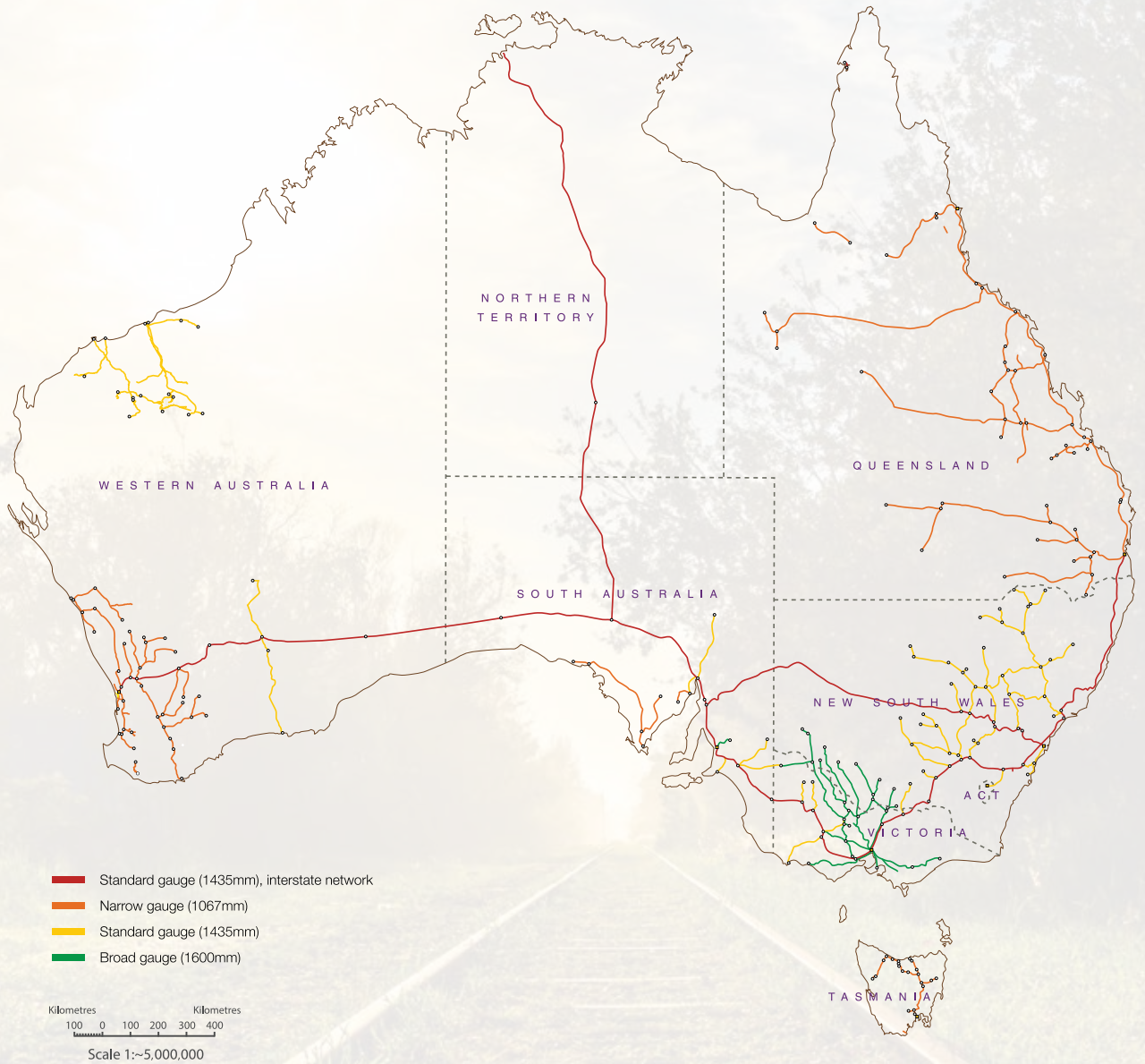
Applying a risk-based approach to regulation has parallels to the RSNL's requirement for rail transport operators to apply a risk-based approach to safety management. It also enables ONRSR to focus resources on the basis of risk and to improve the effectiveness of regulatory interactions. ONRSR uses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

FIGURE 1

Major Inter and Intrastate Networks Administered under the *Rail Safety National Law* as of 1 July 2017.



Sourced from the Australasian Railway Association

ABOUT THIS REPORT

ONRSR's Rail Safety Report provides a summary of rail safety performance in the 2016–2017 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.

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 2016–2017 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 2016 to 30 June 2017 applies to this report. 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 former national occurrence classification guideline³ and ONRSR's reporting requirements for notifiable occurrences⁴. 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.

In June 2017, ONRSR released the Reporting Requirements for Notifiable Occurrences to replace the occurrence classification guideline (OC-G1) and the occurrence notification standard (ON-S1). The new document was introduced to provide greater clarity on what is and isn't reportable for each occurrence category. It did not alter the main categories of occurrence that must be notified to ONRSR, but did include some refinement of subcategories and definitions. The new document assists operators to report more accurately, thus improving the quality and relevance of rail safety data collected by ONRSR. Further details can be found in Appendix C.

³ Office of the National Rail Safety Regulator, Classifying Notifiable Occurrences, Occurrence Classification Guideline (OC-G1), Version 1.1, ONRSR, Adelaide, March 2013.

⁴ Office of the National Rail Safety Regulator, Reporting Requirements for Notifiable Occurrences, Version 1, ONRSR, Adelaide, June 2017.

ONRSR'S MODEL FOR

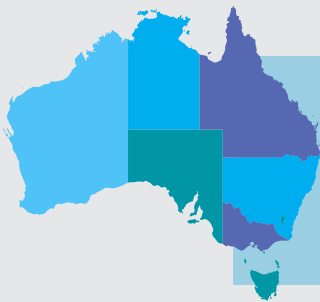
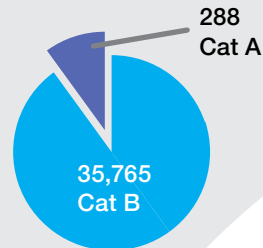
01 COLLECT REGULATORY DATA

ONRSR collects regulatory data from a variety of sources, including operator reporting, third party reports and through its regulatory activities across industry.

FATALITIES (FY 16/17)

Total	89
Suspected Suicide	73
Trespass	10
Public	5
Passenger	1
Worker	0

Notifiable Occurrences (FY 16/17)



Network Statistics (FY 16/17)

- 700 million+ passenger journeys.
- 111.8 million passenger train km.
- 65.4 million freight train km.
- 34,395 track km.

Data Driven Regulatory Intelligence Pg 29

Find out how ONRSR is improving its data collection and analytics capabilities.

04 UNDERTAKE REGULATORY ACTIVITIES

ONRSR implements its risk-based decisions and plans by interacting with industry using a variety of tools and measures, ranging from publication of guidelines to enforcement actions.

ACTIVITY
STATISTICS
FOR FY 16/17

110

Site Visits

41

Variations to accreditation completed

176

Inspections

13

Improvement notices issued

65

Audits

Compliance Project Update Pg 33

An update on ONRSR's progress across its four national priorities for 2017.

Safety Improvement Update Pg 38

Read about the Safety Improvement work ONRSR has undertaken with industry during the 16-17 financial year.

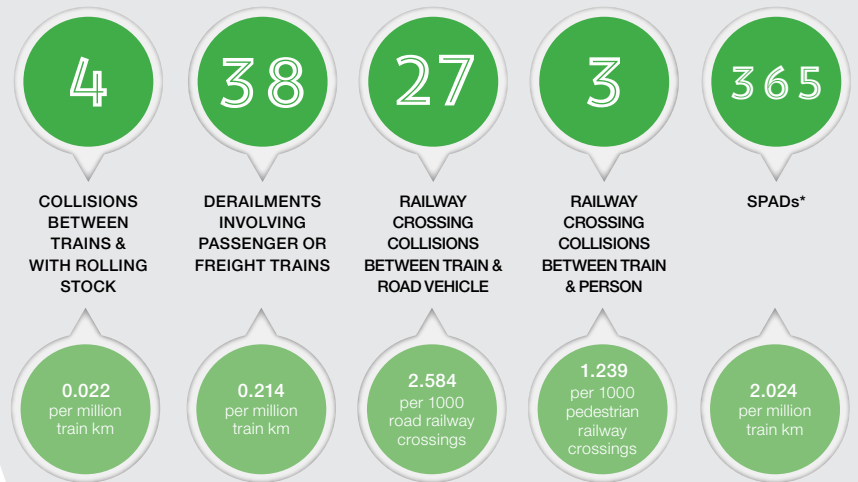
Major Projects Update Pg 39

Find out about how ONRSR is engaging with major rail projects across Australia.

RISK-BASED REGULATION

ANALYSE REGULATORY DATA

By analysing and drawing upon the regulatory data it collects, ONRSR builds a picture of risks to rail safety across the industry.



Rail Safety Statistical Summary Pg 8

Provides an in-depth look at rail safety statistics for 2016-2017 financial year.

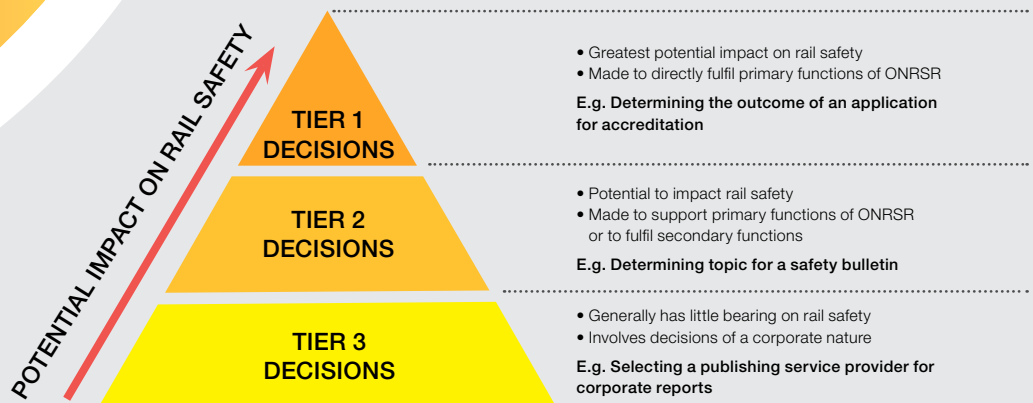
* Driver misjudged, completely missed while running, started against signal only.

ANALYSIS
02

DECISIONS
03

MAKE RISK-BASED REGULATORY DECISIONS

Based on its understanding of risks to rail safety, ONRSR makes informed regulatory decisions to best drive and influence risk reduction across industry. ONRSR categorises its regulatory decisions into one of three tiers of importance.



Identifying ONRSR's National Priorities

Pg 43

A risk-based regulation case study of how ONRSR identifies its national priorities

RAIL SAFETY

STATISTICAL SUMMARY



A large part of ONRSR's regulatory intelligence is gained from the thousands of rail safety occurrences reported each year. 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 2016–2017 financial year. They supplement the statistics that are provided to industry every six months via the national safety data area of ONRSR's website⁵. The report continues, and adds to, 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.

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, as well as a normalised summary of the main data.

RAILWAY-RELATED FATALITY

There were 89 fatalities in the 2016–2017 financial year on railways regulated under the RSNL. These consisted of:

- 73 incidents involving suspected suicide
- nine incidents involving trespassers struck by rolling stock
- four fatalities to members of the public involved in railway crossing collisions between a train and a road vehicle
- one incident involving the assault of a member of the public at a train station
- one incident involving a trespasser impaling themselves on a boundary fence
- one incident involving a passenger who fell down the stairs of a train.

The five-year history of railway-related fatality is summarised in Figure 2.

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 this table 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 suicides as these are also excluded from overseas data.

The comparison is most valid for the Great Britain (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 uncertainties in data collection methods.

The fatality rate for ONRSR's area of operation over the three-year period (0.083 fatalities per million train km) is higher than that of GB (0.073) but well below that of the US (0.788). 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.

⁵ The national safety data area of ONRSR's website presents statistics to allow operators to benchmark their safety performance against industry and sector averages. <<https://www.onrsr.com.au/resource-centre-document-finder/national-safety-data>>

RAILWAY-RELATED SERIOUS INJURY

There were 84 serious injuries in the 2016–2017 financial year on railways regulated under the RSNL. Over 45% of these related to slips, trips and falls while approximately 26% related to attempted suicide.

A summary of some of the more significant railway-related serious injuries is presented in Table 3.

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 2016–2017 financial year on railways regulated under the RSNL, three of which involved empty passenger trains that were not in-service.

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

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

A comparison of the rate of mainline passenger train derailments between ONRSR-regulated railways and selected overseas railways is summarised in Table 5. The ONRSR data in this table are a subset of the derailments summarised in Figure 3, and only includes derailments involving in-service commercial heavy rail passenger trains together with mainline tourist and heritage passenger operations.

FREIGHT TRAIN DERAILMENT

Freight train derailment risk is generally observed to have a higher frequency of occurrence but a lower consequence of event when compared to passenger train derailment. However, derailments of freight trains still expose train crews, recovery teams and, depending on the location of the derailment, members of the public to potential harm.

There were 30 running line derailments involving freight trains in the 2016–2017 financial year. No injuries were reported for any of these incidents.

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

A summary of some of the more significant freight train derailments is presented in Table 6.

A comparison of the rate of running line freight train derailment between ONRSR regulated railways and selected overseas railways is summarised in Table 7.

DERAILMENT NOT INVOLVING PASSENGER OR FREIGHT TRAINS

In the 2016–2017 financial year there were 23 derailments associated with rolling stock used for track maintenance with no serious injuries reported for any of these incidents. These events tend to occur at low speed and on track closed to normal traffic. Almost 80% of these derailments involved road rail vehicles (RRVs).

A summary of some of the more significant derailments not involving passenger or freight trains is presented in Table 8.

TABLE 1

Railway fatalities – ONRSR, Great Britain and United States

SA, NSW, NT, Tas., Vic., and ACT data for full period, WA data from 2 November 2015 onwards. Fatalities involving passengers, workforce, public and trespass (excluding suspected suicide).

		2014-15	2015-16	2016-17	3 YEAR
ONRSR (SA, NSW, NT, Tas., Vic., ACT, WA)	Fatalities	9	12	16	37
	Train Km (million)	115.7	153.4	177.3	446.4
	Rate	0.078	0.078	0.090	0.083
Great Britain (GB)	Fatalities¹	39	45	39	123
	Train Km (million)²	558.5	556.7	572.2	1687.4
	Rate	0.070	0.081	0.068	0.073
United States (US)	Fatalities³	765	779	846	2390
	Train Km (million)³	1068.6	985.4	977.9	3031.9
	Rate	0.716	0.791	0.865	0.788

¹ Source: Rail Safety and Standards Board, Annual Safety Performance Report 2016/17, RSSB, UK, 2017.

² Source: Rail Safety and Standards Board, Rail KM on request (provided 7 October 2017), RSSB, UK, 2017.

³ Source: Source: Federal Railroad Administration Office of Safety Analysis: online database query (accessed 27 September 2017) <http://safetydata.fra.dot.gov>.

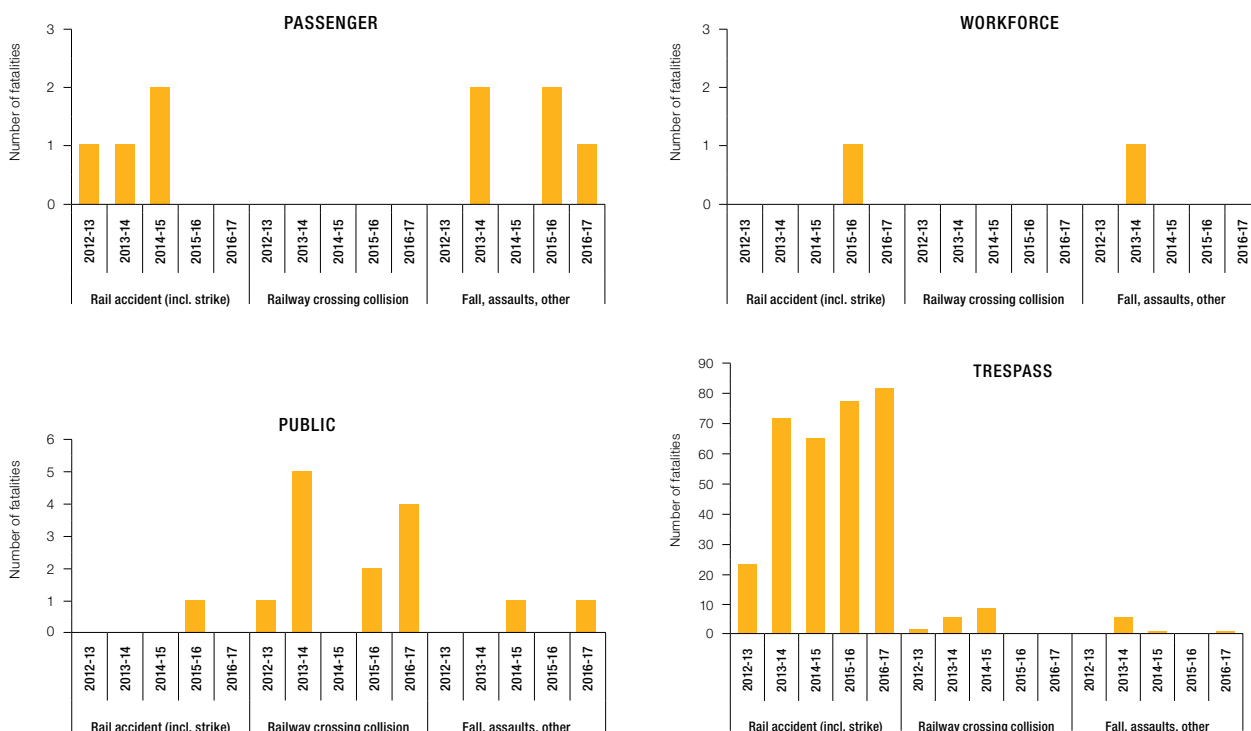


FIGURE 2

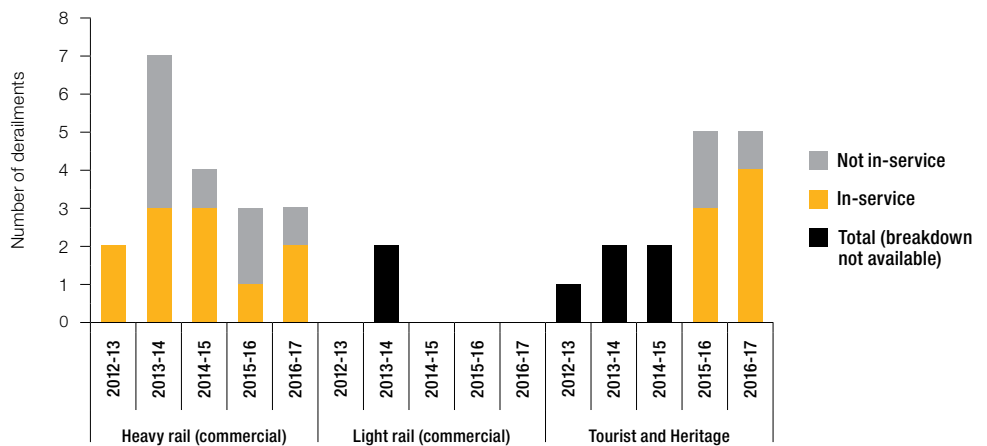
Railway related fatalities, July 2012 to June 2017

SA, NSW, NT and Tas. data is for full period, Vic. data is from 2013–2014 onwards, ACT data is from July 2014 onwards, WA data is from 2 November 2015 onwards. Non-passenger fatalities at railway crossings are classified as Public if neither trespass nor suicide is suspected. Railway crossing collision excludes suspected suicide at railway crossings, which are classified as Rail accident (incl. strike) involving Trespass.

TABLE 2**Fatalities involving passengers, workforce and public, excluding trespass or suspected suicide, July 2016 to June 2017**

Railway operations within SA, NSW, Tas., NT, Vic., ACT and WA regulated under the RSNL.
Excludes fatality associated with trespass or suspected suicide.

Date	Description	Location
10/08/2016	Two elderly passengers fell owing to the shunting force caused by two trains amalgamating. One passenger fell down the stairs and sustained injuries to her head and back. She died fifteen days later.	Central Station, NSW
22/08/2016	There was a collision between a passenger train and a car at a level crossing. The occupant of the car was killed in the collision.	Mittons Rd level crossing, Bairnsdale Vic.
14/09/2016	There was a collision between a passenger train and a car at a level crossing. Two occupants of the car were killed in the collision.	Union Rd level crossing, Surrey Hills, Vic.
23/11/2016	A member of the public was fatally stabbed at a bus interchange at a railway station.	Fremantle Station, WA
14/06/2017	There was a collision between a passenger train and a car at a level crossing. The occupant of the car was killed in the collision.	Andrew St level crossing, Kyogle, NSW

**FIGURE 3****Passenger train running line derailment, July 2012 to June 2017**

SA, NSW, NT and Tas. data is for full period, Vic. data is from 2013–2014 onwards, ACT data is from July 2014 onwards, WA data is from 2 November 2015 onwards. Includes derailments of passenger trains on non-running lines affecting the safety of running lines.

TABLE 3**Selected railway-related serious injuries involving passengers, workforce and members of the public, July 2016 to June 2017**

Railway operations within SA, NSW, Tas., NT, Vic., ACT and WA regulated under the RSNL.

Date	Description	Location
1/10/2016	A person was struck and seriously injured by an urban passenger train while trying to return back onto the platform from the pit.	Oatley, NSW
4/11/2016	A person was struck and seriously injured by an urban passenger train after jumping crossing protection at a railway crossing protected with flashing lights and boom barriers.	Gosnells, WA
23/12/2016	A person was struck and seriously injured by an urban passenger train after jumping crossing protection at a railway crossing protected with flashing lights and boom barriers.	Fremantle, WA
31/01/2017	A person was struck and seriously injured by an urban passenger train at a pedestrian railway crossing protected with a maze.	Prospect, SA
14/02/2017	Works were being undertaken in the rail freight terminal when a backhoe reversed into temporary fencing. This caused the fencing panels to dislodge and strike another worker, resulting in serious injuries.	West Melbourne, Vic.
18/03/2017	A passenger stumbled out of the crowd on a platform and was struck by an approaching urban passenger train, suffering serious injuries.	Footscray, Vic.
27/03/2017	An unidentified male was being pursued by a protective services officer when he struck the side of a departing urban passenger train, suffering serious injuries.	Preston, Vic.
6/05/2017	A trespasser fell and suffered serious injuries while trying to climb between moving wagons.	Brookton, WA
14/06/2017	A maintainer was seriously injured when a wagon on jacks was struck and dislodged.	Adelaide Freight Terminal, SA

TABLE 4**All passenger train running line derailments, July 2016 to June 2017**

Railway operations within SA, NSW, Tas., NT, Vic., ACT, and WA regulated under the RSNL.

Date	Description	Location
13/07/2016	There was a collision between a passenger train and a semi-trailer at a level crossing which resulted in the locomotive and all four carriages derailing. The driver of the semi-trailer, the train driver, conductor and 19 passengers all sustained injuries and were conveyed to hospital.	Phalps Rd level crossing, Pirron Yallock, Vic.
08/10/2016	A locomotive of a tourist and heritage passenger train derailed while traversing a level crossing. No injuries were reported.	Domenics Shaft Way level crossing, Moonta, SA
28/01/2017	An empty tourist and heritage passenger tram derailed. No injuries were reported.	Whiteman Park, WA
15/02/2017	There was a collision between a passenger train and a road vehicle on the running line which resulted in derailment of the lead bogie. Eight passengers were treated for minor injuries.	Kangaroo Flat, Vic.
14/03/2017	An empty passenger train passed a signal at stop resulting in a derailment at catch points.	Port Kembla North, NSW
06/04/2017	Two of twelve carriages of a tourist and heritage passenger train derailed when it passed through a set of points. One passenger reported minor injuries.	Moonta Station, SA
18/04/2017	A loco hauling a tourist and heritage passenger train derailed. A subsequent communications failure resulted in passengers walking 4km back to the station. No injuries were reported.	Ida Bay, Tas.
20/05/2017	A tourist and heritage tram derailed at low speed while passing through points. No injuries were reported.	Whiteman Park, WA

TABLE 5**Passenger train running line derailments – ONRSR, Great Britain and United States**

SA, NSW, NSW, Tas., Vic. And ACT data is for full period, WA data is from 2 November 2015 onwards. 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.

		2014-15	2015-16	2016-17	3 YEAR
ONRSR (SA, NSW, NT, Tas., Vic., ACT, WA)	Derailments	4	1	2	7
	Passenger Train Km (million)	76.5	100.2	109.7	286.4
	Rate	0.052	0.010	0.018	0.024
Great Britain (GB)	Derailments¹	0	3	2	5
	Passenger Train Km (million)²	517.5	521.8	529.2	1568.5
	Rate	0.000	0.006	0.004	0.003
United States (US)	Derailments³	10	9	11	30
	Passenger Train Km (million)³	178.6	174.9	179.1	532.6
	Rate	0.056	0.051	0.061	0.056

¹ Source: Rail Safety and Standards Board, Annual Safety Performance Report 2016/17, RSSB, UK, 2017.

² Source: Rail Safety and Standards Board, Rail KM on request (provided 7 October 2017), RSSB, UK, 2017.

³ Source: Source: Federal Railroad Administration Office of Safety Analysis: online database query (accessed 27 October 2017) <http://safetydata.fra.dot.gov>.

TABLE 6**Selected freight train running line derailments, July 2016 to June 2017**

Railway operations within SA, NSW, Tas., NT, Vic., ACT and WA regulated under the RSNL.

Date	Description	Location
07/08/2016	A freight train was stopped by the driver after a wagon structurally failed, causing the wagon to derail. No injuries were reported.	Edillilie, SA
28/08/2016	Four loaded wagons on a freight train derailed at catch points with two of the wagons fouling the main line. No injuries were reported.	West Wyalong, NSW
28/08/2016	An empty grain train derailed four wagons and travelled for approximately 5km in a derailed state causing damage to infrastructure. No injuries were reported.	Koolbury, NSW
10/10/2016	Eighteen wagons of a loaded ore train derailed damaging 400 metres of track and blocking the main line. No injuries were reported.	Yandi Junction, WA
16/01/2017	A grain train derailed seven wagons while departing the siding. Three of the wagons overturned. The train fouled all lines and the Goolhi Rd level crossing. No injuries were reported.	Emerald Hill, NSW
18/01/2017	There was a collision between a freight train and a grader at a level crossing which derailed three axles on the lead locomotive. The grader driver was taken to hospital.	Public road level crossing, Bogan Gate, NSW
27/01/2017	A loaded ore train derailed seven wagons. No injuries were reported.	Hampton, WA
15/02/2017	A freight train derailed one of 39 wagons and travelled approximately 8km in a derailed state causing considerable damage to the track. No injuries were reported.	Eurabba, NSW
24/02/2017	A loaded ore train consisting of 268 wagons had 46 wagons derail, damaging 500 metres of track and blocking both main lines. Wagons were reported to be stacked on top of each other as a result of the derailment. No injuries were reported.	Abydos, WA
16/05/2017	While entering a siding it was noticed that a freight train had derailed two wagons. Upon further inspection it became apparent that the wagons had been in a derailed state for 2 kilometres causing damage to points and signal cables. No injuries were reported.	Rooty Hill, NSW
12/06/2017	Twelve wagons of a loaded ore train derailed causing 300 metres of damage to infrastructure and fouling a parallel running line.	Spring, WA
16/06/2017	The lead locomotive of a freight train derailed after striking a cow while travelling at 110 km/h.	Between Haig and Nurina, WA
20/06/2017	A freight train derailed one bogie causing a fire. The cause of the derailment was suspected screwed journal. No injuries were reported.	Mainline, near Gillam Creek Crossing, WA

TABLE 7**Freight train running line derailments – ONRSR, Great Britain and United States**

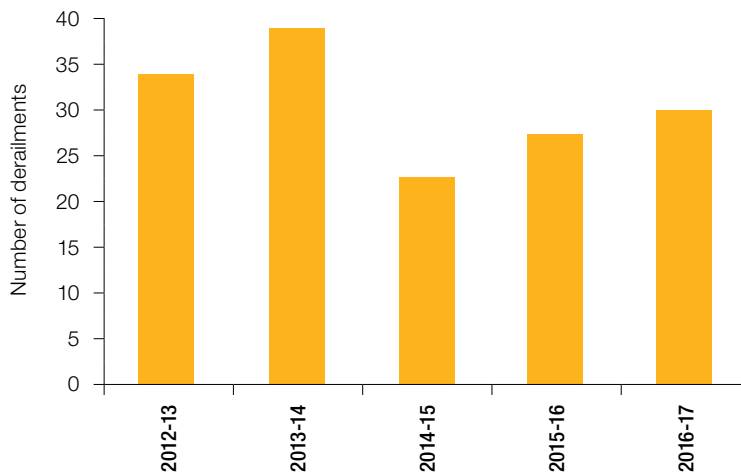
SA, NSW, NT, Tas., Vic. and ACT data is for full period, WA data is from 2 November 2015 onwards. Includes derailments of freight trains on non-running lines affecting the safety of running lines. Excludes rolling stock derailments such as light locomotives and wagons.

		2014-15	2015-16	2016-17	3 YEAR
ONRSR (SA, NSW, NT, Tas., Vic., ACT, WA)	Derailments	23	28	30	81
	Freight Train Km (million)	33.4	52.5	65.4	151.3
	Rate	0.689	0.533	0.459	0.535
Great Britain (GB)	Derailments¹	14	6	3	23
	Freight Train Km (million)²	41.0	34.9	38.6	114.5
	Rate	0.341	0.172	0.078	0.201
United States (US)	Derailments³	309	248	266	823
	Freight Train Km (million)³	889.9	810.5	789.7	2490.1
	Rate	0.347	0.306	0.337	0.331

¹ Source: Rail Safety and Standards Board, Annual Safety Performance Report 2016/17, RSSB, UK, 2017

² Source: Rail Safety and Standards Board, Rail KM on request (provided 7 October 2017), RSSB, UK, 2017

³ Source: Source: Federal Railroad Administration Office of Safety Analysis: online database query (accessed 27 October 2017) <http://safetydata.fra.dot.gov>

**FIGURE 4****Freight train running line derailments, July 2012 to June 2017**

SA, NSW, NT and Tas. data is for full period, Vic. data is from 2013–2014 onwards, ACT data is from July 2014 onwards, WA data is from 2 November 2015 onwards. Includes derailments of freight trains on non-running lines affecting the safety of running lines. Excludes rolling stock derailments such as light locomotives and wagons.

TABLE 8**Selected derailments not involving passenger or freight trains, July 2016 to June 2017**

Railway operations within SA, NSW, Tas., NT, Vic., ACT and WA regulated under the RSNL.

Date	Description	Location
03/09/2016	An RRV derailed all four wheels due to a broken rail. While minor damage was sustained to the vehicle, no injuries were reported.	Tarcoola to West Kalgoorlie, WA
11/12/2016	An RRV derailed after hitting a cow. While minor damage was sustained to the vehicle, no injuries were reported.	Kanga, WA
03/01/2017	The driver of a RRV applied the brakes upon seeing kangaroos on the track. This caused rocks and ballast to pile up in front of the wheels resulting in the wheels riding up and derailling at a private road level crossing. No injuries were reported.	Camurra to North Star, NSW
04/04/2017	An RRV derailed while crossing points. The signalman thought the vehicle was clear and changed the points resulting in its derailment. No injuries were reported.	Menzies Creek, Vic.
29/06/2017	A locomotive was incorrectly moved over a derailer while being shunted into a siding. The locomotive derailed and subsequently blocked the mainline. No injuries were reported.	Port Germein, SA

COLLISION 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), the types of trains involved and the speed the trains were travelling at the time of the collision. 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 four running line collisions involving rolling stock in the 2016–2017 financial year on railways regulated under the RSNL. These consisted of:

- two low-speed, rear-end collisions between track maintenance trains
- two collisions between a locomotive and a wagon.

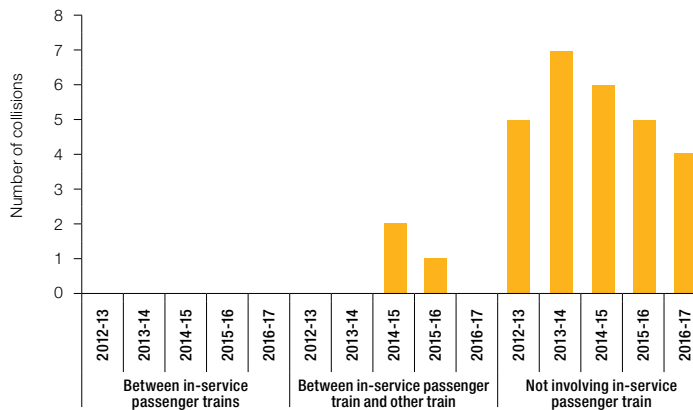
The five-year history of running line collisions is summarised in Figure 5.

A summary of running line collisions is presented in Table 9.

TABLE 9**Running line collisions, July 2016 to June 2017**

Railway operations within SA, NSW, Tas., NT, Vic., ACT and WA regulated under the RSNL.

Date	Description	Location
20/08/2016	A freight train parted between the rear locomotive and the first wagon. The wagons then collided with the locomotive causing damage to the rear locomotive and two of the wagons.	Myamin to Menzies, WA
08/11/2016	The leading track maintenance train in a convoy of two trains had problems with its vigilance system causing the brakes to be applied. The following track maintenance train subsequently collided with the stationary train at low speed. No injuries were reported.	Esperance, WA
30/01/2017	A light engine performing a run around movement collided with the last wagon of the train consist it was due to be coupled to. This caused two wagons to derail. No injuries were reported.	Marrickville, NSW
10/06/2017	The leading track maintenance train in a convoy was brought to rest in advance of a level crossing whilst the driver waited for the crossing to activate. The following track maintenance train subsequently collided with the rear of the stationary train at low speed.	Nundah, NSW

**FIGURE 5****Running line collisions between trains and with rolling stock, July 2012 to June 2017**

SA, NSW, NT and Tas. data is for full period, Vic. data is from 2013–2014 onwards, ACT data is from July 2014 onwards, WA data is from 2 November 2015 onwards. 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.

RAILWAY CROSSING COLLISION

Railway 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 were 27 railway crossing collisions between train and road vehicle, and three collisions between train and person in the 2016–2017 financial year on railways regulated under the RSNL.

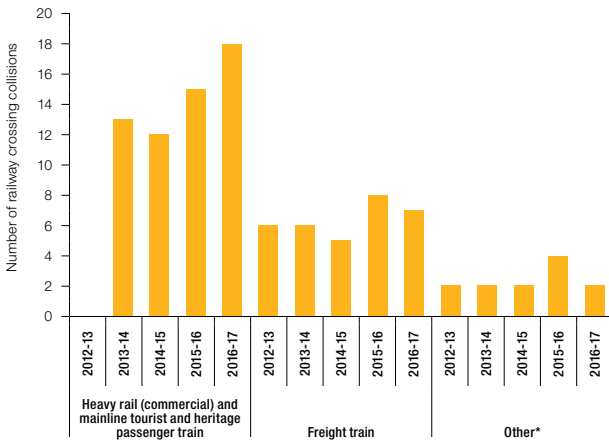


FIGURE 6
Railway crossing collisions between train and road vehicle, July 2012 to June 2017

SA, NSW, NT and Tas. data is for full period, Vic. data is from 2013–2014 onwards, ACT data is from July 2014 onwards, WA data is from 2 November 2015 onwards. Collisions between light rail passenger trains and vehicles on shared roadways are excluded. *Other consists of light rail passenger trains (commercial), isolated tourist & heritage passenger trains, track maintenance trains, RRVs and other movement of rolling stock.

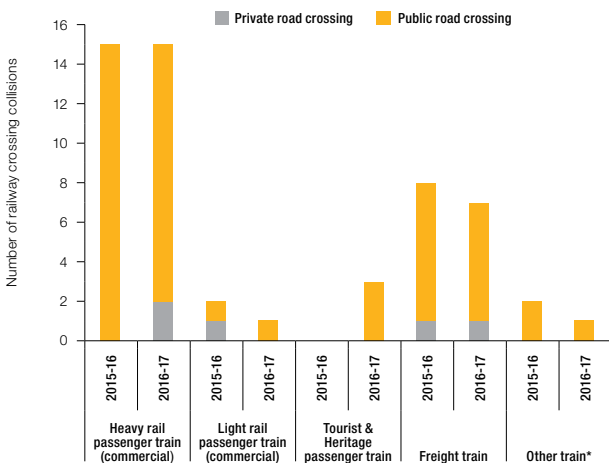


FIGURE 7
Railway crossing collisions between train and road vehicle by crossing access type, July 2015 to June 2017

SA, NSW, NT, Tas. & ACT data is for full period, WA data is from 2 November 2015 onwards. Private or public road crossing access is determined using ALCAM data where available. Where this is not available, a determination has been made based on the information provided by the operator. *Other train consists of track maintenance trains, RRVs and other movement of rolling stock.

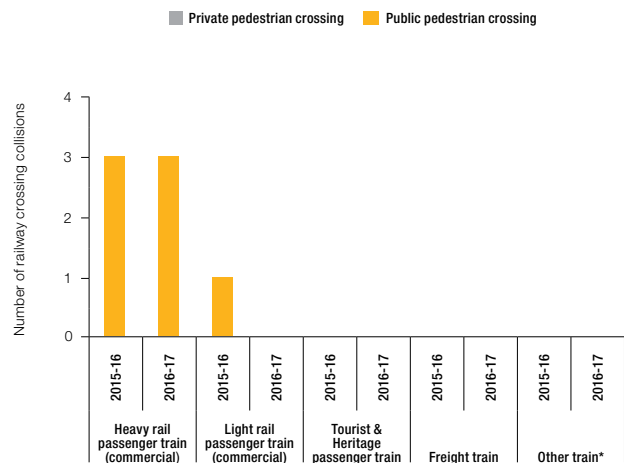


FIGURE 8
Railway crossing collisions between train and person by crossing access type, July 2015 to June 2017

SA, NSW, NT, Tas. & ACT data is for full period, WA data is from 2 November 2015 onwards. Private or public crossing access is determined using ALCAM data where available. Where this is not available, a determination has been made based on the information provided by the operator. *Other train consists of track maintenance trains, RRVs and other movement of rolling stock.

UNSAFE RAILWAY CROSSING EQUIPMENT FAILURE AND DEFECT

During the 2016-2017 financial year, ONRSR was notified of over 1200 railway crossing equipment failures and defects. Not all of these failures and defects presented the same level of rail safety risk. Some of the failures don't present any material increase in safety risk at all, whereas others result in busy railway crossings being left completely unprotected. ONRSR is more interested in the unsafe or potentially unsafe railway crossing failures as opposed to those where equipment has failed in a safe manner.

A review of all railway crossing equipment failures and defects notified to ONRSR during the 2015-2016 and 2016-2017 financial years has been undertaken to identify those failures and defects which were unsafe. An unsafe failure or defect is one that results in the railway crossing failing in such a way that it does not provide the intended level of protection to users of the crossing.

The review identified 370 unsafe equipment failures and defects affecting railway crossings on networks in Australia, regulated under the RSNL. These failures have been categorised into one of three risk levels using the criteria defined below, and are presented in Figure 9.

Category 1 (highest risk) – An equipment failure or defect resulting in:

- Complete failure of active warning devices
- Late activation of warning devices
- Premature deactivation of warning devices.

Category 2 – An equipment failure or defect resulting in:

- Failure of road boom(s) to fully lower
- Failure of pedestrian gate(s) to close or boom(s) to lower.

Category 3 (lowest risk) – An equipment failure or defect resulting in:

- Partial failure of flashing lights (individual lamp failures)
- Failure of audible warning devices (bells, sirens)
- Damaged / missing passive warning devices (e.g. signs)
- Defective locking mechanism on emergency escape gates
- Failure of pedestrian don't walk warning light(s).

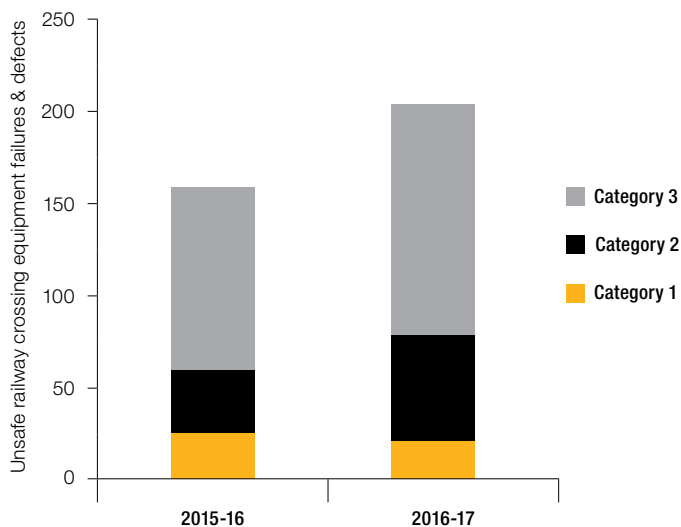


FIGURE 9

Unsafe railway crossing equipment failures and defects, July 2015 to June 2017

Railway operations within SA, NSW, Tas., NT, Vic., ACT and WA, regulated under the RSNL. SA, NSW, NT, Tas., Vic. & ACT data is for full period, WA data is from 2 November 2015 onwards. Data shown is that classified as occurrence category, 'Railway Crossing Equipment Failure/Defect', regardless of top-event, and includes only those failures and defects that resulted in the railway crossing failing in such a way that it does not provide the intended level of protection to users of the crossing.

TABLE 10**Selected railway crossing collisions between train and road vehicle, July 2016 to June 2017**

Railway operations within SA, NSW, Tas., NT, Vic., ACT and WA, regulated under the RSNL.

Date	Description	Location
13/07/2016	There was a collision between a passenger train and a semi-trailer at a level crossing protected by stop signs. This resulted in derailment of the locomotive and all four carriages. The driver of the semi-trailer, the train driver, conductor and 19 passengers all sustained injuries and were conveyed to hospital.	Phalps Rd level crossing, Pirron Yallock, Vic.
27/07/2016	There was a collision between a passenger train and a car at a level crossing protected by stop signs. The leading passenger carriage fuel tank was ripped away causing a diesel spill. The driver of the car was taken to hospital for observation.	Pogue Rd, Toolamba, Vic.
22/08/2016	There was a collision between a passenger train and a car at a level crossing protected by stop signs. The occupant of the car was killed in the collision.	Mittons Rd level crossing, Bairnsdale, Vic.
30/08/2016	There was a collision between a passenger train and a stationary car at a level crossing which led to the removal of the front bumper from the car. No injuries were reported. The crossing was equipped with bells, lights and boom barriers.	Station Rd (Mt Derrimut Rd), Deer Park, Vic.
14/09/2016	There was a collision between a passenger train and a car at a level crossing protected by bells, lights and boom gates. Two occupants of the car were killed in the collision.	Union Rd level crossing, Surrey Hills, Vic.
17/09/2016	An abandoned car was left on an unprotected crossing and was struck by a passenger train. No injuries were reported.	Unnamed public crossing, between Cook and Kalgoorlie, WA
01/11/2016	There was a collision between a freight train and an abandoned car at a level crossing. Upon inspection of the car, an unexploded cannon shell was discovered. No injuries were reported. The crossing was equipped with bells, lights and boom barriers.	Birkett St, Euroa, Vic.
31/12/2016	There was a collision between a tourist and heritage train and a car at a level crossing protected by give way signs. The car was rotated to a 45 degree angle as a result of the collision and the train came to a stop two carriage lengths beyond the level crossing. No injuries were reported.	Grantley Av, Victor Harbor, SA
18/01/2017	There was a collision between a freight train and a grader at a level crossing protected by stop signs which derailed three axles on the lead locomotive. The grader driver was taken to hospital.	Public road level crossing, Bogan Gate, NSW
23/02/2017	There was a collision between an empty cement freight train and a car at a level crossing protected by stop signs. The train took 300 metres to stop with the occupant of the car taken to hospital for observation.	Youngmans – Dulverton Rd, Dulverton, Tas.
05/04/2017	A passenger train struck a truck that was foul of a level crossing equipped with boom barriers. No injuries were reported.	Bell St, Coburg, Vic.
23/05/2017	There was a collision between a passenger train and a road vehicle at a level crossing protected by stop signs. The train driver was taken to hospital and minor damage was sustained to the train.	Smiths' private crossing, Cootamundra, NSW
07/06/2017	There was a collision between a loaded grain freight train and a utility vehicle that had failed to stop at a level crossing protected by flashing lights. The freight train was travelling at 75km/h. The utility vehicle fled the scene.	Segenhoe Rd, Aberdeen, NSW
14/06/2017	There was a collision between a passenger train and a car at a level crossing protected by stop signs. The occupant of the car was killed in the collision.	Andrew St level crossing, Kyogle, NSW

TABLE 11**Railway crossing collisions between train and person, July 2016 to June 2017**

Railway operations within SA, NSW, Tas., NT, Vic., ACT and WA, regulated under the RSNL.

Date	Description	Location
04/11/2016	A person was struck by an urban passenger train after jumping crossing protection at a railway crossing protected with flashing lights and boom barriers.	Stalker Rd, Gosnells, WA
23/12/2016	A person was struck by an urban passenger train after jumping crossing protection at a railway crossing protected with flashing lights and boom barriers.	Phillimore St, Fremantle, WA
31/01/2017	A person was struck by an urban passenger train at a railway crossing protected with a pedestrian maze.	Islington Station (Gawler end), Prospect, SA

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. The two most recent and serious accidents of this nature on railways regulated under the RSNL were at Clyde (NSW) in 2016 when a signal maintainer was struck and killed by a passenger train and at Laverton (Vic.) in 2015 when a track work supervisor was struck and seriously injured by a passenger train. Although outside ONRSR's jurisdiction at the time, there were also accidents at Guilford (WA) in 2015 and at Petrie (QLD) in May 2017, both of which involved a track worker being struck and fatally injured by a suburban passenger train.

In 2016–2017 there were no instances of track workers being struck by trains as a result of worksite protection breaches on railways regulated under the RSNL. However, there were 340 occurrences involving breaches of worksite protection rules and procedures notified to ONRSR.

An analysis of these occurrences shows a wide range of circumstances in terms of the nature of failures and the potential for harm, as shown in Figure 10.

Almost 25% of all occurrences represented breaches of a technical or procedural nature, for example, leaving protection equipment on track after work has been safely completed. These types of events generally have little likelihood of progressing to material harm.

However, almost 55% of all notified breaches represented circumstances that could lead to a worker or group of workers being struck. These ranged from events of a type with a relatively low likelihood of an adverse outcome (termed Category 3 failures) through to events of a type with a relatively high likelihood of an adverse outcome (Category 1 failures).

Just over 10% of all breaches were Category 3 failures. These involved events of a type where progression to an adverse consequence is possible but relatively remote due to various factors, including early detection and other controls being in place to prevent escalation.

Of particular concern were the 93 occurrences identified as Category 1 (27% of all incidents). These involved a type of failure where adverse consequences were probable under slightly different circumstances. In a small number of these cases an accident was averted only through the emergency action(s) of an individual such as a train driver applying emergency brakes or a worker jumping from the path of an approaching train. Some examples of the more serious Category 1 incidents are summarised in Table 12.

Track work – competency and communication has been an ONRSR national priority since 2015 and ONRSR has been engaging with industry through a program of activities to improve management of this risk, as described on page 34.

While there have been positive developments, the continued high number of serious incidents on a range of railways regulated under the RSNL has led ONRSR to redefine the scope of this priority area in 2018 to focus on unplanned and reactive track work activities.

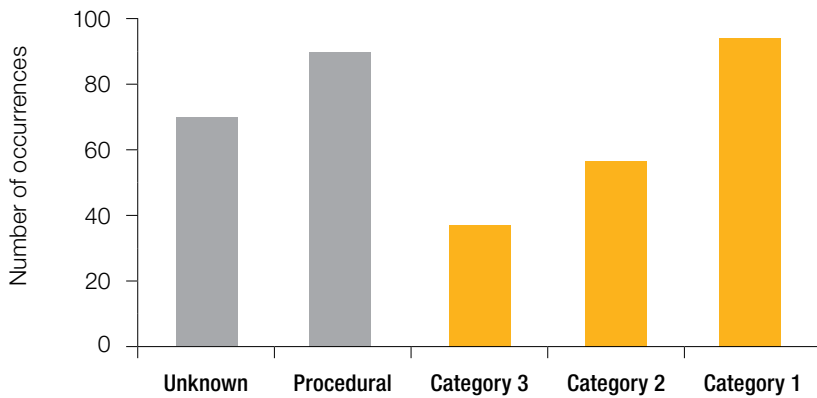


FIGURE 10

Track work safeworking rule and procedure breaches, July 2016 to June 2017

Railway operations within SA, NSW, Tas., NT, Vic., ACT and WA regulated under the RSNL. Category 1 comprises relatively higher risk incidents and Category 3 comprises relatively lower risk incidents. Procedural refers to occurrences of type unlikely to escalate to material harm.

INFRASTRUCTURE IRREGULARITIES

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 in Figure 11 as one indicator of train derailment risk.

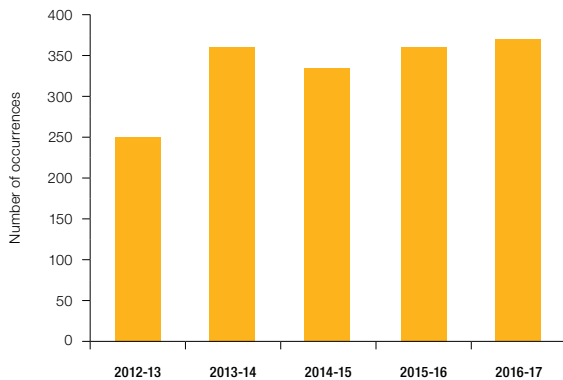


FIGURE 11

Broken rails, July 2012 to June 2017

Data shown is that classified as occurrence sub-category, 'detected outside of maintenance inspections' only. Up until June 2015 this includes top-event occurrence sub-categories only, from July 2015 data is included regardless of top-event. SA, NSW, NT and Tas. data is for full period, Vic. data is from 2013–2014 onwards, ACT data is from July 2014 onwards, WA data is from 2 November 2015 onwards.

TABLE 12**Selected worksite protection safeworking breaches, July 2016 to June 2017**

Railway operations within SA, NSW, Tas., NT, Vic., ACT and WA, regulated under the RSNL.

Date	Description	Location
25/07/2016	The driver of a passenger train reported a near miss with a track worker crouching near a set of points. The worker was also hard to see due to low light conditions.	Campbelltown, NSW
31/07/2016	The driver of a passenger train reported a near miss with a track worker who moved from a safety refuge towards the danger zone. The worker had misinterpreted the site coordinator's "All Right" hand signal directed to the train driver.	Carnegie, Vic.
29/09/2016	Worksite protection was established for rail grinding without accounting for a freight train already in the section. Grinding work was underway when the train entered the worksite and struck detonators.	Yass to Harden, NSW
04/10/2016	The driver of an empty ore train spotted a grader working within the danger zone without protection in place. The driver brought the train to a stand short of the grader.	Boodarie, WA
23/02/2017	Track workers commenced rail grinding operations on the mainline without notifying the signaller or establishing worksite protection arrangements.	Clyde, NSW
08/03/2017	The driver of a passenger train reported a near miss involving between 5 and 7 track workers. The train driver estimated the group had approximately 8 seconds to clear the track.	Kingsgrove, NSW
13/03/2017	The driver of a passenger train reported a near miss with a track worker crossing tracks to apply protection to an adjacent line. The train driver applied emergency brakes and missed the worker by approximately 15 metres.	Wandong to Kilmore East, Vic.
30/04/2017	The driver of a passenger train reported a near miss with track workers at night. The train was rounding a bend with high beam on when the driver spotted the workers, applied the brakes and sounded the whistle. The workers moved to an adjacent track.	Macleod Station, Vic.
06/05/2017	A worksite protection officer documented the incorrect worksite location resulting in protection being placed on the wrong track. The workgroup saw a passenger train approaching their worksite and cleared the track.	Harris Park, NSW
22/05/2017	An actively controlled railway crossing that had been deactivated for track work was not reactivated at the completion of track work. The crew on a locomotive approaching the crossing was contacted by network control and stopped the train before the railway crossing.	Mile End to Belair, SA
13/06/2017	A freight train reported a near miss with track workers by approximately 50m. The workers were spotted as the train exited a curve and the driver blew the horn and applied emergency brakes.	Villawood, NSW
27/06/2017	The driver of a freight train rounding a bend reported workers on track. The driver sounded the horn and applied the brakes. The workers then crossed in front of the train to move to the other side of the track.	Midland to Kwinana, WA

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.

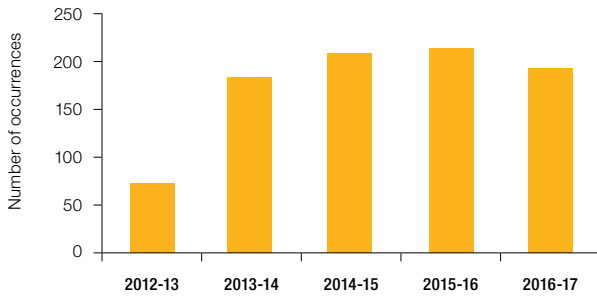


FIGURE 12

Signals passed at danger without authority – passenger trains (commercial) only, July 2012 to June 2017

Data shown is that classified as occurrence sub-categories: driver misjudged, completely missed while running; and starting against signal. Up until June 2015 this includes top-event occurrence sub-categories only, from July 2015 data is included regardless of top-event. SA, NSW, NT and Tas. data is for full period, Vic. data is from 2013–2014 onwards, ACT data is from July 2014 onwards, WA data is from 2 November 2015 onwards. Data shown excludes tourist and heritage operations and is for occurrences involving passenger trains only.

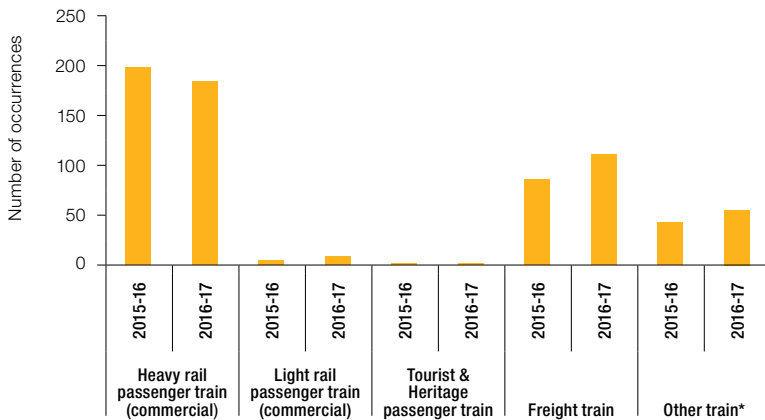


FIGURE 13

Signals passed at danger without authority – all train types, July 2015 to June 2017

Data shown is that classified as occurrence sub-categories: driver misjudged, completely missed while running; and starting against signal, regardless of top-event. SA, NSW, NT, Tas. & ACT data is for full period, WA data is from 2 November 2015 onwards. *Other train include track maintenance trains, RRVs and other movement of rolling stock.

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. Significant bad weather events can also result in landslips and track washaways which pose a risk to rail operations. Examples of some of the potentially serious occurrences of collisions between trains and objects that took place during the 2016–2017 financial year are shown in Table 13.

TABLE 13

Selected collisions between trains and objects, July 2016 to June 2017

Railway operations within SA, NSW, Tas., NT, Vic. and ACT and WA regulated under the RSNL.

Date	Description	Location
24/08/2016	A track maintenance train plough struck hold down lugs on a ballast top bridge resulting in damage to the train plough blade and nine sleepers. No injuries were reported.	Murrurundi, NSW
09/09/2016	A passenger train struck and ran over two axles that had been placed on the running line. No injuries were reported.	Byford, WA
20/10/2016	A passenger train struck a wheelchair that had been left on the tracks resulting in damage to the train. The driver subsequently reported a smell of fuel. Upon investigating, it was discovered 800 litres of fuel had spilled over 500 metres.	Moree, NSW
24/11/2016	An urban passenger train lost air after hitting a cable trough. Upon further investigation it was believed a large sandstone boulder had been rolled down the embankment which had pushed the cable trough out of alignment with nearby rail.	Metropolitan Colliery Junction, NSW
06/12/2016	An urban passenger train driver reported wheel slip which caused the train to hit a buffer stop at the end of the platform. Minor damage to the coupler of one car was sustained and the buffer stop was pushed back two metres.	Cronulla Station, NSW
13/03/2017	A freight train ran over a car tyre and rim causing the train to lose air and stop. During inspection of the train it was identified that the train had parted between two wagons.	Dry Creek, SA
16/03/2017	It was reported that a local farmer had placed ropes and matting across the track to allow stock to cross over. An approaching freight train was travelling at 70km/h and applied the emergency brake stopping 200 metres past the location. No damage to train or injuries were reported.	Coggan Creek, NSW
09/04/2017	A passenger train struck baulks at the end of the platform while travelling at 25km/h. The driver advised that the overrun was due to excessive moisture on tracks. No injuries were reported.	Ararat Station, Vic.
12/05/2017	While completing a run around a light locomotive struck a derailer. Instead of derailing the light locomotive as intended, the derailer failed and snapped.	Coolamon, NSW
17/05/2017	An urban passenger train struck a sheet of sound barrier while near a station platform. No damage was reported.	Central Station, Sydney, NSW

OTHER NOTEWORTHY OCCURRENCES

July 2016 to June 2017

Railway operations within SA, NSW, Tas., NT, Vic. and ACT and WA regulated under the RSNL.

Date	Description	Location
11/08/2016	The train controller reported that two sets of points, which were under block conditions for maintenance, had suddenly run to their alternate positions. This occurred when the train controller performed a route-setting action to establish a path for an approaching train.	Ballarat, Vic.
20/03/2017	A fault on a passenger train caused an external roof hatch to be blown from a carriage and land on the adjacent platform. The interior of the carriage was also damaged and one passenger on the train was treated for a minor injury.	Burwood, NSW
22/04/2017	A freight train consisting of two locomotives and 40 wagons ran away out of control for 15km, reaching 100 km/h. Local train control centres enacted their relevant emergency procedures and track sections were subsequently cleared for the train to operate.	Dombarton, NSW
25/05/2017	Staff sitting in the rear of a track recording vehicle noticed it was sitting foul of the up main line blocking the route set for the freight train. The driver was alerted to move the track recording vehicle forward to avoid a collision.	Islington Junction, NSW

2016-2017

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, but also acts as a key source of regulatory intelligence that ONRSR uses to direct effort and resources in line with its risk-based approach to regulation.

This chapter provides an insight into ONRSR's plans to further enhance its risk-based approach to regulation through better use of data-driven regulatory intelligence. It also provides an update on the four areas that ONRSR has prioritised for compliance activities over the past two years, as well as two other areas of regulatory attention which ONRSR prioritises by risk, namely major rail projects and safety improvement initiatives.

DATA-DRIVEN REGULATORY INTELLIGENCE

Over the past 12 months ONRSR has been examining ways to further improve its risk-based approach to regulation to better focus its efforts and resources on areas of high risk and scope for safety improvement.

ONRSR's risk-based decisions are made by expert and experienced officers who are required to take factors regarding the risk profile, safety performance and safety management capability of operators into account. While ONRSR collects and analyses a range of occurrence data to aid with the consideration of such risk factors when making decisions, there is a strong reliance on its officers' knowledge and experience of interacting with the operators they regulate.

ONRSR is undertaking a program of work focussed on increasing the amount of objective, risk-based regulatory intelligence it derives from the data that it collects and generates to enable its officers to make more informed decisions. This work involves:

- identifying the future data needs of ONRSR to allow for consistent and comparable insight into operators' risk profiles, safety performance and safety management capability
- identifying the future data analytics capability (data management, analysis, modelling and reporting) required to derive risk-based regulatory intelligence from the suite of data available
- enhancing stakeholder information exchange and access via electronic means, principally through a web-based portal.

FUTURE DATA NEEDS

ONRSR collects and generates data to inform regulatory decisions ranging from how to deploy resources to how to respond to an identified operator safety issue or breach of the legislation. The current sources of regulatory data available to ONRSR and the primary ways in which this data is used is depicted in Figure 14. ONRSR also uses the data it collects to produce a variety of routine and ad-hoc reports on rail safety for a range of stakeholders including the general public, government, and rail industry representatives.

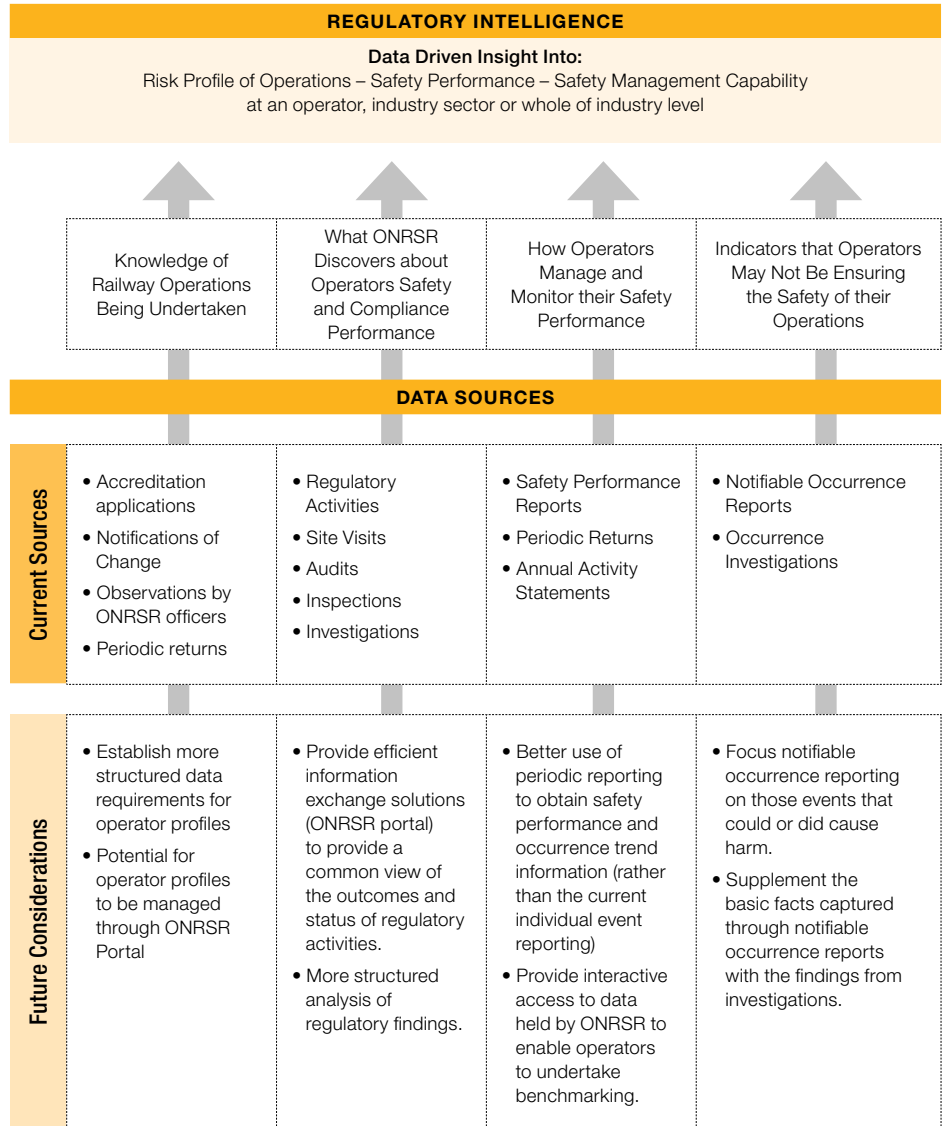
Currently the main sources of regulatory data used by ONRSR are operator notifiable occurrence reports and the information generated through regulatory activities such as audits and inspections. While ONRSR continues to work to enhance its analysis of data generated through regulatory activities, there are limitations to the insight that can be derived from analysis of notifiable occurrence reports in their current form. An examination of the value of the current occurrence data set is being undertaken to identify data surplus to requirements and any other types of data that would be more relevant to ONRSR's decision making.

FUTURE DATA ANALYTICS CAPABILITY

In parallel with the work ONRSR is undertaking to identify its future data needs, it is examining the range of data analytics and visualisation technologies currently available. ONRSR is aiming to build a stronger data analytics capability – one which can seamlessly integrate dynamic, structured and unstructured data sets from multiple sources. Such a capability will also allow ONRSR to tailor data capture and reporting requirements to different industry sectors and operators on a needs basis.

FIGURE 14

Current data sources and future considerations



AUSTRALIAN RAIL RISK MODEL

In November 2017 the first version of the Australian Rail Risk Model was launched by the Rail Industry Safety Standards Board (RISSB). The model uses occurrence data and network information to model and quantify safety risk on railways across Australia.

ONRSR has long championed the need for a rail industry risk model and is pleased to see the collaborative work in this space come to fruition. Attention now shifts to encouraging operators to utilise the model as an additional and vital source of risk information to inform safety investment decisions. The model also presents a new and important source of risk information for ONRSR which will be considered alongside its internal analysis to inform regulatory decision-making.

As the scope and uptake of the model grows over time it is expected to foster a shared understanding of safety priorities between ONRSR and industry and reinforce co-regulation.

GUIDING PRINCIPLES

The program of work ONRSR is undertaking to build a better regulatory intelligence capability is guided by a set of principles that support the corporate goal to minimise regulatory burden:

- ONRSR will only collect data that is required to:
 - » build an accurate understanding of the areas of railway operations that are presenting risks to safety
 - » monitor the effectiveness of rail transport operators' approaches to managing these risks
 - » intervene when operators are deemed to be failing to manage these risks, so far as is reasonably practicable
 - » report on Australian rail safety performance to relevant stakeholders
- Future reporting requirements will be tailored to specific industry sectors or operators, reflecting that all Australian rail operations and operators are not alike
- ONRSR's future data needs and analytics capability will complement, and not replicate, the Australian Rail Risk Model developed by RISSB.

ENHANCING INFORMATION EXCHANGE – THE ONRSR PORTAL

The final element of ONRSR's program to build a better regulatory intelligence capability is the need to improve the quality and efficiency of information exchange between ONRSR and rail transport operators. This will be achieved through the development of a web-based portal which will cater for a significantly wider range of electronic communications than is currently available. Functions of the ONRSR portal currently planned include:

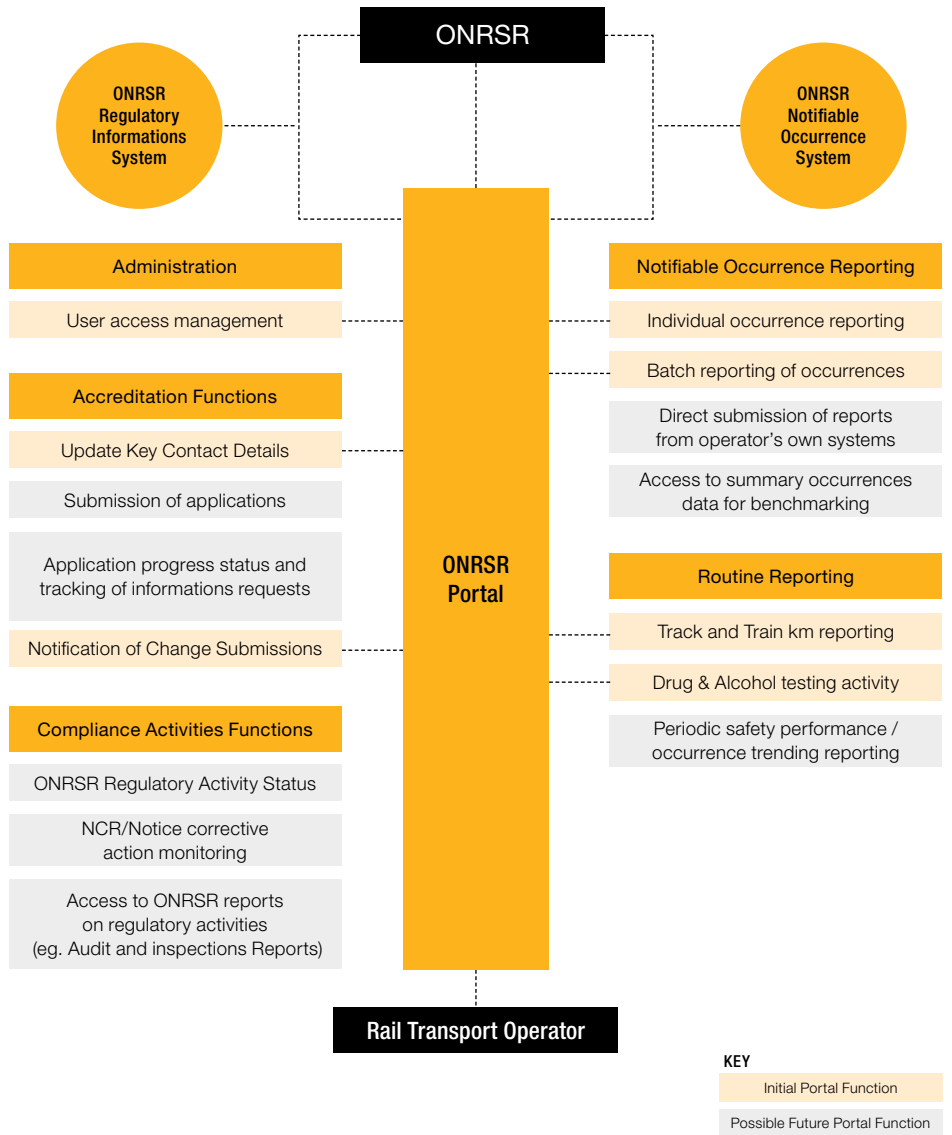
- standard information exchange transactions (e.g. submission of periodic returns or notifiable occurrence reports) including automated validation of the information being provided, and the ability to retrieve and update information
- access to information held by ONRSR regarding operator-regulator interactions (e.g. Notices of Accreditation, audit or inspection reports) and any other information of relevance to the operator (e.g. safety performance benchmarking information)
- managing and monitoring progress with accreditation applications, notifications of change, audits, inspections and investigations
- direct online entry of information through system-to-system communication.

ONRSR is progressing the development and implementation of an online portal in the first half of 2018 which will include the initial functionality highlighted in Figure 15. Future expansions of portal functionality will be incrementally introduced based on balancing ONRSR's needs with the benefits that can be provided to rail transport operators.

STAKEHOLDER ENGAGEMENT

ONRSR acknowledges that changes to reporting requirements and methods of operator-regulator interaction will impact industry stakeholders. ONRSR will consult with industry over such changes to validate that they are practical and to fully examine the benefits that can be provided back to operators. For specific projects such as the portal, ONRSR will seek to partner with industry to ensure end user requirements are captured and met.

FIGURE 15
ONRSR Portal Concept



COMPLIANCE PROJECTS

Four national priorities were selected by ONRSR towards the end of 2015 and have been the focus of compliance projects over the past 24 months. While individually unique, each of the priorities shares specific characteristics, namely that the topics require sustained regulatory focus and the issues affect railways across the country.

The four areas selected for a compliance focus in 2015 were:

- track condition
- track work – competency and communication
- rolling stock maintenance
- road rail vehicle safety

TRACK CONDITION

ONRSR national priority 2015–2017.

Why was this designated as a national priority?

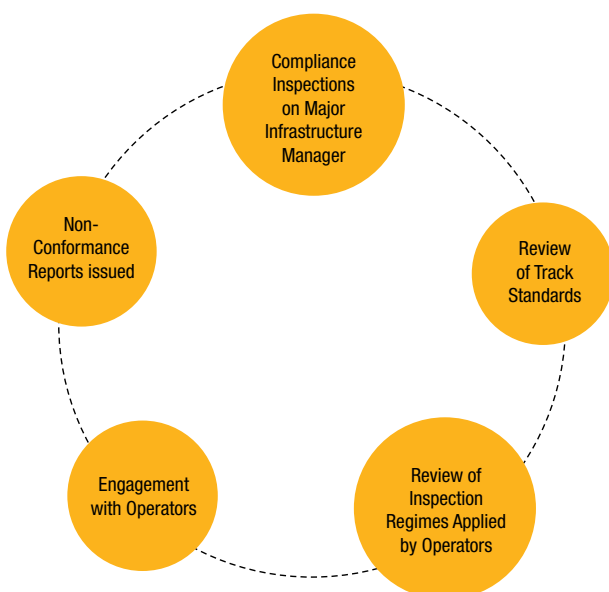
Poor track condition is a common causal factor in derailments. ONRSR's occurrence data, together with a literature review, highlighted broken rails, track geometry, misalignments and broken joints as high-risk track condition issues.

Further analysis yielded a number of derailment precursors and contributing factors including:

- undetected track degradation
- uncorrected track degradation
- adverse weather such as summertime heat.

Against this backdrop ONRSR commenced a program of work to foster improvements in track stability, track geometry and rail management and general track condition.

How did ONRSR's national compliance project tackle this issue?



While compliance activities have led to the issue of a number of non-conformance reports, ONRSR has been pleased with the response of rail infrastructure managers whose staff have been eager to discuss track-specific issues leading to valuable insights.

In light of the positive engagement and outcomes of the regulatory activities, track condition will cease to be one of ONRSR's four priorities in 2018. However, an operational focus on track condition in association with rail infrastructure managers will be maintained through ONRSR's annual audit and compliance work program. This will focus on a number of areas where ONRSR sees a need for further safety improvements, including:

- track management practices not reflecting engineering standards
- management of sections of track missed by track geometry cars
- some rail infrastructure managers not undertaking ultrasonic inspections through switches and crossings
- inadequate recording of rail adjustment (de-stressing)
- scope and consistency of broken rail investigations
- lack of quality defect management systems for reliable asset management decision making.

TRACK WORK – COMPETENCY AND COMMUNICATION

ONRSR national priority since 2015. The scope of the priority area will be redefined in 2018.

Why was this designated as a national priority?

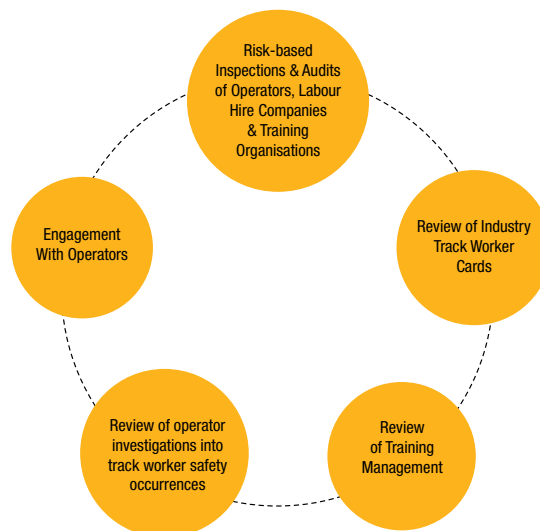
More than 400 track work safeworking breaches were reported in the 2014–2015 financial year from which ONRSR identified the recurring themes of rail safety worker competence and safety critical communication.

Further analysis of ONRSR data by the ATSB since then⁶ identified the following recurring safety factors associated with worksite occurrences:

- insufficient or incorrect protection types
- incorrect protection location and incorrect definition of worksite
- incorrect identification of worksite location
- incorrect removal of protections.

These issues carry significant safety risk and since the rate of serious occurrences has remained high (refer to the analysis on page 22). ONRSR will redefine the scope of this priority area in 2018 to focus on unplanned and reactive track work activities.

How did ONRSR's national compliance project tackle this issue?



⁶ ATSB Research Investigation Report - RI-2014-011: Safe work on track across Australia, November 2017.

Goals of this national compliance project include:

- a reduction in track worker related incidents and occurrences
- greater operator understanding of track worker safety risks
- operator implementation of systems, procedures and processes to deliver effective and adequate management of track worker safety risks.

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.

A notable finding from across industry is that while the majority of operators apply a process of signing people and equipment in to a worksite, very few subsequently apply a process of signing people and equipment out.

Operators should consider reviewing systems for positively accounting for all personnel and equipment on a worksite to ensure they are all clear for the passage of rail traffic, and that no unauthorised re-entry occurs.

Track worker safety remains an issue driven by a number of interrelated causes. Key issues that require ongoing attention include:

- training of staff by training providers
- provision of staff by labour hire companies
- staff moving locations with no requirement for site-specific competencies
- staff in the rail corridor setting up protection (and their safety before protection is in place).

Furthermore, ONRSR will increase its focus on how operators respond to track worker safety occurrences through post-incident audits. A safety improvement project is also scheduled for delivery in 2018, as discussed on page 38.

ROLLING STOCK MAINTENANCE

ONRSR national priority 2015–2017.

Why was this designated as a national priority?

Poor maintenance of rolling stock heightens the risk of safety-critical component failures.

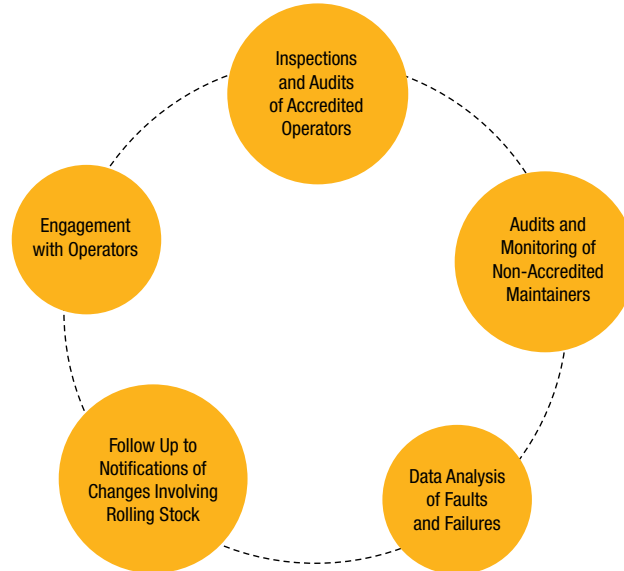
Maintenance-related issues may contribute to braking system failure, defective bearings, wheel failure or axle failure, all of which can create serious situations with the potential for catastrophic consequences.

Several concerning industry trends led to the establishment of rolling stock maintenance as an ONRSR priority, including:

- significant numbers of reported component failures
- poor results from audits of accredited and third-party maintainers
- an increasing trend of contractors performing maintenance activities.

ONRSR's focus on these issues has sought to drive a higher standard of rolling stock maintenance across industry.

How did ONRSR's national compliance project tackle this issue?



Maintenance issues that have been identified through ONRSR's activities include:

- maintenance practices inadequately documented in safety management systems
- maintenance practices not conforming to documented systems
- calibration of test equipment not current
- poor definition and maintenance of competency and qualifications
- insufficient or ineffective monitoring of contractors by accredited railway organisations
- lack of clarity in the establishment of agreed standards between accredited rolling stock operators and some contractors.

During compliance activities ONRSR has looked closely at general engineering and operational system safety, process control and rail safety worker competence with a strong focus on the management and safety duties of contractors.

As well as aiming for a reduction in rolling stock irregularities, the program has sought an aligned understanding of risk between ONRSR, operators and third party maintainers and greater clarity on how operators manage and maintain rolling stock.

Following two years of priority focus, intelligence suggests rolling stock maintenance should remain an operational focus for ONRSR rail safety officers with specific issues to be addressed via regular compliance activities.

ROAD RAIL VEHICLE SAFETY

ONRSR national priority since 2015. Ongoing.

A road rail vehicle (RRV) is a vehicle that can operate on a conventional road as well as rail tracks. Common examples are modified four wheel drive vehicles or excavators with additional rail wheels that can be lowered into place for rail operation.

Why was this designated as a national priority?

In recent years RRVs have featured in a high proportion of significant safety occurrences including collisions, derailments and runaways. Some of these incidents have resulted in fatalities and serious injuries.

An analysis of notifiable occurrences during the 2016–2017 financial year has identified 130 incidents relating to RRV safety, which is an increase on the 102 incidents identified in the 2015–2016 financial year.

While safety deficiencies continue to be identified there is also evidence that operators have responded to guidance material offered by ONRSR with various issues being addressed and managed appropriately.

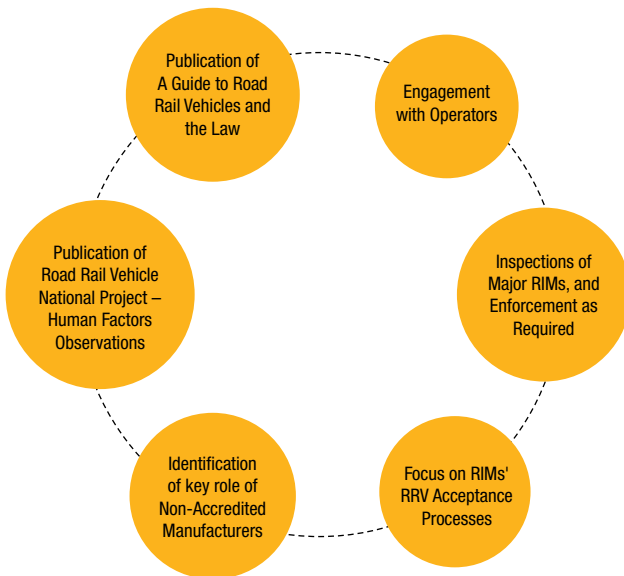
Despite this the ongoing safety risks associated with RRV operations and the persistently concerning rate of occurrences means ONRSR will continue to focus on RRV safety as a national priority into 2018.

How did ONRSR's national compliance project tackle this issue?

Over the last two financial years ONRSR has focused on the safety obligations of individual RRV operators and those of rail infrastructure managers.

Some of the key focal points of inspections have included procurement, network access, risk management, rail safety worker competency, general engineering and operational systems safety requirements.

Importantly ONRSR expects rail infrastructure managers to demonstrate their acceptance processes for allowing RRVs onto their networks.



As well as identifying human factors issues related to RRV operation and issuing appropriate enforcement options, ONRSR has made the following observations in relation to RRVs in 2016–2017:

- Some pre-operational checklists sampled during inspections were not adequately configured to allow accurate identification of whether or not an RRV was fit for purpose
- A high percentage of pre-operational checklists sampled during inspections had missing data or information
- Rail safety worker competencies and health assessment verification processes are not adequately conducted prior to commencing works
- The mechanical condition of all RRVs sampled varied from 'good' to 'excellent'
- Various RRVs lacked the necessary documentary evidence within the vehicle regarding adequate, site-specific risk assessments
- Numerous site risk assessments failed to identify certain controls unique to the site.

In spite of improvements that have been made across industry more is needed and RRV safety remains a focus for ONRSR.

Further work needs to be undertaken with rail infrastructure managers to ensure that they maintain effective management and control of RRV operations on their network.

An ONRSR compliance project scheduled for 2018 will use the findings from the 2015–2017 project to determine areas of improvement in the management of RRVs on the Australian rail network. It will focus on the planning, risk assessment and auditing process used by rail infrastructure managers to ensure RRVs are being operated safely, so far as is reasonably practicable. The objective is to ensure rail infrastructure managers are demonstrating effective management and control of the risks presented by the use of RRVs on their network.

SAFETY IMPROVEMENT PROJECTS

ONRSR-led, industry-wide safety improvement and education initiatives are one of the ways the regulator works with the rail industry to drive national improvements in safety. These initiatives are separate to, but complement, the compliance and enforcement activities which focus on individual operators. ONRSR's three priority areas for safety improvement during 2016–2017 were:

- Investigation reports
- Track worker safety
- Risk management.

INVESTIGATION REPORTS

Working with industry to achieve a consistent high standard in operator investigation reports. Safety improvement project completed in 2017 with the publication of a new guideline and fact sheet.

The Investigations by Rail Transport Operators Guideline and the Notice to Conduct a S122 Investigation Fact Sheet were published in May 2017. These resources clarify ONRSR's expectations in relation to investigation reports and support an operator's interactions with ONRSR when the regulator requests a copy of a report, or directs an operator to undertake an investigation.

Operators' investigation reports are an opportunity to better understand how an incident occurred, prevent a reoccurrence and act upon safety lessons. The anticipated benefits of these resources include encouraging a consistent standard of investigations (and the resulting reports) and improving safety learnings from investigation reports.

TRACK WORKER SAFETY

Supporting industry to work together in a targeted way to reduce the risk of track workers being struck by rolling stock. Safety improvement project ongoing.

In the Australian rail industry there continues to be a high number of worksite incursions whereby a train erroneously enters a section of track that is occupied by rail safety workers. Table 12 provides some examples of track work safeworking rules and procedural breaches that have led to worksite incursions during 2016–2017.

To improve ONRSR's understanding of how rail operators are addressing risks to track worker safety, ONRSR undertook compliance activities as part of a national priority project during 2017 with a focus on competency and communication (refer to page 34 for details). The findings of this project, along with work undertaken by the Australian Transport Safety Bureau⁷, will be a key input into the design and delivery of an industry-wide safety improvement initiative in 2018.

RISK MANAGEMENT

Supporting industry to improve risk management through a better understanding and application of safety risk management practices.

Work is planned in the coming year on a safety improvement project targeting risk management. The project will leverage resources which are being developed internally to assist rail safety officers in their interactions with, and to better support, the rail industry.

In addition to the two ongoing initiatives discussed above, ONRSR will begin scoping two new safety improvement projects to help tackle two of ONRSR's new national priority areas for 2018 – safety management capability within the tourist and heritage sector and level crossing safety.

⁷ ATSB Research Investigation Report – RI-2014-011: Safe work on track across Australia, November 2017.

MAJOR PROJECTS

Across Australia the delivery of significant railway projects remains an established part of the transport landscape. With investment in improving passenger and freight services continuing unabated, ONRSR's work with the railway industry to support safe project outcomes has continued throughout 2016–2017.

Effective safety governance is a key component of projects that are successfully managing rail safety. Used appropriately it provides the checks and balances between the competing demands faced by those entities delivering complex projects. From the outset as projects progress through their delivery lifecycle the importance of effective oversight of safety activity cannot be underestimated.

ONRSR's Major Project Guideline recommends that safety assurance is planned – including the safety governance processes. ONRSR is encouraged to see this activity occurring in an increasingly robust manner across major projects. This demonstrates rail transport operators have knowledge of the safety risks associated with their projects and are making appropriate decisions in their management of those risks.

Considering the project lifecycle as it is developed and designed remains critical for safe outcomes. This can be a challenge during the procurement phases of complex projects which may often involve the development of innovative solutions. Recognising this, the RSNL contains duties to ensure that project development results in railway infrastructure or rolling stock that can be constructed, maintained and operated safely. Throughout 2016–2017 ONRSR has worked with a number of projects to support their safety management and their understanding of safety risks during the early phases of design.

2016–2017 has seen substantial progress in relation to the introduction of a fee associated with the delivery of nationally significant projects. Following approval by state and territory ministers at the Transport and Infrastructure Council, amendments to the RSNL were progressed which included the introduction of a major project fee. This initiative serves to make the relative fee contributions between major projects and other rail transport operators more equitable. The new major project fees are payable from 1 July 2017.

In 2016–2017, ONRSR engaged with a number of major projects and key examples include:

- Sydney Metro with Transport for New South Wales (TfNSW) and 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
- Melbourne Metro Rail Project with the Melbourne Metro Rail Link Authority and Metro Trains Melbourne
- Caulfield to Dandenong level crossing removals with the Level Crossing Removal Authority and Metro Trains Melbourne
- Forrestfield Airport Link with the Public Transport Authority of Western Australia
- Autohaul project with Rio Tinto.

Significant regulatory activity with major projects during the year included working with:

- Metro Trains Sydney to support their delivery of the first train for Sydney Metro Northwest
- the ALTRAC Partnership to support their ongoing construction activity on the Sydney CBD and South East Light Rail project
- Canberra Metro Operations to support their ongoing construction activity on the Canberra Light Rail project
- Metro Trains Melbourne to support the ongoing level crossing removal program in metropolitan Melbourne.

NATIONAL PRIORITIES

FOR 2018



A national priority for ONRSR is defined as a rail safety area of regulatory focus that applies to multiple jurisdictions and operators and warrants a sustained period of regulatory attention. ONRSR typically targets its national priorities through operator-centric, national compliance projects or industry-wide, safety improvement projects.

ONRSR applied a structured, evidence-based risk assessment process to identify the following four national priority areas of regulatory focus for the 2018 calendar year:

- Track worker safety
- Road rail vehicle safety
- Level crossing safety
- Tourist and heritage sector safety management capability.

TRACK WORKER SAFETY

Track work – competency and communication was a national priority for ONRSR throughout 2016–2017 and has been the focus of a national compliance project during that time.

ONRSR was notified of 340 occurrences involving breaches of worksite protection rules and procedures during 2016–2017. An analysis of these breaches found that 93 cases (27% of all breaches of worksite protection rules and procedures) involved a type of failure where adverse consequences were probable under slightly different circumstances. In a small number of instances an accident was averted only through the emergency action(s) of an individual such as a train driver applying emergency brakes or a worker jumping from the path of an approaching train. Refer to page 22 for further details.

Furthermore, inspections undertaken as part of the national compliance project on track work – competency and communication identified recurring issues with the types of worksite protection applied, the identification and definitions of worksite locations and the removal of protection at worksites. Refer to page 34 for further details.

These issues carry significant safety risk and since the rate of serious occurrences has remained high, ONRSR has retained this as a priority area in 2018. A new national compliance project focused on unplanned and reactive track work activities, together with an industry-wide safety improvement initiative will be progressed in 2018.

ROAD RAIL VEHICLE SAFETY

This area was a national priority for ONRSR throughout 2016–2017 and has been the focus of a national compliance project during that time.

There were 130 occurrences reported to ONRSR in relation to RRV safety in 2016–2017 at a rate consistent with previous years. Many of these occurrences involved potentially serious collisions, derailments and uncontrolled movements of RRVs. Furthermore, the national compliance project on road rail vehicle safety found a number of common concerns affecting multiple operators particularly in relation to risk management practices for RRV operations. Refer to page 36 for further details.

ONRSR will maintain a heightened level of regulatory focus on this area in 2018, shifting its attention from RRV operators to rail infrastructure managers who must maintain effective management and control of RRV operations on their network.

LEVEL CROSSING SAFETY

Excluding trespass and suicide, accidents at railway crossings account for the largest number of railway-related fatalities involving members of the public.

There were 27 railway crossing collisions between train and road vehicles notified to ONRSR in the 2016–2017 financial year of which 18 (67%) involved passenger trains. The threat of a catastrophic consequence is particularly relevant to passenger trains because of the potentially large number of people exposed.

Industry and governments are taking a leading role in addressing safety risks at level crossings and ONRSR continues to provide its full support. A number of jurisdictions have level crossing committees and ONRSR provides regular occurrence data and information to inform the safety-related decisions made by these committees.

ONRSR will increase its focus on this area in 2018 by scoping a safety improvement project which will support industry and government to promote improvements in level crossing safety nationally.

TOURIST AND HERITAGE SECTOR, SAFETY MANAGEMENT CAPABILITY

ONRSR has accredited over 70 tourist and heritage operators with most accredited for rolling stock operations. The nature of operations and rolling stock varies widely but most involve the operation of historical passenger rolling stock hauled by various traction types including steam and early diesel locomotives. Operations range from short duration trips on isolated railways through to longer distance services on mainline networks.

The rate of SPADs and derailments notified to ONRSR involving tourist and heritage trains is significantly higher than the equivalent rate for commercial heavy rail passenger trains. For example, during 2016–2017 there were 17.8 derailments of in-service tourist and heritage passenger trains for every million kilometres travelled. This compares with a rate of 0.03 derailments per million kilometres travelled for commercial heavy rail passenger trains.

Furthermore, through its interactions with the sector ONRSR is aware of the challenges that tourist and heritage operators face with maintaining a safety management system that is compliant with legislative requirements and suitable for volunteer-resourced organisations to administer.

ONRSR will increase its efforts in this area during 2018 by scoping a safety improvement project focusing on tourist and heritage operators involving safety management capability.

EMERGING RISK – RAIL CYBER SECURITY

Whilst the introduction of automated, safety-critical systems across the Australian rail industry can provide a step change in the control of safety risks, it also brings an increased exposure to cyber security threats.

During the past 12 months both the German Deutsche Bahn rail system and the San Francisco Municipal Railway became the targets of cyber-attacks. Although there were no injuries as a result of these attacks they serve as a reminder of the serious threat that cyber security poses.

ONRSR is represented on the RISSB Advisory Group and Development Group on rail cyber security and will continue to be active in this space in 2018.

RISK-BASED REGULATION CASE STUDY - SETTING ONRSR'S NATIONAL PRIORITIES

ONRSR's Framework for Risk-based Regulation⁸ categorises regulatory decisions into one of three tiers: 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.

The framework identifies eight Tier 1 decisions and sets risk-based decision-making process requirements for each. Setting ONRSR's national priorities is one of these Tier 1 decisions for which the framework requires the application of a structured, evidence-based risk assessment process to inform the decision outcome.

The process involves an analysis of multiple sources of safety data including:

- ATSB investigation reports
- REPCON reports
- operator notifiable occurrence reports
- operator safety performance reports
- operator investigation reports
- the findings of ONRSR's regulatory interactions with operators.

These reports are reviewed and analysed to identify common themes, trends, systemic issues and areas of concern for consideration as an ONRSR national priority.

ONRSR then assigns a risk score to each priority area under consideration, based on an assessment of a series of quantitative and qualitative risk factors, including:

- **National exposure** – the number of ONRSR's jurisdictions affected by safety issues relating to the priority area
- **Rail industry exposure** – the number of operators and/or industry sectors exposed to safety risks relating to the priority area
- **Regulatory response** – the frequency of issues relating to the priority area that have prompted regulatory intervention
- **Level of control** – the scope of control that operators have over risks relating to the priority area
- **Novelty** – the novelty to the Australian rail industry of risks relating to the priority area
- **Harm to people** – the worst credible harm that could eventuate following an accident related to the priority area
- **Occurrence frequency** – the number of notifiable occurrences reported to ONRSR in relation to the priority area
- **Stakeholder concern** – the level of safety concern held across ONRSR's stakeholders in relation to the nominated area
- **Scope for improvement** – the scope for ONRSR to drive safety improvement across industry in relation to the priority area.

ONRSR subject matter experts then review the potential priority areas in order of risk score to identify the areas that most warrant a nationally coordinated and sustained period of regulatory focus and the appropriate regulatory response to deliver safety benefits for the community.

⁸ ONRSR's model for risk-based regulation is depicted on page 6. A more detailed overview of ONRSR's framework for risk-based regulation, including the eight Tier 1 decisions, is provided in the 2015-2016 Rail Safety Report, available at <http://www.onrsr.com.au/resource-centre-document-finder/rail-safety-report>.

APPENDICES



APPENDIX A

DATA TABLES

A1

Railway-related fatalities, July 2012 to June 2017 (Figure 2)

SA, NSW, NT and Tas. data is for full period, Vic. data is from 2013–2014 onwards, ACT data is from July 2014 onwards, WA data is from 2 November 2015 onwards. Non-passenger fatalities at railway crossings are classified as Public if neither trespass nor suicide is suspected. Railway crossing collision excludes suspected suicide at railway crossings, which are classified as Rail accident (incl. strike) involving Trespass.

PASSENGER		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Rail accident (incl. strike)	2012-13	0	1	0	0	n/a	n/a	n/a	1
	2013-14	0	1	0	0	0	n/a	n/a	1
	2014-15	0	1	0	0	1	0	n/a	2
	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Railway crossing collisions	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	0	0	0	0	0	n/a	n/a	0
	2014-15	0	0	0	0	0	0	n/a	0
	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Fall, assault, other	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	0	1	0	0	1	n/a	n/a	2
	2014-15	0	0	0	0	0	0	n/a	0
	2015-16	0	0	0	0	0	0	2	2
	2016-17	0	1	0	0	0	0	0	1

WORKFORCE		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Rail accident (incl. strike)	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	0	0	0	0	0	n/a	n/a	0
	2014-15	0	0	0	0	0	0	n/a	0
	2015-16	0	1	0	0	0	0	0	1
	2016-17	0	0	0	0	0	0	0	0
Railway crossing collisions	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	0	0	0	0	0	n/a	n/a	0
	2014-15	0	0	0	0	0	0	n/a	0
	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Fall, assault, other	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	0	1	0	0	0	n/a	n/a	1
	2014-15	0	0	0	0	0	0	n/a	0
	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0

PUBLIC		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Rail accident (incl. strike)	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	0	0	0	0	0	n/a	n/a	0
	2014-15	0	0	0	0	0	0	n/a	0
	2015-16	1	0	0	0	0	0	0	1
	2016-17	0	0	0	0	0	0	0	0
Railway crossing collisions	2012-13	1	0	0	0	n/a	n/a	n/a	1
	2013-14	0	0	0	1	4	n/a	n/a	5
	2014-15	0	0	0	0	0	0	n/a	0
	2015-16	0	1	0	0	1	0	0	2
	2016-17	0	1	0	0	3	0	0	4
Fall, assault, other	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	0	0	0	0	0	n/a	n/a	0
	2014-15	0	1	0	0	0	0	n/a	1
	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	1	1

TRESPASS		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Rail accident (incl. strike)	2012-13	2	22	0	0	n/a	n/a	n/a	24
	2013-14	3	37	0	0	33	n/a	n/a	73
	2014-15	1	27	0	0	37	0	n/a	65
	2015-16	3	25	0	0	47	0	2	77
	2016-17	4	32	0	0	38	0	8	82
Railway crossing collisions	2012-13	1	1	0	0	n/a	n/a	n/a	2
	2013-14	0	0	0	0	6	n/a	n/a	6
	2014-15	2	1	0	0	6	0	n/a	9
	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Fall, assault, other	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	0	3	0	0	2	n/a	n/a	5
	2014-15	0	0	0	0	1	0	n/a	1
	2015-16	0	0	0	0	0	0	0	0
	2016-17	1	0	0	0	0	0	0	1

A2

Passenger train running line derailment, July 2012 to June 2017 (Figure 3)

SA, NSW, NT and Tas. data is for full period, Vic. data is from 2013–2014 onwards, ACT data is from July 2014 onwards, WA data is from 2 November 2015 onwards. Includes derailments of passenger trains on non-running lines affecting the safety of running lines.

HEAVY RAIL (COMMERCIAL)		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
In-service	2012-13	0	1	1	0	n/a	n/a	n/a	2
	2013-14	0	2	0	0	1	n/a	n/a	3
	2014-15	0	2	0	0	1	0	n/a	3
	2015-16	0	0	0	0	1	0	0	1
	2016-17	0	0	0	0	2	0	0	2
Not in-service	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	1	2	0	0	1	n/a	n/a	4
	2014-15	0	1	0	0	0	0	n/a	1
	2015-16	0	0	0	0	2	0	0	2
	2016-17	0	1	0	0	0	0	0	1
Total	2012-13	0	1	1	0	n/a	n/a	n/a	2
	2013-14	1	4	0	0	2	n/a	n/a	7
	2014-15	0	3	0	0	1	0	n/a	4
	2015-16	0	0	0	0	3	0	0	3
	2016-17	0	1	0	0	2	0	0	3

LIGHT RAIL (COMMERCIAL)		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
In-service	2012-13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2013-14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2014-15	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Not in-service	2012-13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2013-14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2014-15	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Total	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	0	2	0	0	0	n/a	n/a	2
	2014-15	0	0	0	0	0	0	n/a	0
	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0

TOURIST & HERITAGE		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
In-service	2012-13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2013-14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2014-15	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2015-16	1	0	0	0	1	0	1	3
	2016-17	2	0	0	1	0	0	1	4
Not in-service	2012-13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2013-14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2014-15	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2015-16	2	0	0	0	0	0	0	2
	2016-17	0	0	0	0	0	0	1	1
Total	2012-13	1	0	0	0	n/a	n/a	n/a	1
	2013-14	0	0	0	2	0	n/a	n/a	2
	2014-15	1	0	0	1	0	0	n/a	2
	2015-16	3	0	0	0	1	0	1	5
	2016-17	2	0	0	1	0	0	2	5

A3

Freight train running line derailment, July 2012 to June 2017 (Figure 4)

SA, NSW, NT and Tas. data is for full period, Vic. data is from 2013–2014 onwards, ACT data is from July 2014 onwards, WA data is from 2 November 2015 onwards. Includes derailments of freight trains on non-running lines affecting the safety of running lines. Excludes rolling stock derailments such as light locomotives and wagons.

	SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
2012-13	4	22	2	6	n/a	n/a	n/a	34
2013-14	7	15	2	3	11	n/a	n/a	38
2014-15	6	9	2	2	4	0	n/a	23
2015-16	3	10	0	2	7	0	6	28
2016-17	2	13	0	1	1	0	13	30

A4

Running line collisions between trains and with rolling stock, July 2012 to June 2017 (Figure 5)

SA, NSW, NT and Tas. data is for full period, Vic. data is from July 2013 onwards, ACT data is from July 2014 onwards, WA data is from 2 November 2015 onwards. 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.

		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Between in-service passenger trains	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	0	0	0	0	0	n/a	n/a	0
	2014-15	0	0	0	0	0	0	n/a	0
	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Between in-service passenger train and other train	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	0	0	0	0	0	n/a	n/a	0
	2014-15	0	0	0	0	2	0	n/a	2
	2015-16	0	1	0	0	0	0	0	1
	2016-17	0	0	0	0	0	0	0	0
Not involving in-service passenger train	2012-13	1	3	0	1	n/a	n/a	n/a	5
	2013-14	0	3	0	0	4	n/a	n/a	7
	2014-15	1	3	0	0	2	0	n/a	6
	2015-16	0	4	0	0	0	0	1	5
	2016-17	0	2	0	0	0	0	2	4

A5

Railway crossing collisions between train and road vehicle, July 2012 to June 2017 (Figure 6)

SA, NSW, NT and Tas. data is for full period, Vic. data is from 2013–2014 onwards, ACT data is from July 2014 onwards, WA data is from 2 November 2015 onwards. *Other consists of light rail passenger trains (commercial), isolated tourist & heritage passenger trains, track maintenance trains, RRVs and other movement of rolling stock.

		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Heavy rail (commercial) and mainline tourist and heritage passenger train	2012-13	0	0	0	0	n/a	n/a	n/a	0
	2013-14	1	0	0	0	12	n/a	n/a	13
	2014-15	1	1	0	0	10	0	n/a	12
	2015-16	0	2	0	0	13	0	0	15
	2016-17	3	3	0	0	10	0	2	18
Freight train	2012-13	1	4	0	1	n/a	n/a	n/a	6
	2013-14	2	1	0	1	2	n/a	n/a	6
	2014-15	1	3	0	1	0	0	n/a	5
	2015-16	1	3	0	0	2	0	2	8
	2016-17	0	2	0	1	3	0	1	7
Other*	2012-13	1	1	0	0	n/a	n/a	n/a	2
	2013-14	0	0	0	0	2	n/a	n/a	2
	2014-15	1	0	0	0	1	0	n/a	2
	2015-16	2	1	0	1	0	0	0	4
	2016-17	1	1	0	0	0	0	0	2

A6

Railway crossing collisions between train and road vehicle by crossing access type, July 2015 to June 2017 (Figure 7)

SA, NSW, NT, Tas. & ACT data is for full period, WA data is from 2 November 2015 onwards. Private or public road crossing access is determined using ALCAM data where available. Where this is not available, a determination has been made based on the information provided by the operator. *Other train consists of track maintenance trains, RRVs and other movement of rolling stock.

HEAVY RAIL PASSENGER TRAIN (COMMERCIAL)		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Private road crossing	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	1	0	0	0	0	1	2
Public road crossing	2015-16	0	2	0	0	13	0	0	15
	2016-17	0	2	0	0	10	0	1	13
Total	2015-16	0	2	0	0	13	0	0	15
	2016-17	0	3	0	0	10	0	2	15

LIGHT RAIL PASSENGER TRAIN (COMMERCIAL)		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Private road crossing	2015-16	0	1	0	0	0	0	0	1
	2016-17	0	0	0	0	0	0	0	0
Public road crossing	2015-16	1	0	0	0	0	0	0	1
	2016-17	1	0	0	0	0	0	0	1
Total	2015-16	1	1	0	0	0	0	0	2
	2016-17	1	0	0	0	0	0	0	1

TOURIST AND HERITAGE PASSENGER TRAIN		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Private road crossing	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Public road crossing	2015-16	0	0	0	0	0	0	0	0
	2016-17	3	0	0	0	0	0	0	3
Total	2015-16	0	0	0	0	0	0	0	0
	2016-17	3	0	0	0	0	0	0	3

FREIGHT TRAIN		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Private road crossing	2015-16	0	1	0	0	0	0	0	1
	2016-17	0	0	0	0	1	0	0	1
Public road crossing	2015-16	1	2	0	0	2	0	2	7
	2016-17	0	2	0	1	2	0	1	6
Total	2015-16	1	3	0	0	2	0	2	8
	2016-17	0	2	0	1	3	0	1	7

OTHER TRAIN*		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Private road crossing	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Public road crossing	2015-16	1	0	0	1	0	0	0	2
	2016-17	0	1	0	0	0	0	0	1
Total	2015-16	1	0	0	1	0	0	0	2
	2016-17	0	1	0	0	0	0	0	1

A7

Railway crossing collisions between train and person by crossing access type, July 2015 to June 2017 (Figure 8)

SA, NSW, NT, Tas. & ACT data is for full period, WA data is from 2 November 2015 onwards. Private or public crossing access is determined using ALCAM data where available. Where this is not available, a determination has been made based on the information provided by the operator. *Other train consists of track maintenance trains, RRVs and other movement of rolling stock.

HEAVY RAIL PASSENGER TRAIN (COMMERCIAL)		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Private pedestrian crossing	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Public pedestrian crossing	2015-16	1	0	0	0	2	0	0	3
	2016-17	1	0	0	0	0	0	2	3
Total	2015-16	1	0	0	0	2	0	0	3
	2016-17	1	0	0	0	0	0	2	3

LIGHT RAIL PASSENGER TRAIN (COMMERCIAL)		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Private pedestrian crossing	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Public pedestrian crossing	2015-16	1	0	0	0	0	0	0	1
	2016-17	0	0	0	0	0	0	0	0
Total	2015-16	1	0	0	0	0	0	0	1
	2016-17	0	0	0	0	0	0	0	0

TOURIST AND HERITAGE PASSENGER TRAIN		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Private pedestrian crossing	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Public pedestrian crossing	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Total	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0

FREIGHT TRAIN		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Private pedestrian crossing	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Public pedestrian crossing	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Total	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0

OTHER TRAIN*		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Private pedestrian crossing	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Public pedestrian crossing	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0
Total	2015-16	0	0	0	0	0	0	0	0
	2016-17	0	0	0	0	0	0	0	0

A8

Signals passed at danger without authority, July 2015 to June 2017 (Figure 13)

Data shown is that classified as occurrence sub-categories: driver misjudged, completely missed while running; and starting against signal, regardless of top-event. SA, NSW, NT, Tas. & ACT data is for full period, WA data is from 2 November 2015 onwards. *Other train consists of track maintenance trains, RRVs and other movement of rolling stock.

		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Heavy rail passenger train (commercial)	2015-16	11	81	0	0	102	0	6	200
	2016-17	5	83	0	0	76	0	16	180
Light rail passenger train (commercial)	2015-16	5	3	0	0	0	0	0	8
	2016-17	5	6	0	0	0	0	0	11
Tourist & heritage passenger train	2015-16	0	1	0	0	0	0	0	1
	2016-17	0	2	0	0	0	0	0	2
Freight train	2015-16	5	41	0	0	6	0	29	81
	2016-17	3	66	0	0	6	0	39	114
Other train*	2015-16	5	14	0	0	12	0	12	43
	2016-17	4	26	0	0	7	0	21	58

A9

Track and Train km, July 2015 to June 2017

SA, NSW, NT, Tas., Vic., ACT data is for full period, WA track and train km from 2 November 2015.

		SA	NSW	NT	TAS.	VIC.	ACT	WA	TOTAL
Passenger train kilometres (million km)	2015-16	6.243	46.687	0.187	0.045	35.277	0.004	14.295	102.738
	2016-17	6.221	47.040	0.162	0.048	35.613	0.003	22.795	111.881
Freight train kilometres (million km)	2015-16	7.332	19.155	1.252	0.731	3.736	0.001	20.335	52.542
	2016-17	7.353	20.951	1.163	0.752	4.191	0.000	30.996	65.405
Total km of track managed (thousand km)	2015-16	4.724	9.793	1.738	0.909	5.718	0.016	11.305	34.203
	2016-17	4.740	9.928	1.738	0.909	5.751	0.016	11.312	34.395

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. Railway crossing numbers are sourced from the Australian Level Crossing Assessment Model (ALCAM).

B1

Railway-related fatalities, July 2015 to June 2017 (Figure 2)

SA, NSW, NT, Tas., Vic., ACT data is for full period, WA data is from 2 November 2015 onwards. Non-passenger fatalities at railway crossings are classified as 'Public' if neither trespass nor suicide is suspected. Suspected suicide at railway crossing is classified as 'Trespass'.

FATALITIES		
Passenger	2015-16	0.019 per million passenger train km
	2016-17	0.009 per million passenger train km
Public	2015-16	0.019 per million total train km
	2016-17	0.028 per million total train km
Trespass	2015-16	0.448 per million total train km
	2016-17	0.460 per million total train km
Workforce	2015-16	0.006 per million total train km
	2016-17	0.000 per million total train km

B2

Passenger train running line derailment, July 2015 to June 2017 (Figure 3)

SA, NSW, NT, Tas., Vic., ACT data is for full period, WA data is from 2 November 2015 onwards. Includes derailments of passenger trains on non-running lines affecting the safety of running lines.

PASSENGER RUNNING LINE DERAILMENTS		
Heavy rail (commercial) - in-service	2015-16	0.010 per million commercial heavy passenger train km
	2016-17	0.018 per million commercial heavy passenger train km
Heavy rail (commercial) - not in-service	2015-16	0.020 per million commercial heavy passenger train km
	2016-17	0.009 per million commercial heavy passenger train km
Light rail (commercial) - in-service	2015-16	0.000 per million commercial light passenger train km
	2016-17	0.000 per million commercial light passenger train km
Light rail (commercial) - not in-service	2015-16	0.000 per million commercial light passenger train km
	2016-17	0.000 per million commercial light passenger train km
Tourist and heritage - in-service	2015-16	11.388 per million tourist and heritage passenger train km
	2016-17	14.269 per million tourist and heritage passenger train km
Tourist and heritage - not in-service	2015-16	7.592 per million tourist and heritage passenger train km
	2016-17	3.567 per million tourist and heritage passenger train km

B3

Freight train running line derailment, July 2015 to June 2017 (Figure 4)

SA, NSW, NT, Tas., Vic., ACT data is for full period, WA data is from 2 November 2015 onwards. Includes derailments of freight trains on non-running lines affecting the safety of running lines. Excludes rolling stock derailments such as light locomotives and wagons.

FREIGHT RUNNING LINE DERAILMENTS		
Freight train	2015-16	0.533 per million freight train km
	2016-17	0.459 per million freight train km

B4

Running line collisions between trains and with rolling stock, July 2015 to June 2017 (Figure 5)

SA, NSW, NT, Tas., Vic., ACT data is for full period, WA data is from 2 November 2015 onwards. 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.

RUNNING LINE COLLISIONS BETWEEN TRAIN AND WITH ROLLING STOCK		
Between in-service passenger trains	2015-16	0.000 per million passenger train km
	2016-17	0.000 per million passenger train km
Between in-service passenger train and other train	2015-16	0.006 per million total train km
	2016-17	0.000 per million total train km
Not involving in-service passenger train	2015-16	0.091 per million freight train + maintenance vehicle km
	2016-17	0.058 per million freight train + maintenance vehicle km

B5

Railway crossing collisions between train and road vehicle by crossing access type, July 2015 to June 2017 (Figure 7)

SA, NSW, NT, Tas. & ACT data is for full period, WA data is from 2 November 2015 onwards. Private or public road crossing access is determined using ALCAM data where available. Where this is not available, a determination has been made based on the information provided by the operator. *Other train consists of track maintenance trains, RRVs and other movement of rolling stock.

RAILWAY CROSSING COLLISIONS BETWEEN TRAIN AND ROAD VEHICLE		
Heavy rail passenger train (commercial) at private crossing	2015-16	0.000 per thousand private road railway crossings
	2016-17	0.429 per thousand private road railway crossings
Heavy rail passenger train (commercial) at public crossing	2015-16	2.591 per thousand public road railway crossings
	2016-17	2.246 per thousand public road railway crossings
Light rail passenger train (commercial) at private crossing	2015-16	0.215 per thousand private road railway crossings
	2016-17	0.000 per thousand private road railway crossings
Light rail passenger train (commercial) at public crossing	2015-16	0.173 per thousand public road railway crossings
	2016-17	0.173 per thousand public road railway crossings
Tourist and heritage passenger train at private crossing	2015-16	0.000 per thousand private road railway crossings
	2016-17	0.000 per thousand private road railway crossings
Tourist and heritage passenger train at public crossing	2015-16	0.000 per thousand public road railway crossings
	2016-17	0.518 per thousand public road railway crossings
Freight train at private crossing	2015-16	0.215 per thousand private road railway crossings
	2016-17	0.215 per thousand private road railway crossings
Freight train at public crossing	2015-16	1.209 per thousand public road railway crossings
	2016-17	1.036 per thousand public road railway crossings
Other train at private crossing*	2015-16	0.000 per thousand private road railway crossings
	2016-17	0.000 per thousand private road railway crossings
Other train at public crossing*	2015-16	0.345 per thousand public road railway crossings
	2016-17	0.173 per thousand public road railway crossings

B6

Railway crossing collisions between train and person by crossing access type, July 2015 to June 2017 (Figure 8)

SA, NSW, NT, Tas. & ACT data is for full period, WA data is from 2 November 2015 onwards. Private or public crossing access is determined using ALCAM data where available. Where this is not available, a determination has been made based on the information provided by the operator. *Other train consists of track maintenance trains, RRVs and other movement of rolling stock.

RAILWAY CROSSING COLLISIONS BETWEEN TRAIN AND PERSON		
Heavy rail passenger train (commercial) at private crossing	2015-16	0.000 per thousand private pedestrian railway crossings
	2016-17	0.000 per thousand private pedestrian railway crossings
Heavy rail passenger train (commercial) at public crossing	2015-16	1.356 per thousand public pedestrian railway crossings
	2016-17	1.356 per thousand public pedestrian railway crossings
Light rail passenger train (commercial) at private crossing	2015-16	0.000 per thousand private pedestrian railway crossings
	2016-17	0.000 per thousand private pedestrian railway crossings
Light rail passenger train (commercial) at public crossing	2015-16	0.452 per thousand public pedestrian railway crossings
	2016-17	0.000 per thousand public pedestrian railway crossings
Tourist and heritage passenger train at private crossing	2015-16	0.000 per thousand private pedestrian railway crossings
	2016-17	0.000 per thousand private pedestrian railway crossings
Tourist and heritage passenger train at public crossing	2015-16	0.000 per thousand public pedestrian railway crossings
	2016-17	0.000 per thousand public pedestrian railway crossings
Freight train at private crossing	2015-16	0.000 per thousand private pedestrian railway crossings
	2016-17	0.000 per thousand private pedestrian railway crossings
Freight train at public crossing	2015-16	0.000 per thousand public pedestrian railway crossings
	2016-17	0.000 per thousand public pedestrian railway crossings
Other train at private crossing*	2015-16	0.000 per thousand private pedestrian railway crossings
	2016-17	0.000 per thousand private pedestrian railway crossings
Other train at public crossing*	2015-16	0.000 per thousand public pedestrian railway crossings
	2016-17	0.000 per thousand public pedestrian railway crossings

B7

Signals passed at danger without authority, July 2015 to June 2017 (Figure 13)

Data shown is that classified as occurrence sub-categories: driver misjudged, completely missed while running; and starting against signal, regardless of top-event. SA, NSW, NT, Tas. & ACT data is for full period, WA data is from 2 November 2015 onwards. *Other train consists of track maintenance trains, RRVs and other movement of rolling stock.

RAILWAY CROSSING COLLISIONS BETWEEN TRAIN AND PERSON		
Heavy rail passenger train (commercial)	2015-16	1.988 per million commercial heavy passenger train km
	2016-17	1.642 per million commercial heavy passenger train km
Light rail passenger train (commercial)	2015-16	4.278 per million commercial light passenger train km
	2016-17	5.713 per million commercial light passenger train km
Tourist and heritage passenger train	2015-16	3.796 per million tourist and heritage passenger train km
	2016-17	7.134 per million tourist and heritage passenger train km
Freight train	2015-16	1.542 per million freight train km
	2016-17	1.743 per million freight train km
Other train*	2015-16	0.273 per million total train km
	2016-17	0.322 per million total train km

APPENDIX C

SCOPE AND METHODS

GEOGRAPHIC COVERAGE

Descriptions and statistics in this report apply only to those railways within ONRSR's area of operation as at 30 June 2017 – South Australia, New South Wales, Tasmania, Northern Territory, Victoria, Australian Capital Territory and Western Australia.

REPORTING PERIOD

A minimum reporting period of 1 July 2016 to 30 June 2017 applies to this report. Longer term data, from 1 July 2012 to 30 June 2017, was used when available in order to present trends of incidents over time.

RAILWAY OPERATIONS

The statistics cover all railway operations within the aforementioned geographic bounds with the exception of Victoria. There are 11 railways which continue to be regulated under local Victorian law and are therefore not subject to *Rail Safety National Law* (RSNL). These comprise the metropolitan tram operator and 10 standalone tourist and heritage railways.

DATA AND SOURCES

The statistics in this report are 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 and *Rail Safety National Law National Regulations 2012 (SA)* and *Rail Safety National Law (WA) Regulations 2015 (National Regulations)*. The specific information to be provided is defined in clause 57 of the *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
- 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*.

Railway crossing numbers and access types are sourced from the Australian Level Crossing Assessment Model (ALCAM).⁹

⁹ ALCAM Level Crossing Management System (LXM), June 2017.

DEFINITIONS

The majority of statistics are based on the incident definitions of the national occurrence classification guideline which is date dependent. For ONRSR collected data from the period 20 January 2013 to 7 June 2017 inclusive, incident definitions are based on those in the Occurrence Classification Guideline (OC-G1), 2013.¹⁰ For ONRSR collected data since 8 June 2017 incident definitions are based on the Reporting Requirements for Notifiable Occurrences.¹¹ All data collected by previous state and territory regulators were classified under similar but different classification standards. For definitions of specific terms used in this report please refer to Appendix D: Glossary.

Serious injury and minor injury

The definitions of a serious injury and minor injury used in this report vary from those that applied to previous versions of ONRSR's Rail Safety Report and were introduced to improve the consistency and accuracy of injury coding. Please refer to Appendix D: Glossary for the updated definitions, which have been applied internally at ONRSR since 1 July 2016.

Strike

For the purposes of this report a strike is a train or rolling stock colliding with a person.

Risk-based analysis

Some of the statistics presented are based on definitions specific to this report to support a more meaningful risk-based analysis of critical events. In such cases these definitions are presented in the body of the report.

DISCLAIMER

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, international 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.

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.¹²

The statistics in this report may differ to other sources that utilise the same data and coding specifications. This will be due in part to the data collection and preparation methods used to generate the tables and charts in this report which included identification and correction of errors in historical data.

Past and future releases

The statistics presented in this report are subject to review and amendment as more information becomes available through investigation or inquiry or as ONRSR refines its systems for data capture, validation and reporting. This may result in variation between historical and future reports.

¹⁰ Office of the National Rail Safety Regulator, Classifying Notifiable Occurrences. Occurrence Classification Guideline (OC-G1), Version 1.1, ONRSR, Adelaide, March 2013.

¹¹ Office of the National Rail Safety Regulator, Reporting Requirements for Notifiable Occurrences, Version 1, ONRSR, Adelaide, June 2017.

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.

APPENDIX D

GLOSSARY

Ballast: a stone or aggregate material spread on the ground for the purpose of holding the track in line laterally and longitudinally and also to provide drainage.

Block (section): a portion of line with defined limits between which only one rail traffic movement is permitted at any time.

Buffer stop: a structure erected across the end of a track at main line terminals or dead end sidings which is intended to stop rolling stock.

Catch points: set of points designed to prevent unauthorised access to a section of track by prior intentional derailment of a vehicle.

Derailer: a specially shaped block placed over one rail of a siding to protect main line traffic from any runaway vehicles or unauthorised moves. This protection is achieved by derailing any locomotive or wagon that comes in contact with the derailer. In some terminals derailleurs are also used to prevent unauthorised entry into sidings.

Fatality: a person who dies, within 30 days of a notifiable occurrence, from injuries sustained as a result of that occurrence.

Foul: in a position to obstruct rail traffic on an adjacent line or track.

Freight train: a train that is designed and used for carrying freight, such as coal and minerals, grain, fuel, livestock and containers, whether or not it is carrying freight at the time. It also refers to a train operated in conjunction with maintenance activities such as a ballast train.

Heavy rail passenger train (commercial): a passenger train, other than a tram or a tourist and heritage passenger train. See also **Train, Tram** and **Tourist and heritage passenger train**.

Injury: refer to **Minor injury** and **Serious injury**.

Level crossing: an area where a road and railway meet at substantially the same level, whether or not there is a level crossing sign on the road at all or any of the entrances to the area, as defined in section 4 of the RSNL – see also **Railway crossing**.

Light rail passenger train (commercial): a passenger tram or light rail passenger vehicle, other than a tourist & heritage passenger train. See also **Train, Tram** and **Tourist and heritage passenger train**.

Minor injury: an injury other than a **serious injury** sustained by a person as a result of a notifiable occurrence that receives medical treatment. In general this will exclude injuries that only require first aid.

Near miss: is an occurrence where the driver of a moving train takes emergency action, or would have if there was sufficient time, to avoid impact with a person, vehicle or other obstruction and no collision occurred. Emergency action includes continuous audible warning and/or brake application.

Network control: responsible for managing rail movements safely across the national rail network. Also known as a train control.

Notifiable occurrence: as defined in section 4 of the RSNL is an accident or incident associated with railway operations:

- that has, or could have, caused significant property damage; serious injury; or death
- that is, or is of the class that is, prescribed by the national regulations to be a notifiable occurrence or class of notifiable occurrence
- but does not include an incident, or class of incident, that is prescribed by the national regulations not to be a notifiable occurrence.

Passenger: a person travelling or intending to travel on a train. Such a person may be a member of the public or an off-duty railway employee that is (regardless of whether they hold a valid ticket or authority to travel):

- travelling, boarding or alighting from a train
- on railway premises (other than a railway station car park) before and after travel.

It does not refer to:

- a trespasser, a stowaway or a person travelling on the outside of a train or in a location on a train not authorised for passenger travel
- a railway driver or on-duty railway employee travelling to a place of work at the time of an occurrence.

Pedestrian crossing: railway crossing provided for the exclusive use of pedestrians who may be people travelling on foot, by bicycle (dismounted, where required) or by mobility aid (e.g. wheelchair, scooters).

Points: a set of points permit rail traffic to change from one track to another. Points are normally referred to as left or right hand denoting the turnout direction as viewed from the toe end.

Public: persons who are authorised to be in a designated area of the railway premises but are not there for travel by train. This may include:

- persons passing through a concourse or station or bystanders
- persons on a railway crossing, bridge or adjacent to railway premises affected by a notifiable occurrence
- emergency services personnel.

Rail corridor¹³: the area of land reserved for railway operations typically everywhere within 15 metres of the outermost rails or:

- the boundary fence where boundary fences are provided and are closer than 15 metres
- if the property boundary is less than 15 metres, the property boundary
- a permanent structure such as a fence, wall or level.

Rail infrastructure manager: defined in section 4 of the RSNL, is the person who has effective control and management of the rail infrastructure of a railway, whether or not the person:

- owns the rail infrastructure
- has a statutory or contractual right to use the rail infrastructure or to control, or provide, access to it.

Rail safety worker: an individual who has carried out, is carrying out, or is about to carry out, rail safety work, as defined in section 8 of the RSNL.

Rail transport operator: infrastructure manager, rolling stock manager or both.

Railway: guided system designed for the movement of rolling stock which has the capability to transport passengers, freight, or both on a railway track with a gauge of 600 millimetres or more. It also comprises all associated infrastructure, sidings and rolling stock. Common types of railways include heavy and light railways, monorails and tramways – refer to section 4 of the RSNL for further examples. The RSNL does not apply to certain railways listed under section 7, including slipways, aerial cable operated systems and railways used only by a horse-drawn tram.

Railway crossing: defined under section 4 of the RSNL as a level crossing; or any area where a footpath or shared path crosses a railway at substantially the same level. A railway crossing may either be a pedestrian crossing or a road crossing. See also **Pedestrian crossing** or **Road crossing**.

¹³ Some operators may define the 'rail corridor' differently. For example, in WA the 'rail corridor' can be defined as 50 metres from the centre of the track.

Railway infrastructure: facilities other than rolling stock necessary for a railway to operate safely including:

- railway track, associated track structures and over-or-under track structures
- supports (including supports for railway equipment or items associated with the use of a railway)
- tunnels, bridges, stations and platforms
- train control systems, signalling systems and communications
- electric traction infrastructure
- buildings, workshops and associated equipment.

Railway operations: includes all activities related to the performance of a rail transport operator as defined in section 4 of the RSNL, namely:

- the construction of a railway, railway tracks and associated railway track structures
- the construction of rolling stock
- the management, commissioning, maintenance, repair, modification, installation, operation or decommissioning of rail infrastructure
- the commissioning, use, modification, maintenance, repair or decommissioning of rolling stock
- the operation or movement, or causing the operation or movement by any means of rolling stock on a railway (including for the purposes of construction or restoration of rail infrastructure)
- the movement, or causing the movement, of rolling stock for the purposes of operating a railway service
- the scheduling, control and monitoring of rolling stock being operated or moved on rail infrastructure.

Railway worker: a person (whether full or part time) who works for or at the direction of a railway organisation and is not off duty. This includes a person who is:

- a permanent or temporary employee (including a trainee or apprentice)
- a contractor, (sub) contract worker or a person supplied by an employment agency
- a volunteer.

Work that may be undertaken by such a person includes:

- rail safety work (including as a shunter, a driver, a guard, a controller or signaller, station staff and the maintainer of rolling stock or rail infrastructure)
- work on the office and technical staff
- work on the infrastructure staff and freight centre staff.

Road crossing: railway crossing, where a railway line and road intersect permitting road users to travel through the area in a motor vehicle.

Road rail vehicle (RRV): vehicle which can operate under its own power, both on rail and road, and which can transition from one mode of operation to the other. Such a vehicle may or may not have the ability to travel on a public highway and may or may not be road registered.

Road vehicle: vehicle or any device, in, on, or by which a person or property is permitted to be transported on a public or private roadway. It includes:

- light passenger vehicles: cars (sedans/utilities/station wagons/4WDs), light commercials (<4.5t), delivery vans and mini buses (maximum capacity of 12 passengers)
- heavy freight vehicles: medium rigid trucks, semi-trailers, B doubles and road trains
- dangerous goods vehicles: fuel tankers and tankers containing other dangerous goods (such as acid)
- buses: with a capacity greater than 12 passengers
- special purpose machine: tractors, forklifts, general farm machinery and specially constructed machinery

- motorcycles (including motorised scooters)
- bicycles
- animal-drawn vehicles and animals that are being ridden or drawing a vehicle (as defined in the Australian Road Rules).

It does not include:

- trams
- motorised wheelchairs
- pedestrian conveyances – human powered devices by which a pedestrian may move other than by walking or by which a walking person may move another pedestrian e.g. baby carriages, roller skates, skateboards and non-motorised scooters and wheelchairs.

Rolling stock: vehicle, whether or not self-propelled, that operates on or uses a railway including a locomotive, carriage or monorail vehicle. Refer to section 4 of the RSNL for more examples. It does not include a vehicle that is designed to operate on the track and road when it is on the road.

Rolling stock operator: a person who has effective control and management of the operation or movement of rolling stock on rail infrastructure for a railway, but does not include a person by reason only that the person drives the rolling stock or controls the network or network signals, as defined in section 4 of the RSNL.

Running line: is a railway track used primarily for the through movement of trains, as defined in section 4 of the RSNL. Turnbacks or reversing tracks are considered to be part of the running line by ONRSR, unless specified as a siding by the railway infrastructure manager since their primary use is for terminating passenger trains and not usually for the long term stabling of trains.

Safeworking: prescribe the network requirements for the different systems of safeworking utilised across the rail network. Different rules, procedures and systems of safeworking are utilised across the rail network.

Serious injury¹⁴: an injury requiring the person to have:

- Immediate treatment as an in-patient in a hospital
- Immediate treatment for:
 - » Amputation of any part of his or her body
 - » Serious head injury
 - » Serious eye injury
 - » Serious burn
 - » Separation of his or her skin from an underlying tissue such that tendons, bones or muscles are exposed (such as degloving or scalping)
 - » Spinal injury
 - » Loss of a bodily function
 - » Serious lacerations
- Medical treatment within 48 hours of exposure to a substance, such as chemicals, animal or human blood and airborne contaminants.

Shunting: movement of trains or rail vehicles for the purposes of marshalling or altering their consist.

Siding: portion of track where vehicles can be placed clear of the running lines.

Signal: a visual display device which conveys instructions or provides prior warning of instructions regarding the driver's authority to proceed.

Tourist and heritage passenger train: passenger train, including a tram, which is in service primarily for nostalgia, leisure and tourism purposes such as a heritage steam train.

¹⁴ Note this definition incorporates elements of section 36 of the Work Health and Safety Act 2011 (Cth).

Track: combination of rails, rail connectors, sleepers, ballast, points and crossings, or substitute devices, if used.

Track maintenance train: special type of train that is designed and used for track inspection and maintenance work.

Train: one or more units of rolling stock coupled together, at least one of which is a locomotive or other self-propelled unit that is designed to run on a railway, as defined in section 4 of the RSNL. Common types of trains are: passenger trains (urban, non-urban and tourist & heritage), trams, freight trains, track maintenance trains, light locomotive(s), monorails and inclined railways.

Tram: type of passenger train that runs on light rail and is typically designed to travel short distances in an urban setting.

Trespasser: a person who is in a railway premises (including land and rolling stock) without the necessary permission or authority, whether intentionally or negligently. Trespassers on a railway premises include:

- persons who commit suspected suicides
- stowaways and persons travelling on places not authorised for their use e.g. outside trains
- persons who disobey warning signs or signals or stray away from the normal route of the railway crossing
- persons who cross the track anywhere other than at an authorised crossing point (such as passengers or members of the public that use a recognised 'staff only' crossing at a station without authority)
- persons electrocuted while dangling or throwing objects from a position that is not on railway premises, onto overhead line equipment/conductor rails at bridges etc.
- persons deliberately falling or jumping from a platform i.e. where not caused by illness, platform congestion or other incident
- persons carrying out illegal activities.

However, the following persons will not be considered trespassers on a railway premises:

- pedestrians crossing the road where tram tracks run within the road
- persons with the requisite authority to be on a railway premises.

Urban passenger train: passenger train that primarily travels within designated metropolitan areas, such as a commuter train or tram. Accordingly, it does not include inter-city, regional or long-distance services.

Workforce: persons (whether full or part time) who work for or at the direction of a railway organisation and are not off duty – see also **Railway Worker**.

NOTES

NOTES





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