Government of Western Australia
Department of Mines and Petroleum
Resources Safety

Overview of dangerous goods reportable situations and incidents 2016

March 2017

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Contents

Overview of 2016 reportable situations and incidents

This report describes dangerous goods and explosives incidents that occurred in 2016 and are required to be reported to the Resources Safety Division of the Department of Mines and Petroleum under the *Dangerous Goods Safety Act 2004* and associated regulations. The report also compares the 2016 incident data with comparable data collected since 1997 and provides some analysis of incident data for that period.

The quantity of dangerous goods being stored, handled and transported across the State remains steady. Looking at 21 years of data, the total number of reported incidents, excluding major hazard facility (MHF) incident reports, has remained relatively constant over the period. It is acknowledged that the actual number of incidents is likely to be greater than the number reported, so year-to-year variations should not be over-interpreted. For example, rather than indicating an increase in the number of incidents, the significant increase in the number of explosives incident reports since 2008 most likely reflects an increased awareness of reporting responsibilities by mining companies and users.

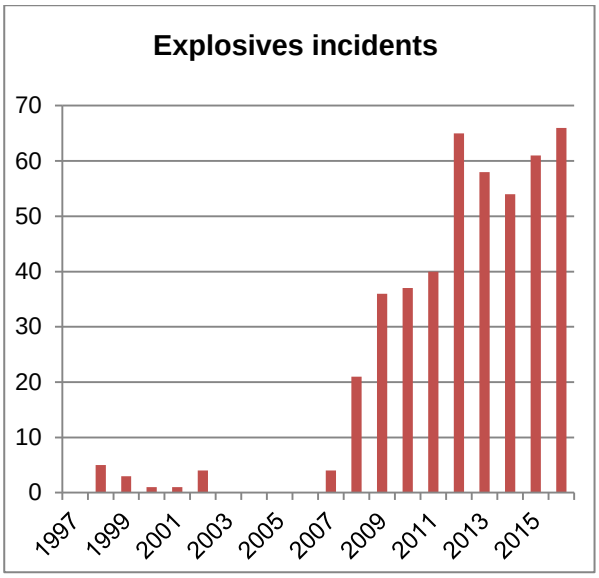
There were no fatalities in 2016. While several injuries received were serious, the majority were minor.

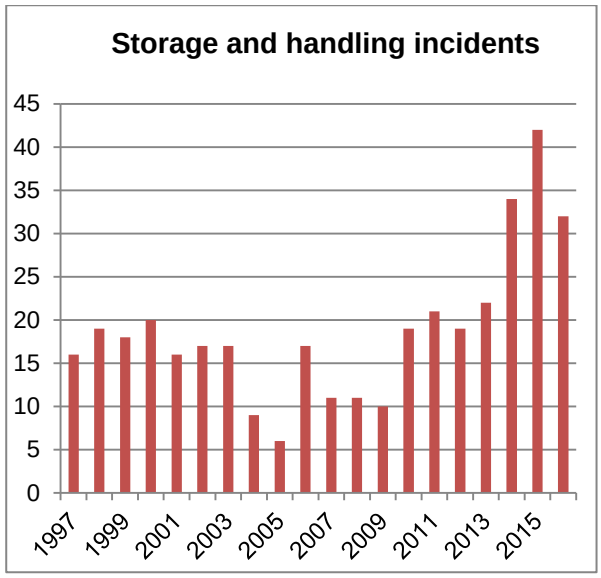
Ross Stidolph

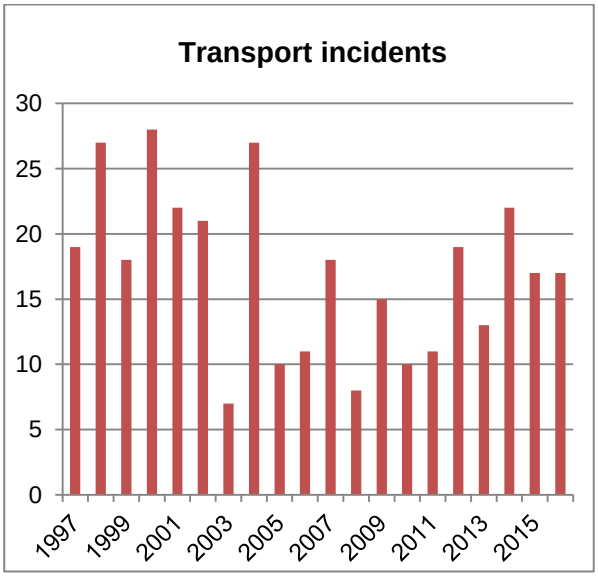
CHIEF DANGEROUS GOODS OFFICER

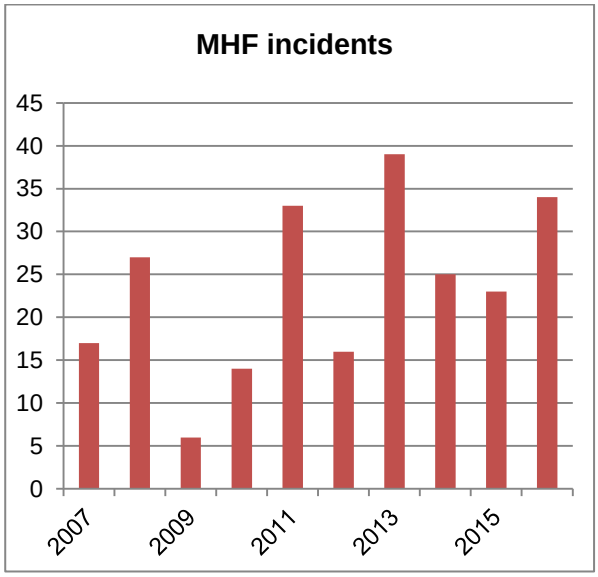
March 2017

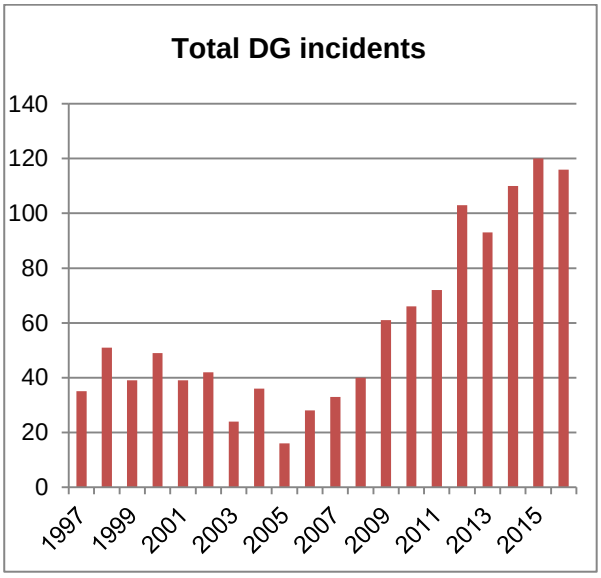
Number of reportable situations and incidents for 1997–2016











Explosives and Security Sensitive Ammonium Nitrate (SSAN) reportable situations in 2016

There were 66 explosives and SSAN reportable incidents notified to Resources Safety in 2016. Twelve of these were reported to the mines inspectorate only, with the balance reported to the dangerous goods inspectorate. Users of explosives are reminded of their responsibilities under the Dangerous Goods Safety (Explosives) Regulations 2007 to report incidents.

The number of incidents reported for 2016 is slightly higher than for 2015.

The report covers a wide range of incident types. The number of incidents involving losses of detonators, primers or boosters at mine sites is consistent with previously periods. Mine site operators are expected to continue to improve their accounting and reconciliation processes to eliminate this problem. There is currently a targeted inspection program by Resources Safety to better manage the accounting and reconciliation of explosives and demolition accessories. Other than this, there is no identifiable pattern to the incidents listed.

None of the reported incidents resulted in a fatality, but some caused minor injuries as well as damage to mine equipment, buildings, vehicles and plant.

Serial	Date	Location	Goods	Incident details
1	10 January	Pilbara	Booster	A booster was unaccounted for.
2*	10 January	Pilbara	ANFO	An excavator operator discovered unfired ANFO when clearing product.
3	13 January	Perth	Ammonium nitrate emulsion or suspension or gel	Two pumps that were sent off site for repair were contaminated with emulsion.
4	20 January	Pilbara	Ammonium nitrate emulsion or suspension or gel	Product spilt when reloading an MPU.
5*	24 January	Pilbara	Booster	The driver of a stemming loader drove over and crushed a booster.
6	26 January	Pilbara	Booster and detonator	An excavator operator, discovered a detonator and booster when clearing product.
7	30 January	Pilbara	Booster and detonator	An excavator operator, discovered a detonator and booster when clearing product.
8	31 January	Pilbara	Booster and detonator	An excavator operator discovered a detonator and booster when clearing product.
9*	7 February	East Goldfields	Detonators	Two detonators were unaccounted for after charging a face.

Serial	Date	Location	Goods	Incident details
10*	15 February	Pilbara	Booster and detonating cord	An excavator operator discovered an unfired booster and detonating cord when loading a haul truck.
11	16 February	Pilbara	Boosters	An excavator operator unearthed a 400 g booster.
12	9 March	Goldfields	Boosters	A booster was unaccounted for.
13	9 March	Goldfield	Boosters and detonators	During a shot reconciliation two boosters and two detonators were unaccounted for.
14	27 March	Mid-West	Explosives	Attempted break in on a compound. No items were stolen.
15	30 March	North West	Explosives	Attempted break in on a compound. No items were stolen.
16	3 April	Pilbara	Detonator	During a shot reconciliation a detonator was unaccounted for.
17*	6 April	Midwest	Blasting explosives	A bogger operator initiated an unfired blast hole. There were no injuries or equipment damage.
18	18 April	Pilbara	Booster	During priming and loading activities at a mine site a booster was lost down a hole.
19	21 April	Pilbara	Ammonium nitrate emulsion or suspension or gel	A battery isolation switch on a MPU short circuited causing sparking. No fire started.
20	21 April	Pilbara	Detonator assemblies	A vehicle drove over and cut the down line of a loaded hole.
21*	4 May	Pilbara	Boosters	An excavator operator discovered some unfired boosters when loading waste.
22	23 May	Pilbara	Ammonium nitrate emulsion or suspension or gel	When loading a MPU, a minor amount of product was spilt.
23	31 May	Pilbara	Detonator assemblies	During a shot reconciliation a detonator was unaccounted for.
24	4 June	Pilbara	Blasting explosive	Flyrock damaged buildings within the blast exclusion zone. There were no injuries.
25*	6 June	Pilbara	Detonator	A detonator was unaccounted for.
26	10 June	Pilbara	Detonator assemblies	During a shot reconciliation a detonator was unaccounted for.

Serial	Date	Location	Goods	Incident details
27*	15 June	Eastern Goldfields	Blasting explosives	Flyrock from a blast landed in close proximity to the blast crew. Small fragments of rock struck a vehicle. There were no injuries.
28	16 June	Southern Goldfields	Boosters	A vehicle drove over a 400 g booster during stemming operations.
29	16 June	Pilbara	Booster and detonator	A digger operator discovered an unfired detonator and primer when clearing product.
30	16 June	Goldfields	Boosters, without detonator	During a shot reconciliation a booster remained unaccounted for.
31	18 June	Pilbara	Boosters, without detonator	A partially fired booster and detonator were discovered when clearing product.
32	15 July	Pilbara	Detonators	A bulldozer operator discovered a primer when clearing a blast floor.
33	21 July	South West	Blasting explosives	A grader operator cut a downline.
34	24 July	Eastern Goldfields	Blasting explosives	The blast crew remained inside the blast exclusion zone during a blast.
35	25 July	South West	Detonator assemblies	Unauthorised personnel drove over some nonel tubing on a blast site.
36*	26 July	Pilbara	Blasting explosives	A dozer operator trammed over a tied-in blast hole.
37	7 August	Northern Goldfields	Boosters	Two boosters were unaccounted for after loading the shot. After searching area, one booster was found and the other was not located.
38	12 August	Pilbara	Blasting explosives	An excavator operator discovered a column of unfired explosives when clearing product.
39	16 August	Mid-West	Detonators	A shotfirer experienced a near miss when picking up a delay detonator which initiated several seconds later.
40	20 August	North Eastern Wheatbelt	Blasting explosives	Flyrock exceeded the blast exclusion zone. There were no injuries or damage caused.
41	24 August	Goldfields	Blasting explosives	An explosives delivery truck slid into the decline wall when travelling underground. There were no injuries.

Serial	Date	Location	Goods	Incident details
42	26 August	Pilbara	Boosters	A 400 g booster could not be accounted for during a stocktake. It was later found due to an accounting error.
43	27 August	Pilbara	Boosters	While holes were being slept, ten boosters became loose when the bulk explosive dissolved in water.
44	28 August	Pilbara	Boosters	During the placing out of boosters alongside the blast holes, one remained unaccounted for.
45*	29 August	Pilbara	Blasting explosives	A vehicle drove over and damaged signal tube on a shot.
46	2 September	Pilbara	Detonators	An unfired detonator and booster combination was discovered during post blast clean-up operations.
47	21 September	Pilbara	Detonators	During stocktaking actions a discrepancy was discovered. Reconciliation actions determined the stock had fallen down a shot hole.
48	6 October	Eastern Goldfields	Detonator and booster	Drilling personnel discovered an unfired detonator and booster combination from a previous shot.
49	8 October	Pilbara	Detonator and booster	A dump truck driver discovered a detonator and booster combination at the spoil tip head.
50	9 October	Pilbara	Booster and detonating cord	A digger operator discovered an unfired booster and detonating cord when clearing product.
51	10 October	Pilbara	Boosters	When conducting a stock reconciliation a booster remained unaccounted for.
52	10 October	Goldfields	Blasting explosives	Five detonators and five cartridges of explosives were found at the mine site's rubbish tip.
53	11 October	Perth	Boosters	A booster was left on a public transport train.
54	17 October	Pilbara	Boosters	A blast hole slumped after loading, causing the downline to be lost down the hole.
55	25 October	Northern Goldfields	Ammonium nitrate emulsion or suspension or gel	An SSAN compound was left unsecured.

Serial	Date	Location	Goods	Incident details
56	25 October	Pilbara	Detonator assemblies	During reconciliation actions a detonator remained unaccounted for.
57	30 October	Goldfields	Detonator assemblies	A down hole detonator was lost while pre-loading a blast pattern.
58*	1 November	Pilbara	Blasting explosives	The blast crew remained inside the blast exclusion zone at the time of initiation.
59	15 November	Pilbara	Boosters	When preparing a new site for drilling the shotfirer found an assembled unfired primer from a previous shot.
60*	15 November	Pilbara	Detonators	A detonator was unaccounted for.
61	19 November	Pilbara	Detonators	A detonator was lost down a drill hole.
62	30 November	Pilbara	Detonator assemblies	A detonator was lost down a drill hole.
63	6 December	Pilbara	Detonator assemblies	A booster casing and a non-electric detonator were discovered from a previous shot while loading a blast pattern.
64	21 December	Pilbara	Detonators	An excavator operator discovered ANFO when clearing product.
65	29 December	Pilbara	Ammonium nitrate	A MPU was left unattended on a mine site.
66	29 December	Goldfields	Blasting explosives and detonators	The driver of an explosives vehicle fell asleep at the wheel. There were no injuries or loss of explosives.

** Reported to Mines Inspectorate only.*

Dangerous goods storage and handling reportable situations in 2016

There were 32 reported dangerous goods storage and handling incidents in 2016, a reduction on the previous year. There was no general pattern or trends identified with the incidents, with causes ranging from mechanical equipment failure to human error. There was a significant reduction in the number of incidents involving ammonia and chlorine; this is in part, assessed as a result of targeted campaign by Resources Safety during late 2015 and 2016. A similar number of incidents involving liquefied petroleum gas (LPG) were reported as in the previous year. Resources Safety will continue targeting these industries in the coming reporting period.

Three operations within the State are particularly prone to loss of containment. These operations reported a further 185 spill incidents that involved 1 kL or more. None of these losses resulted in environmental harm. Before March 2008, such incidents had not been considered or reported as dangerous goods incidents. The 2016 figure is higher than that reported in 2015 (129). A range of preventative actions continue to be implemented to reduce the likelihood of recurrence.

Serial	Date	Location	Goods	Incident details
1	11 January	Kewdale	Ammonia	Ammonia gas leaked from a refrigeration system.
2	11 January	Balcatta	Liquefied petroleum gas	Gas leaked from a pump gasket.
3	25 January	Nedlands	Hypochlorite solutions	Solution leaked from the cooling tower of a hospital's chemical dosing system.
4	27 January	Nedlands	Environmentally hazardous substance	A capacitor bank cable box failed resulting in a small spill of Sefton gel within the substation.
5	9 February	Coolgardie	Diesel	During refuelling operations a tank was overfilled resulting in a spill of about 2 000 L of diesel.
6	14 February	Belmont	Combustible liquid	An electrical transformer exploded releasing about 100 L of C1 combustible liquid.
7	15 February	Kulin	Chlorine	There was a small release of chlorine gas from a cylinder at an aquatic centre.
8	25 February	Merredin	Combustible liquid	An electrical transformer seam failed releasing about 1 kL of C1 combustible liquid. There were no injuries.
9	15 March	Margaret River	Liquefied petroleum gas	Gas leaked from a faulty seal inside a LP gas dispenser.
10	23 March	Merredin	Diesel	About 1 000 L of diesel leaked from an electrical terminal.
11	10 April	Canning Vale	Combustible liquid	An electrical transformer failed causing an oil spill and fire.

Serial	Date	Location	Goods	Incident details
12	21 April	Myaree	Liquefied petroleum gas	Gas leaked from a dispenser at a service station.
13	25 April	Collie	Sodium hydroxide	A worker had chemical contact to face and eyes while operating machinery.
14	26 April	Noonkanbah	Diesel	Diesel leaked from a transfer valve. All contaminated soil was properly disposed of.
15	11 May	Collie	Corrosive solid	A worker got a corrosive substance in their eye and received a caustic burn.
16	23 May	Fremantle	Liquefied petroleum gas	Gas leaked from a LP gas tank valve at a service station site.
17	25 May	Pannawonica	Chlorine	Minor vapour leak from a chlorine drum at a water treatment facility.
18	2 June	Cockburn Central	Flammable liquid	A person suffered burns while working in a spray painting booth.
19	4 June	Collie	Sodium hydroxide	A transfer hose split, releasing caustic slurry onto internal roadway outside bunded area.
20	27 July	Kwinana	Sulphur	A fire started after hours in pile of sulphur. There were no injuries.
21	1 August	Nullagine	Sodium cyanide solution	While unloading, an isotainer leaked. All product was contained in a bunded area.
22	17 August	Karratha	Aerosols	Used empty aerosol cans were being sorted when a spark ignited vapour, causing a fire.
23	18 August	Tropicana	Ammonium nitrate	When unloading ammonium nitrate between 5-8 tonnes spilt in the tipping area. All product was recovered.
24	25 August	Mount Barker	Flammable liquid	When filling an underground petrol tank fuel was seen spilling out of the dip point. About 150 L of fuel was lost. There were no injuries or environmental damage.
25	12 September	South Lake	Liquefied petroleum gas	LP gas escaped through the ullage valve on an underground storage tank.
26	14 October	Nedlands	Chlorine	A worker inadvertently added chlorine to a drum containing sulfuric acid resulting in chlorine gas. The worker received medical attention.
27	26 October	Mount Lawley	Hypochlorite solution	Sodium hypochlorite was added to hydrochloric acid resulting in chlorine gas. No injuries resulted.

Serial	Date	Location	Goods	Incident details
28	3 November	Cockburn Central	Ammonia	During maintenance work a valve was opened and ammonia gas released. About 100 kg of product was lost.
29	15 November	Perth Airport	Nitrogen	Gas fire protection system failed and nitrogen leaked into a computer server room.
30	27 November	Perth	Liquefied petroleum gas	A small quantity of gas leaked from a LP gas tank. The leak was quickly isolated.
31	8 December	Binningup	Bisulphites	A dosing pipeline elbow joint failed and allowed 15 litres of solution to leak into the surrounding ground. There were no injuries.
32	9 December	Bassendean	Sulfuric acid	A small quantity of acid drained into the waste pit and reacted exothermically with water. A worker was affected and received medical attention.

Dangerous goods transport reportable situations in 2016

Seventeen dangerous goods transport incidents were reported in 2016, this is the same as 2015. Resources Safety has continued its active safety campaign during 2016 and engagement with transport operators.

The majority of reported incidents can be attributed largely to human error, with no dangerous goods loads being the causal factor in any incident.

Serial	Date	Location	Goods	Incident details
1	11 January	Balga	Hydrochloric acid	Road traffic accident resulted in the loss of containment of hydrochloric acid. Some people at the scene were affected by the fumes.
2	14 January	Wyndham	Petroleum crude oil	The seam of a road tanker split causing oil to leak onto an unsealed road. The spill was contained and recovered. There was no environment damage.
3	13 February	Nanutarra	Ammonium nitrate	The rear trailer of a double road trained rolled over. About 6 tonnes of ammonium nitrate spilled. All product was recovered.
4	11 March	Wickepen	Mixed dangerous goods	A vehicle collided with a house. The driver suffered minor injuries.
5	29 March	Tom Price	Ammonium nitrate	Hot wheel bearings were detected on a trailer which resulted in a fire. An attempt to cool it using fire extinguishers failed. The driver disconnected the burning trailer and drove prime mover and front trailer to a safe location. Ammonium nitrate started burning and a 3 km radius area was evacuated. Trailer with product was allowed to burn. About 13 tonne of product was lost.
6	1 April	Lake Grace	Bipyridilium pesticides	A vehicle rolled and a number of IBCs and 110 L drums of pesticide fell from the truck and onto the road and road verge.
7	7 May	Hazelmere	Ammonium nitrate	The rear trailer of a B-double became unhitched when driver was negotiating a left hand turn. 20 kg of ammonium nitrate spilt onto the ground.
8	11 May	Leinster	Ammonium nitrate emulsion	The second trailer of a triple road train rolled over. No product was lost.

Serial	Date	Location	Goods	Incident details
9	11 May	Kalgoorlie	Sulphuric acid	The rear trailer of a quad diesel tanker road train collided with an empty tank trailer of an acid triple road train. About 25 kL of diesel fuel spilled onto the road.
10	14 May	Mount Magnet	Ammonium nitrate emulsion or suspension or gel	The second trailer in a triple rolled over. Product spilt from hatch.
11	19 May	Bassendean	Hydrochloric acid	A pump seal leaked during a delivery. About 200 L was lost into a bunded area and then recovered for disposal.
12	21 May	Port Hedland	Liquefied natural gas	A road train carrying gas collided with a semi-trailer. There was no loss of product.
13	28 June	Perth	Diesel	A vehicle jack knifed resulting in the loss of about 300 L of diesel from the vehicle's fuel tank.
14	25 July	Pilbara	Ammonium nitrate	The brake hub on a dolly carrying ammonium nitrate collapsed and overheated. Water was quickly applied to cool the hub and brakes.
15	17 August	Mount Magnet	Ammonium nitrate	The driver of a truck carrying ammonium nitrate took evasive action to avoid another vehicle. A freight container detached from the third trailer causing a small amount of product to spill out.
16	7 August	Jimblebar	Ammonium nitrate emulsion or suspension or gel	A small amount of product spilled through an open hatch. The product was collected and disposed of.
17	21 September	Kewdale	Carbon dioxide	The driver vented product from the isotainer in a public place as it was over pressurised and occasionally self-venting.

Major hazard facility reportable situations in 2016

Major hazard facility (MHF) incident reports and reportable situations cover circumstances involving injury, damage or near misses.

There were 34 reportable incidents in 2016, compared with 23 in 2014. All incidents were minor in nature and some workers received minor injuries.

Serial	Date	Location	Goods	Incident details
1	9 January	Kwinana	Acid phosphate	A discharge valve and associated drain piping leaked, discharging about 2000 L of acid phosphate solution into the bund. All was recovered.
2	15 January	Kwinana	Zirconium oxychloride	There was a loss of containment of zirconium oxychloride from a storage tank.
3	25 January	Kwinana	Crude oil	About 1000 L of oil leaked from an internal roof drain into a bund. All was recovered.
4	3 February	Burrup	Ammonia	Ammonia gas was released from a pressure relief device. Seven workers were affected with two sent to hospital.
5	7 February	Barrow Island	Liquefied natural gas	Gas leaked from an inlet separator. No injuries occurred.
6	19 February	Burrup	Ammonia	An ammonia leak occurred from a transfer pump.
7	20 February	Kwinana	Acidic solution / hydrogen	A heater bundle failed allowing an acidic solution to be released. Hydrogen was released as part of the purge process.
8	1 March	Kwinana	Sodium hydroxide	Sodium hydroxide overflowed from a storage tank, the loss was contained in a bund.
9	22 March	Kemerton	Hydrochloric acid	About 2.4 kL of product (28% concentration) was released through a split process line. The product was contained and neutralised. There were no injuries or environmental damage.
10	25 March	Burrup	Ammonia	Ammonia gas was released from a pressure relief device.
11	17 April	Kwinana	Ammonium nitrate	A leak of liquid ammonium nitrate was detected. The material was recovered.
12	27 April	Burrup	Nitric acid	A valve flange leaked releasing nitric acid and generating NOx vapours.

Serial	Date	Location	Goods	Incident details
13	1 May	Burrup	Nitric acid	Nitric acid was lost. There were no injuries.
14	3 May	Kemmerton	Caustic	About 24 000 L of 15% caustic was lost due to failed non-return valves. All liquid was contained. There were no injuries.
15	7 May	Kwinana	Chlorine	About 10 kg of chlorine was released from a scrubber stack.
16	11 May	Kalgoorlie	Hydrogen sulfide	Sulphur leaked from the side-supply / fill line from a H2S reactor. The leak ignited but was quickly extinguished.
17	21 May	Karratha	Methane	Gas was released due to an isolation valve not fully closed.
18	30 May	Barrow Island	Methane	Gas fumes bled from a cabinet door seal. The leaking valve was discovered and isolated. There were no injuries
19	30 May	Burrup	Ammonia	Ammonia gas was released through a pressure relief device.
20	3 June	Burrup	Ammonia	Ammonia gas was released through a pressure relief device.
21	11 June	Kalgoorlie	Sulphur	A small amount of sulphur caught fire. The fire was quickly extinguished, there were no injuries.
22	12 June	Kwinana	Grease	Grease caught fire within a trunnion shaft on an ammonium nitrate production line.
23	30 June	Barrow Island	Liquefied natural gas	Gas leaked through a hairline crack in a flare header pipeline. There were no injuries.
24	5 July	Burrup	Flammable gas	Flammable gas from a leaking valve gland was ignited by sparks from a nearby hot work grinding operation. There were no injuries.
25	21 July	Kwinana	Petrol	A small leak occurred in motor spirit pipework.
26	30 July	Karratha	Carbon monoxide	An elevated carbon monoxide concentration was identified at a gas plant. It was confirmed as originating offsite.
27	3 August	Karratha	Methane	An open valve allowed a vent line containing liquid to pressurise. The pipe became distorted and fell from its support.

Serial	Date	Location	Goods	Incident details
28	11 August	Burrup	Ammonia	A worker sustained injury while working on an ammonia converter.
29	8 September	Barrow Island	Petroleum distillates	Condensate slops spilled into the bund wall during a product transfer.
30	23 September	Kwinana	Environmentally hazardous substance, liquid, N.O.S.	An emergency relief vent initiated as a result of failure on demand of the primary pressure vacuum vent.
31	2 October	Kwinana	Crude oil	About 520 L of crude oil was released into a bunded area.
32	3 October	Burrup	Ammonia	A valve leaked allowing process steam, containing a small quantity of ammonia and nitric acid to be released.
33	6 December	Kwinana	Liquefied petroleum gas	A loss of containment of flammable gases occurred from a heat exchanger.
34	27 December	Karratha	Methane	Loss of containment from pipework flange.

Statistical analysis of incident data for 2007–2016

The following table summarises storage and handling and transport incident data for the 10-year period between 2007 and 2016. The data have been analysed to identify the proportion of incidents nominally caused by mechanical failure or human error, and whether there was loss of product, serious injuries or fatalities.

Of the 220 *storage and handling incidents* over this period, 40 per cent are assessed as being caused by mechanical or design failure and 47 per cent by human error. Unfortunately, in 2016, as well as some incidents resulting in minor injuries, one serious injury was sustained. However, over the 10-year period, the incidence rate for serious injuries and fatalities has remained low.

For storage and handling and transport incidents, there was a wide variety of mechanical failures involved that do not show any consistent pattern or trend requiring further investigation.

Of the 151 *transport incidents*, 28 per cent are assessed as being caused by mechanical or design failure and 61 per cent by human error. For the purposes of this analysis, incidents such as truck roll-overs were classified as due to human error on the assumption that the main cause of the incident was driver inattention, fatigue, excessive speed or a combination of these, although it should be noted that, in some cases, other vehicle drivers were at fault. Unfortunately, over the 10-year period, there have been three seriously injured and four fatalities.

Further analysis of the transport data shows that 63 incidents (42%) involved double or triple road trains and most were roll-overs. In addition, several other incidents involved standard single-tanker vehicles. This reflects the extensive use of these vehicles for dangerous goods transport and the inherently greater risk of driving these vehicles, particularly where long distance transport is involved. The data suggest that dangerous goods transport companies need to focus on ensuring road train drivers do not speed and that they negotiate poor roads more carefully. Vehicle drivers should be well trained and provided with adequate rest breaks to maintain their alertness. No particular trend warranting further investigation has been identified.

Storage and handling and transport incident data 2007–2016

	Total number	Assessed cause			Loss of product	Serious injury	Fatality
		Material or design failure	Human error	Other causes			
Storage and handling (number of incidents)	197	87	104	29	177	10	2
		40%	47%	13%	80%	5%	1%
Transport (number of incidents)	151	42	92	17	100	3	4
		28%	61%	11%	66%	2%	3%