Australian Government
Australian Transport Safety Bureau

Wagon out of gauge on freight train 2BW4

Main North rail line, New South Wales, on 16 June 2020

ATSB Transport Safety Report
Rail Occurrence Investigation (Short)
RO-2020-009
Final – 20 January 2021

This investigation was conducted under the Transport Safety Investigation Act 2003 (Commonwealth) by the Office of Transport Safety Investigations (NSW) on behalf of the Australian Transport Safety Bureau in accordance with the Collaboration Agreement.

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Addendum

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Safety summary

What happened

On 15 June 2020, wagon RKOX4055Y was unloaded at the BlueScope Steel Coopers Plains facility, south of Brisbane, Queensland. The forklift operator experienced difficulty unloading the welded beams and sought assistance from a second forklift operator. Footage from security cameras within the Coopers Plains facility showed the corner of wagon RKOX4055Y lifting during the unloading before dropping back down.

Following unloading, wagon RKOX4055Y was shunted and attached to other wagons to form train 2BW4. This train underwent a full train examination and departed Brisbane bound for Port Kembla, New South Wales.

At around 0430 on 16 June, station staff at Grafton found damage to the platform. Train 2BW4 was identified as passing through Grafton and the train crew were directed to inspect their train at Kempsey. The inspection did not identify any faults with wagon RKOX4055Y and the train continued.

At 1040, workers at Dungog noticed a wagon on train 2BW4 contact the platform. The train was directed to stop at Wallarobba. On inspection, the wagon body on RKOX4055Y was found to have dislodged and was resting on the bogie. Wagon contact damage was also found on, Coffs Harbour, Taree, Wingham and Dungog platforms. There were no injuries as a result of the occurrence.

What the ATSB found

During the unloading of wagon RKOX4055Y the wagon body was likely lifted off the centre pin and dislodged as the load became stuck. The forklift operators did not notice that the wagon body had lifted and continued unloading other wagons. The underframe of train 2BW4 was not inspected as required by Pacific National's train examination procedure. The likely dislodged wagon body was not identified and train 2BW4 departed with a rolling stock irregularity.

During the journey to Port Kembla, further inspections occurred after reports of platform damage were made by station staff. The out of gauge wagon was detected when the train crew inspected the train at Wallarobba.

Additionally, the risk of a wagon lift off event had not been identified or controlled by BlueScope Steel or Pacific National.

What has been done as a result

Following the occurrence BlueScope Steel and Pacific National completed the following actions:

- Communicated the details of the occurrence and contributing factors to the unloading and maintenance personnel.
- Revised the unloading procedure to include the risk of lift off events and reinforced the requirement to unload welded beams from both sides.
- Reviewed the safety interface agreement and risk assessments to ensure all risk controls were current and included the risks associated with lift off events.

Safety message

Procedures and practices for loading and unloading rolling stock must ensure risks are identified, controlled and that the practices do not affect the safe operation of rolling stock.

Maintenance inspection regimes must be completed in accordance with engineering practices to identify conditions that might contribute to accidents.

The investigation

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope investigation was conducted in order to produce a short investigation report, and allow for greater industry awareness of findings that affect safety and potential learning opportunities.

The occurrence

On 15 June 2020, a total of 14 loaded steel wagons were shunted into the BlueScope Steel (BSS) Coopers Plains facility,[1] south of Brisbane, Queensland.

At around 0600,[2] a forklift operator began unloading wagon RKOX4055Y which had a load of three stacks of welded beams.[3] The forklift operator had difficulty unloading the welded beams and made a number of attempts to move and lift the beams. The operator unloaded two of the three stacks and sought assistance from a second forklift operator as the last stack of beams had become stuck. The last stack was lifted from the wagon using both forklifts. Unloading then continued on other wagons.

Once unloaded, the wagons were shunted and attached to other wagons to form Pacific National (PN) train 2BW4. Train 2BW4 consisted of three locomotives and 53 wagons which underwent a full train examination without incident.

Train 2BW4 departed the Brisbane Freight Terminal (BFT) around 2145, bound for Port Kembla, New South Wales (NSW) (Figure 1). A roll-by inspection[4] was completed on departure with no abnormalities detected.

At 0222 on 16 June, train 2BW4 passed through Grafton station and Coffs Harbour station at 0343. NSW Trains station staff identified damage to Grafton station platform at around 0430. This was reported to the network controller and the train crew of 2BW4 was directed to inspect their train on arrival at Kempsey.

At around 0615 a roll-by inspection was performed by one of the train crew as train 2BW4 entered the loop line at Kempsey. The driver then walked along the opposite side to inspect the train. A couple of loose straps were found on some wagons which were rectified and 2WB4 departed Kempsey.

A crew change was performed south of Taree station with the outgoing train crew performing a roll-by inspection. Following this the train continued the journey.

As train 2BW4 passed through Dungog platform at 1040, nearby workers noticed that a wagon on 2BW4 made contact with the platform. Network control was advised and train 2BW4 was diverted into the loop at Wallarobba for inspection.

The train crew inspected the train and identified that the wagon body on the 35th wagon (RKOX4055Y) was detached and resting on the bogie bolster at the A-end of the wagon. The bogie had shifted towards the middle of the wagon with the centre bearing sitting forward of the

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1 The BlueScope Steel's Coopers Plains facility and Pacific National's Brisbane Freight Terminal are both located within the larger Acacia Ridge Freight Terminal.

2 Times shown in 24 hour time as Australian Eastern Standard Time (AEST).

3 Welded beams also known as fabricated steel sections are manufactured by welding plate and bar to form H or I beam sections.

4 Roll-by inspections are a visual inspection of moving rail traffic to identify equipment, loading security or other defects or failures.

centre plate (Figure 2). It was the trailing bogie on the wagon. Two huck bolts[5] from the centre bearing mount were sitting within centre plate, limiting further movement of the bogie.

Arrangements were made to remove wagon RKOX4055Y from the consist and the wagon was recovered the following day.

Minor damage was found on Grafton, Coffs Harbour, Taree, Wingham and Dungog platforms believed to be a result of contact with the detached wagon RKOX4055Y. Closed-circuit television (CCTV) footage from Coffs Harbour, Taree and Dungog showed this wagon contact the platforms with dust, smoke and sparks visible (Figure 1).

Figure 1: Train path 2BW4 and platform footage of wagon RKOX4055Y

Map showing the path of train 2BW4 and platform locations. Footage from Taree and Dungog platforms inset showing wagon RKOX4055Y contacting the platforms.
Source: Geoscience Australia and Sydney Trains, modified and annotated by OTSI

[5] A hulk bolt is a specialised bolt to provide a permanent mounting, in this case, permanent mounting of the centre bearing to the underside of the wagon.

Figure 2: RKOX4055Y A-end bogie detached

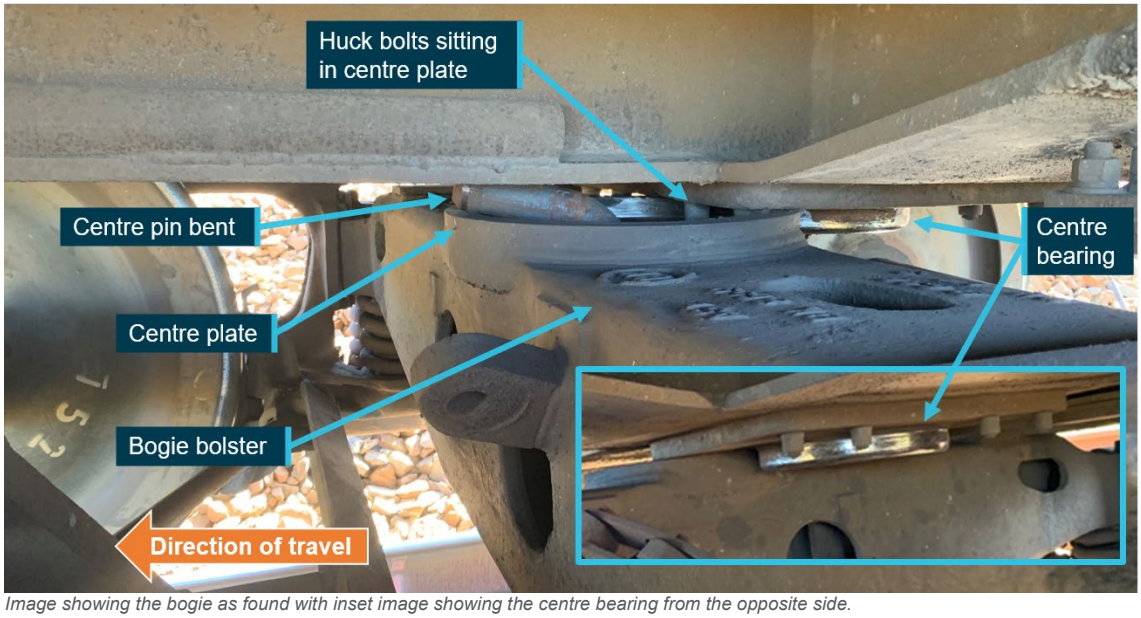

Image showing the bogie as found with inset image showing the centre bearing from the opposite side.
Source: Pacific National, modified and annotated by OTSI

Context

Wagon and bogies

Wagon RKOX4055Y was a bulk steel wagon with tare mass of 27 t and a maximum capacity of 50 t. The wagon body had three openings along the side walls to allow access for loading and unloading (Figure 1 – Taree platform footage). Timber dunnage[6] (blocks) was positioned horizontally (side wall to side wall) along the base of the wagon to support loaded material. If there are gaps between the dunnage and side wall loads can become stuck.

Each end of the wagon rested on a bogie with the centre bearing, centre plate and centre pin permitting bogie rotation. Seated correctly the bogie maintains the gauge of the rolling stock within the kinematic outline.[7] The mass of the wagon body retains the bogie in position.

The design of the wagon body and bogie interface makes them susceptible to lifting if a load becomes stuck and can lift off the centre pin. Lift off events do occur periodically.

Loading

BSS Port Kembla (NSW) loaded wagon RKOX4055Y on 13 June 2020 with three stacks of welded beams totalling 48 t.

PN required loading to be completed in accordance their freight loading manual (Fabricated Steel (Welded Beam) Sections – Web Horizontal, FLM 05-19_09). This specified the minimum requirements for loading including:

- welded beams are loaded with the web[8] horizontal
- inspection of dunnage, including gaps between dunnage and wagon side wall
- load is distributed evenly as possible (horizontally and longitudinal).

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6 Dunnage is packing material used to support loads and allows for loading and unloading using forklifts or lifting slings.

7 Kinematic outline - A two-dimensional cross-section of the shape of a vehicle that consists of the static outline plus the maximum permitted allowance for vertical bounce upwards plus lateral and roll movements in response to a steady-state cant deficiency force at maximum permitted cant deficiency (or the maximum permitted installed cant) and dynamic movements in response to track irregularity. Rail Industry Safety and Standards Board (2020). Glossary of Terms.

8 Web refers to the centre plate in a H or I beam. Welded beams shown with the web horizontal in Figure 3.

Welded beams are not required to have restraints securing the load due to their length and mass.

Unloading

BSS unloading procedure (Rail SOP Rail Wagon Discharge, QLD-PR-T-008) required welded beams to be unloaded from both sides to maintain weight distribution (prevent leaning or tipping of the wagon). If both sides could not be accessed the rail coordinator was to be notified to allow for appropriate arrangements to be organised.

It was common practice to unload welded beams from one side in the same manner as other wagons. On the morning of the occurrence, there were wagons positioned on the adjacent road preventing access to both sides of wagon RKOX4055Y and this wagon was unloaded from one side only.

The unloading was conducted pre-dawn under artificial lighting within the BSS facility and the forklifts had additional lighting to assist with visibility during loading or unloading.

Both forklift operators had approximately 20 years' experience unloading rail wagons. The forklift operators reported that welded beams could be difficult to unload if the welded beams were placed close together, touching or if the beams fell between the dunnage and side wall.

Train examination

Prior to departure PN required trains to undergo a full train examination in accordance with Train Inspection Manual's (TIM 01-01_03 and TIM 01-02_04). These manuals specified the inspection requirement for the mechanical integrity (including underframe and bogie centre pin interface), load security and brake system and brake testing.

The full train examination was performed by two terminal operator personnel who held the required qualifications. One had 16 years' experience and the other 27 years' experience.

Interface agreement

PN and BSS had a safety interface agreement (SIA) as required by the rail safety national law (RSNL). The purpose of interface agreement was to:[9]

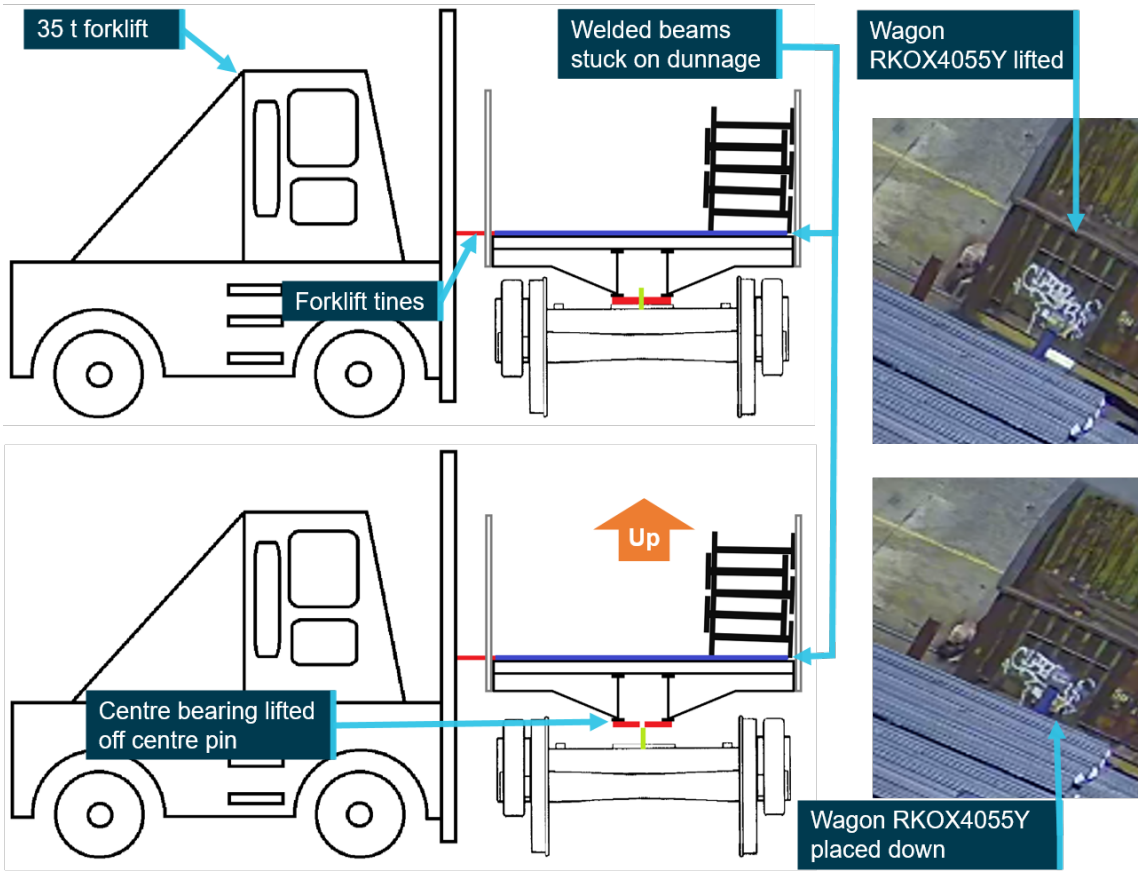
- identify and assess risks that may arise from operations at the interface
- determine measures to manage those risks
- establish the processes for the evaluation, testing and where necessary, revision of those measures
- identify how each party will monitor compliance with its obligations under the agreement
- define the roles and responsibilities of each party to the SIA
- establish a process for keeping the SIA under review.

Safety analysis

Wagon RKOX4055Y was unloaded from one side and the forklift operator had difficulty unloading the beams. The BSS unloading procedure did not address loads that became stuck. The operators attempted to free the load using two forklifts, as the last stack of beams (approximately 15 t) became stuck between the dunnage and the side wall of the wagon. While attempting to lift the beams, the A-end of the wagon was likely lifted off the centre pin (Figure 3). Footage from the BSS Coopers Plains facility showed the corner of wagon RKOX4055Y lift before being placed down again. Neither forklift operator identified the likely lift off event and dislodged wagon body.

[9] Pacific National (2020). Safety Interface Agreement, Pacific National Pty Ltd and BlueScope Steel (AIS) Pty Limited, 24 January 2020

Figure 3: Unloading wagon RKOX4055Y



The upper diagram shows the unloading of wagon RKOX4055Y with the welded beams stuck between the dunnage (blue) and the wagon side walls. The lower diagram shows the wagon body and centre bearing lift off the centre pin (green) during attempts to lift the beams. Screenshots from CCTV footage showing the corner of RKOX4055Y lifted before being placed down.
Source: Pacific National footage, diagrams and annotation by OTSI

Unloading welded beams from one side likely increased the risk of a wagon lift off event, in particular, if the last stack of beams become stuck. At that point, the mass of the load is at the lightest and the capacity of a single forklift (35 t) could lift the wagon body and load.

Following the unloading, wagon RKOX4055Y was shunted to form train 2BW4. The train underwent a full train examination by PN two terminal operators. The personnel conducting this inspection did not inspect the underframe of the wagons on 2BW4. The deviation from the train examination procedure had not been identified through PNs compliance monitoring prior to the occurrence. It is likely that the dislodged wagon body on RKOX4055Y would have been identified if the underframe was inspected as required.

A roll-by inspection was completed as train 2BW4 departed the BFT. There were two additional roll-by inspections during the journey. These inspections did not identify the likely dislodged wagon body on RKOX4055Y. The manner in which the wagon body rested on the bogie would make it difficult to identify there was a rolling stock irregularity. Additionally, there were only minor scrape marks on the A-end of wagon RKOX4055Y which could be missed when inspecting three locomotives and 53 wagons (1099 m long).

The inspection of 2BW4 at Kempsey following reports of platform damage at Grafton was conducted pre-dawn. The inspection identified loose strapping which was corrected but found no faults with wagon RKOX4055Y.

The risk of a lift off event had not been identified or controlled within the SIA or within the BSS unloading procedure. The monitoring associated with the SIA and BSS unloading practices had not identified that wagons were being unloaded from one side only.

The risk controls preventing rolling stock entering service after a lift off event were:

- unloading personnel detecting the lift off event and reporting it.
- Terminal operators or maintenance personnel identifying the rolling stock irregularity prior to departure.
- roll-by inspections on departure and during the journey.

The two forklift operators reported that neither had experienced a lift off event prior to the occurrence and unaware what to look for. The PN terminal operator personnel did not inspect the underframe of 2BW4 as required and the roll-by inspections were ineffective at detecting the rolling stock irregularity.

In this instance, the wagon body was partially restrained by the huck bolts resting within the centre plate. The A-end of wagon RKOX4055Y travelled intermittently out of gauge for approximately 739 km in a trailing direction, likely reducing the consequences of this occurrence. On each occasion the wagon body contacted an obstruction such as a platform, the wagon body glanced rather than catching the obstruction.

Findings

ATSB investigation report findings focus on safety factors (that is, events and conditions that increase risk). Safety factors include 'contributing factors' and 'other factors that increased risk' (that is, factors that did not meet the definition of a contributing factor for this occurrence but were still considered important to include in the report for the purpose of increasing awareness and enhancing safety). In addition 'other findings' may be included to provide important information about topics other than safety factors.

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

From the evidence available, the following findings are made with respect to the out of gauge wagon on freight train 2BW4 on 16 June 2020.

Contributing factors

- The body on wagon RKOX4055Y was likely lifted and dislodged during unloading of the wagon as the welded beams had become stuck. The dislodged wagon body was not identified at the time of unloading, during subsequent inspections prior to departing as 2BW4 or during the journey.
- The underframe of train 2BW4 was not inspected prior to departing the Brisbane Freight Terminal as required by Pacific National's train examination procedure.
- The risk of a wagon lift off event and potential consequences had not been identified or controlled in the Pacific National and BlueScope Steel safety interface agreement or within BlueScope Steels unloading procedure.

Other factors that increased risk

- Wagon RKOX4055Y was unloaded from one side contrary to the requirements of the unloading procedure, likely increasing the risk of a lift off event.

Safety actions

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

BlueScope Steel

BlueScope Steel advised that the following safety actions was taken:

- The requirement to unload welded beams from both sides was reinforced with terminal personnel.
- Unloading procedure (SOP QLD-PR-T-008) was reviewed to ensure appropriate controls are in place and to highlight the risk of a wagon lift off event.
- Lift off events were included into BlueScope Steels incident management system as a reportable incident.

Pacific National

Pacific National advised that the following safety action was taken:

- Communicated the occurrence and contributing factors to the BFT terminal operators and maintenance personnel and reinforced the requirement for underframe inspections prior to trains departing the terminal.
- Required BFT terminal operators and shunting personnel to undertake an underframe inspection on each wagon before shunting from the BlueScope Steel Coopers Plains facility.
- Reviewed the safety engagement schedule to include engagements relating to full train examinations at BFT.
- Reviewed the verification of competency (VOC) assessments at BFT for full train examinations by driver trainers and train crew including inspection of the wagon body and bogie interface.

Pacific National also advised that an engineering review is currently underway to review the design of the RKOX wagons to prevent welded beams becoming stuck between the dunnage and wagon side wall.

Pacific National and BlueScope Steel

In addition to the above, the following combined actions were undertaken:

- Reviewed the Wagon Corrective Action Report (WCAR) process to include wagon lift off events as a defect requiring attention.
- Reviewed the safety interface agreement and risk assessments to ensure all risk controls are current and include risks associated with lift off events.
- Routine combined audits to be established to assess the effectiveness of the risk controls as per the safety interface agreement.

Sources and submissions

Sources of information

The sources of information during the investigation included the:

- Australian Rail Track Corporation
- BlueScope Steel
- BlueScope Steel Coopers Plains forklift operators
- NSW Trains
- Office of National Rail Safety Regulator
- Pacific National
- Sydney Trains.

References

BlueScope Steel (2019). *Rail SOP Rail Wagon Discharge, QLD-PR-T-008,* V6.0, 10 October 2019

Pacific National (2015). *Train Inspection Manual, Train Inspection, TIM 01-01_03,* 26 November 2015

Pacific National (2015). *Train Inspection Manual, Full Train Inspection Procedure, TIM 01-02_04*, 18 December 2015

Pacific National (2019). *Freight Loading Manual, Fabricated Steel (Welded Beam) Sections – Web Horizontal, FLM 05-19_09,* 20 June 2019

Pacific National (2020). *Safety Interface Agreement, Pacific National Pty Ltd and BlueScope Steel (AIS) Pty Limited,* 24 January 2020

Rail Industry Safety and Standards Board (2020). *Glossary of Terms*. Accessed at: https://www.rissb.com.au/glossary/

Submissions

Under section 26 of the *Transport Safety Investigation Act 2003*, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. That section allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the following directly involved parties:

- BlueScope Steel
- BlueScope Steel Coopers Plains forklift operator
- Office of the National Rail Safety Regulator
- Pacific National
- Transport for NSW

Submissions were received from:

- Office of the National Rail Safety Regulator
- Pacific National.

The submissions were reviewed and, where considered appropriate, the text of the report was amended accordingly.

General details

Occurrence details

Date and time:	16 June 2020 – 1040 AEST	
Occurrence category:	Incident	
Primary occurrence type:	Rolling stock irregularity	
Location (unloading):	Coopers Plains, Queensland	
	Latitude: 27º 34.513' S	Longitude: 153º 2.001' E
Location (platform strike 1):	Grafton, Main North rail line, New South Wales	
	Latitude: 29º 42.221' S	Longitude: 152º 56.505' E
Location (platform strike 2):	Coffs Harbour, Main North rail line, New South Wales	
	Latitude: 30º 18.371' S	Longitude: 153º 8.272' E
Location (platform strike 3):	Taree, Main North rail line, New South Wales	
	Latitude: 31º 54.380' S	Longitude: 152º 27.429' E
Location (platform strike 4):	Wingham, Main North rail line, New South Wales	
	Latitude: 31º 52.085' S	Longitude: 152º 22.037' E
Location (platform strike 5):	Dungog, Main North rail line, New South Wales	
	Latitude: 32º 24.144' S	Longitude: 151º 45.564' E
Location (detected):	Wallarobba, Main North rail line, New South Wales	
	Latitude: 32º 29.499' S	Longitude: 151º 42.629' E

Train details

Track operator:	Australian Rail Track Corporation	
Train operator:	Pacific National	
Train number:	2BW4	
Type of operation:	Freight intermodal	
Consist:	Three locomotives and 53 intermodal wagons	
Departure:	Brisbane Freight Terminal, Queensland	
Destination:	Port Kembla, New South Wales	
Persons on board:	Crew – 2	Passengers – N/A
Injuries:	Crew – 0	Passengers – 0
Damage:	Minor damage to wagon RKOX4055Y and platforms at Grafton, Coffs Harbour, Taree, Wingham and Dungog.	