



Australian Government

Australian Transport Safety Bureau

Collision between light engine LET0 and empty coal train EE16

Westwood, Queensland, on 18 June 2021

ATSB Transport Safety Report

Rail Occurrence Investigation (Defined)

RO-2021-007

Preliminary – 10 September 2021

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Publishing information

Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office: 62 Northbourne Avenue Canberra, ACT 2601
Telephone: 1800 020 616, from overseas +61 2 6257 2463
Accident and incident notification: 1800 011 034 (24 hours)
Email: atsbinfo@atsb.gov.au
Website: www.atsb.gov.au

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Addendum

Page	Change	Date

Preliminary report

This preliminary report details factual information established in the investigation’s early evidence collection phase and has been prepared to provide timely information to the industry and public. Preliminary reports contain no analysis or findings, which will be detailed in the investigation’s final report. The information contained in this preliminary report is released in accordance with section 25 of the *Transport Safety Investigation Act 2003*.

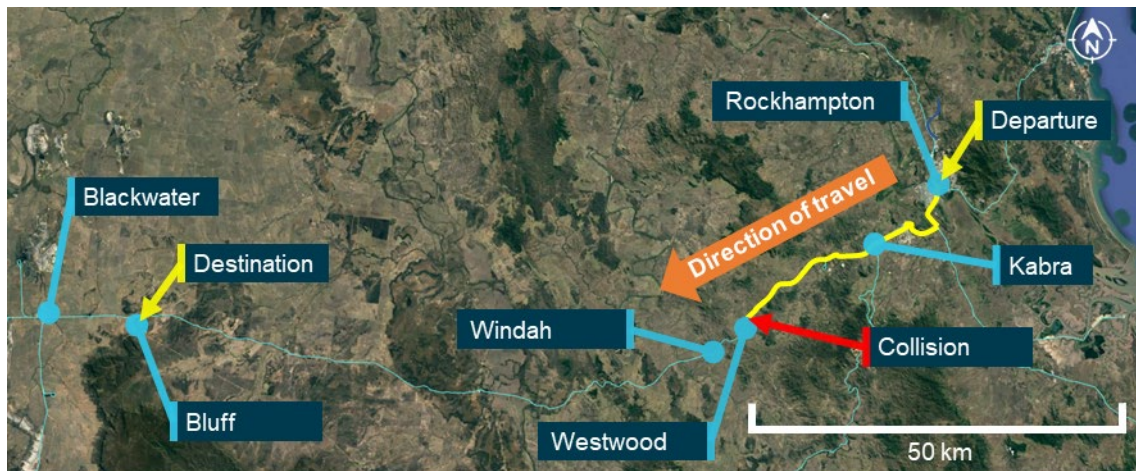
The occurrence

At about 1126¹ on 18 June 2021, a locomotive collided with the rear of a stationary coal train at Westwood, Queensland, located about 45 km west of Rockhampton.

The locomotive, operated by Queensland Rail (QR), was being used for route tuition² on the Blackwater system³ in Queensland. It was being operated as a ‘light engine’ (that is, with no other rail vehicles attached) and it was assigned the train number LET0. The crew consisted of a tutor driver providing route tuition and two other QR drivers receiving route tuition. LET0 utilised a single QR class 2470 class locomotive (number 2471).

The intended route for the tuition was from Rockhampton to Bluff and then return (Figure 1). For the first leg of the route, the locomotive was long end leading (that is, operated in the reverse direction to normal operation, see *Long end leading* for further details).

Figure 1: Rail route on the Blackwater system showing the path of the locomotive and the collision point



Source: Google Maps, annotated by the ATSB

The three-person QR crew started and prepared the locomotive for traffic in Rockhampton yard. At 1041, LET0 left Rockhampton yard and entered the Blackwater system. One of the drivers receiving route tuition performed the role of the driver and the other driver receiving route tuition performed the role of co-driver.

¹ All time references in this report are in local time (Eastern Standard Time).

² Route tuition involved learning the signalling, speeds, and dynamics of a section of a track prior to an assessment for route qualification for that section.

³ The Blackwater system was managed by Aurizon and included the section of track from Rocklands (3 km south of Rockhampton) to Nogoa (2.5 km east of Emerald), including the track at Westwood.

Between Rockhampton and Bluff, there was an Up⁴ line and a Down line. LET0 travelled on the Up line until it reached Kabra, where the network control officer (NCO) routed it to the Down line to allow for the passage of a loaded coal train travelling east on the Up line.

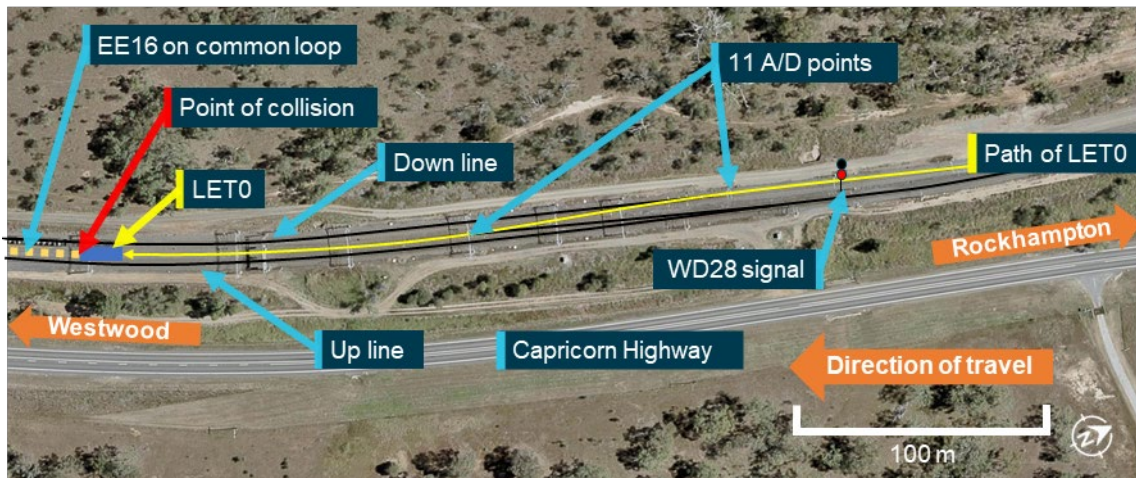
At Westwood there was a common loop.⁵ There was a maintenance closure on the Down line to the west of Westwood, which meant all rail traffic in that area had to use the Up line, and the common loop at Westwood was used for passing traffic.

As LET0 approached Westwood, there was an Aurizon coal train (EE16) stationary in the common loop. EE16 was travelling westwards between Callemondah (Gladstone) and Ensham Mine (Comet), and it consisted of three Aurizon 3800 class locomotives and 102 empty coal wagons.

At 1107, the NCO set up the route for LET0 to travel to Westwood signal WD28, located to the east of Westwood (Figure 2). The NCO planned to route LET0 via the Westwood common loop and then for all traffic (EE16 and LET0) to travel via the Up line from Westwood to Windah. The signal interlocking system was set up to show a yellow (caution) aspect in the approach signal WD28P and a red (stop) aspect in WD28. That meant that LET0 would be required to stop at signal WD28 outside Westwood until EE16 had vacated the common loop, at which time the signal aspect in WD28 would change to proceed.

At 1119, while LET0 was travelling towards Westwood, the NCO set the 11 A/D points as planned from the Down line into the common loop at Westwood in preparation for the locomotive to enter the common loop after EE16 had departed (Figure 2).

Figure 2: The route of LET0 into Westwood common loop



The yellow solid line within the image shows the path of the locomotive on approach and after passing signal WD28.
Source: Queensland Globe, annotated by the ATSB

The locomotive's data logger showed that a partial application of the independent brake was initiated at 1125:42, as the locomotive entered a downhill gradient into Westwood yard.

At 1125:43, a SPAD (signal passed at danger) alarm was generated in the Aurizon network control centre, indicating that LET0 had passed signal WD28 while it was displaying a red (stop) aspect.

At 1125:46, LET0 entered the 11 A/D points. The locomotive's data logger showed that it entered the 50 km/h turnout⁶ from the Down line to the common loop at approximately 72 km/h.

⁴ The Up direction on the Blackwater system was in a westerly direction. The Up line was the name applied to the left-hand duplicated track, facing westward.

⁵ The common loop was the middle of the three tracks at Westwood.

⁶ Turnout: a combination of a set of points, V crossing and guard rails that permit traffic to turn out from one track to another.

At 1125:49, in response to the SPAD alarm, the NCO made an emergency broadcast over the network control radio. There was no response from the crew of LET0.

At 1125:53, a full independent brake application was made. At this time the speed of the locomotive was approximately 60 km/h.

At 1125:59, LET0 collided with the rear of EE16 at a speed of approximately 44 km/h. The collision occurred just after the locomotive entered the Westwood common loop. Figure 3 shows the collision point between the locomotive and the coal train on the common loop (centre track) of the three-track Westwood yard.

Figure 3: Collision site at Westwood, Queensland



Source: Queensland Police Service, inserts by the ATSB

The locomotive and the last nine wagons of the coal train sustained significant damage from the collision. The driver was fatally injured, the co-driver sustained serious injuries and the tutor driver received minor injuries.

At 1130, after attempting to call for help using the radio, the tutor driver of LET0 called the network control centre via mobile phone to advise that LET0 had been involved in a collision. The NCO provided first aid and CPR instructions to the tutor driver. At 1132, another Aurizon NCO contacted the Queensland Ambulance Service, and the first emergency vehicle arrived on scene at 1201.

Context

Signal testing

Aurizon was the rail infrastructure manager for the Blackwater system. Remote controlled colour light signalling controlled train movements on the system and it was operated by the Aurizon network control centre at Rockhampton.

Testing of the signalling system by Aurizon found that, at the time of the accident:

- Approach signal WD28P was displaying a single yellow aspect, which indicated to a driver that the next signal, WD28 would be at red (stop).
- The dynamic speed indicator⁷ attached to WD28P was not illuminated.
- WD28 was displaying a red aspect.

Train crew information

Driver

The main role of a driver is to control the movement of the locomotive. The driver is also responsible for observing and obeying signal aspects and maintaining control of the speed of the locomotive.

The driver of LET0 had been qualified as a QR driver for about 4 months, and had both the safeworking⁸ and traction⁹ competencies required to drive the locomotive. The driver was receiving route tuition for the section of track between Rockhampton and Bluff.

Co-driver

One of the roles of a co-driver is to observe, announce and confirm the signal aspects as they are sighted. When driving long end leading, the structure of the locomotive on 2470 class and similar locomotives limits vision for the driver and they rely heavily on the co-driver for observing signals.

The co-driver on LET0 had been qualified as a QR driver for about 6 months, and had both the safeworking and traction competencies required to drive the locomotive. It was intended that the co-driver would perform the role of the driver (from the driver's position) for a period during the tuition that day. The co-driver was receiving route tuition for the section of track between Rockhampton and Bluff.

Tutor driver

A tutor driver is responsible for instructing drivers on all aspects of controlling a locomotive, which includes teaching train handling and route knowledge.

The tutor driver on LET0 had qualified as a driver with another rail operator about 9 years previously. They had been qualified as a tutor driver about 5 years earlier, before joining QR in that role about 3 years before the accident. They had the safeworking, traction and route competencies to drive the locomotive from Rockhampton to Bluff, and were providing tuition on that route to both the driver and co-driver.

Locomotive information

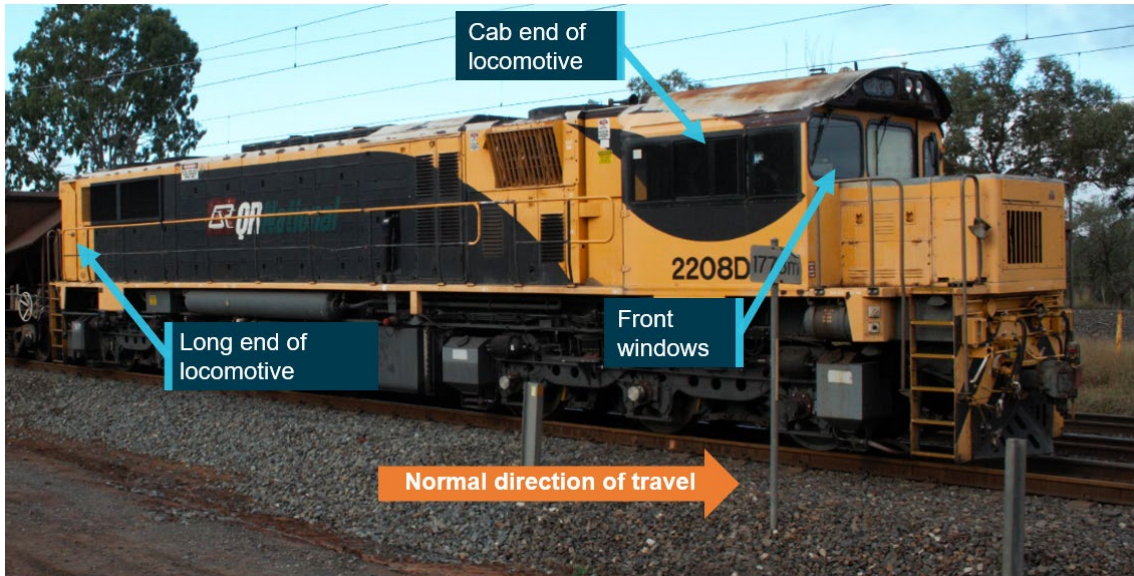
Locomotive 2471 was a Queensland Rail (QR) 2470 class locomotive with a single driving station at the front right of the cabin. The normal driving direction of the locomotive was with the cabin end leading (Figure 4).

⁷ A dynamic speed indicator is an illuminated numeric display attached to an approach signal that indicated the maximum speed which applied at the next signal. It is only illuminated when the next signal was not at stop (red) or green, and the approach signal it was attached to was at yellow.

⁸ Safeworking: an integrated system of operating rules and procedures that define the interaction between workers and engineered systems for the safe operation of a railway

⁹ Traction competency refers to the type of motive power (locomotive) driven.

Figure 4: Locomotive 2208D similar to a QR 2470 class locomotive



Source: ATSB

Figure 5 is a view from inside the cabin looking forward, showing the driver's vision on the right and the co-driver and tutor driver's view on the left when travelling in the normal direction.

Figure 5: View from inside the cab looking forward

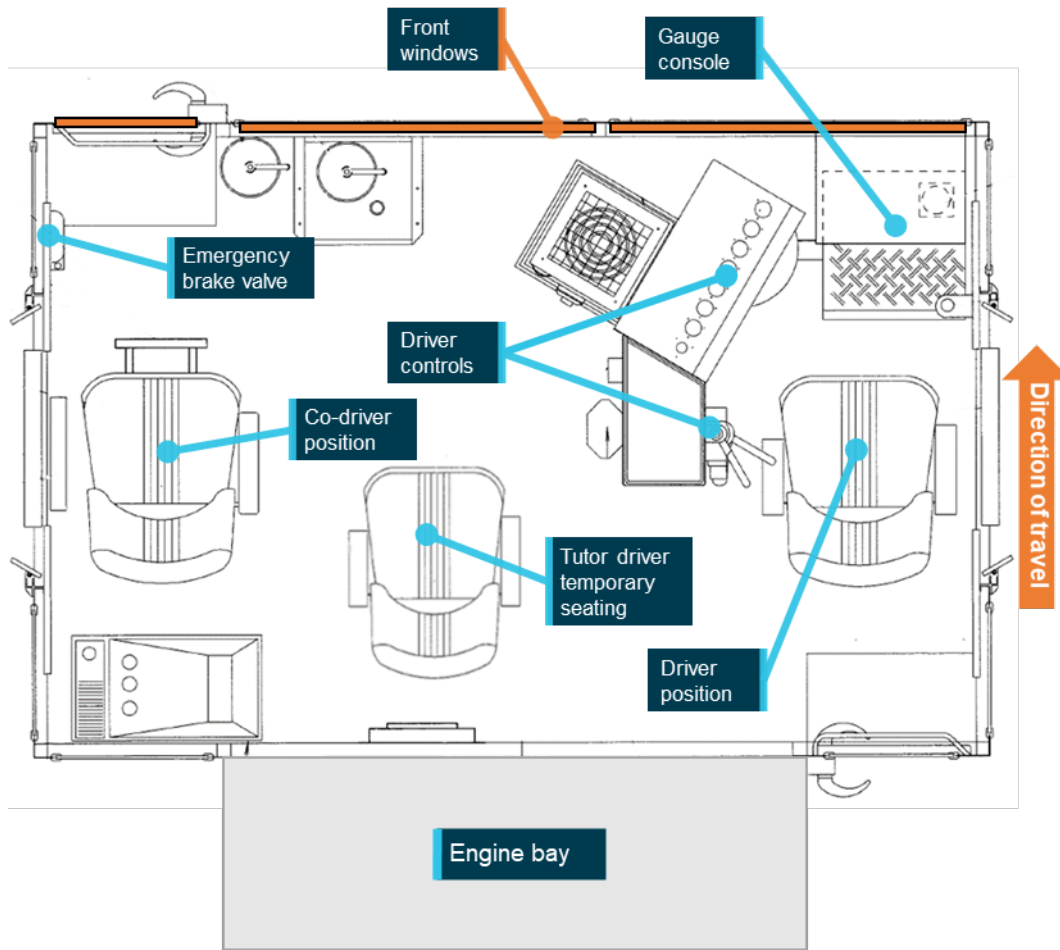


Source: ATSB

Figure 6 is a plan view of the driver's cabin with the seats in the normal position (driven cabin end leading). A driver seated in the driver's seat has access to all the relevant controls. The only locomotive control available to the co-driver on a 2470 class locomotive is an emergency brake valve.

The tutor driver was positioned in a temporary seat (removable chair) located in the centre rear of the cabin, facing towards the front windows. From that position the tutor driver had a good view out the front of the train during normal operations. According to the tutor driver, it was normal practice for the tutor driver to take a position in the temporary seat at the centre rear of the cabin area when two drivers were undergoing route tuition. This would have been the configuration of the cabin for the return trip from Bluff to Rockhampton.

Figure 6: Plan view of the driver's cabin in normal configuration



Source: Queensland Rail, annotated by the ATSB

Long end leading

'Long end leading' occurs when a locomotive travels with the driving cabin at the rear for the direction of travel. Figures 7 and 8 shows the limited view for the driver during this method of operation on a 2470 class locomotive, with a significant amount of the forward view being obstructed by the leading portion of the locomotive and the back wall of the cabin.

Figure 7: Driver's viewport when long end leading



Source: ATSB

Figure 8: View from inside the cabin from driver and co-driver perspective with long end leading



The image on the left shows the driver's view from the locomotive's active driving station when long end leading. The image on the right shows the view from the co-driver's seat when long end leading.
Source: ATSB

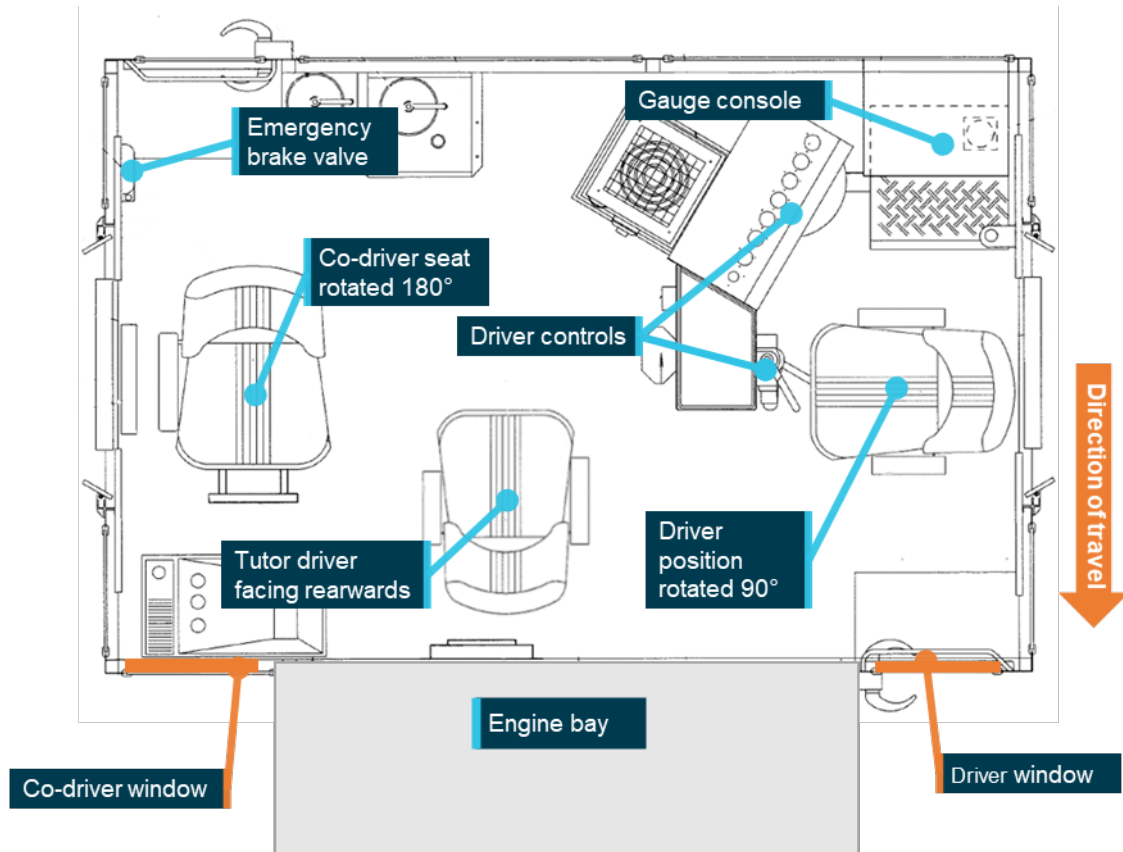
Figure 9 is a plan view of the driver's cabin configured for long end leading. The driver's position was such that they were required to face 90° to the direction of travel to enable use of the driver

controls. The driver’s attention was split between the driver controls, the gauge console and the view ahead.

The co-driver’s seat was rotated 180°. The co-driver was relied upon to convey observations to the driver because the driver’s view was obscured on the right side of the locomotive. When the co-driver was positioned this way, they could no longer reliably operate the emergency brake valve without moving from their seat.

On LET0, the tutor driver’s temporary seat was positioned as shown in Figure 9. They were facing rearward in relation to the direction of travel and had no forward view.

Figure 9: Plan view of driver’s cabin configured for long end leading



Source: Queensland Rail, annotated by the ATSB

Long end leading is conducted in the rail industry with many types of locomotives, usually for the purposes of manoeuvring to a location to turn around or for shunting wagons. Some types of locomotives are designed with additional controls at the rear of the cabin and cameras to facilitate long end leading operations. Some designs have eliminated long end leading by implementing driving cabins at each end of the locomotive.

QR used long end leading for tuition trains between Rockhampton and Bluff for its current training cohort since December 2020.

Safety action

On 21 June 2021, QR suspended all mainline long end leading operations both on its own network, and as an operator of its trains on other networks. Permitted operations for long end leading were limited to shunting, turning of a locomotive, setting back and propelling movements.

In addition, on 25 June 2021, the Office of the National Rail Safety Regulator issued a safety alert, requiring all rail infrastructure managers and rolling stock operators to review the risks associated with long end leading operations (if applicable) by the end of July 2021.

Further investigation

To date, the ATSB has:

- gathered and undertaken preliminary analysis of locomotive event recordings and network control and locomotive voice recordings
- conducted brake and operational control testing of the locomotive
- gathered information about the locomotives, rail infrastructure and operational procedures
- conducted a re-enactment of the event to identify visual limitations from long end leading operations, including on the curved section approaching signal WD28.

The investigation is continuing and will include:

- review and examination of the functionality and cabin ergonomics of the 2470 class locomotives for long end leading operations and other factors that may have influenced the crew's performance
- review of the nature and extent of the use of long end leading for main line operations
- review of long end leading risk controls related to collision and authority exceedance (SPAD) hazards
- review of change management and risk management processes applicable to the use of long end leading for route tuition
- review of post incident procedures for managing emergencies on the network
- review and examination of the radio and signalling infrastructure and procedures on the Blackwater system
- review of the Westwood signal interlocking event recordings and associated circuit diagrams.

Should a critical safety issue be identified during the course of the investigation, the ATSB will immediately notify relevant parties so appropriate and timely safety action can be taken.

A final report will be released at the conclusion of the investigation.

General details

Occurrence details

Date and time:	18 June 2021, 1126 AEST	
Occurrence category:	Accident	
Primary occurrence type:	Collision	
Location:	Westwood, 45 km west of Rockhampton, Queensland	
	Latitude: 23° 36.158' S	Longitude: 150° 9.937' E

Train details

Track operator:	Aurizon	
Train 1		
Train operator:	Queensland Rail	
Train number:	LET0 (2471)	
Type of operation:	Tuition	
Departure:	Rockhampton	
Destination:	Bluff	
Persons on board:	Crew – 3	Passengers – 0
Injuries:	Crew – 2	Passengers – 0
Fatal:	Crew – 1	Passengers – 0
Damage:	Substantial	
Train 2		
Train operator:	Aurizon	
Train number:	EE16 (3826 / 3824 / 3813)	
Type of operation:	Coal rail freight	
Consist:	102 empty coal wagons	
Departure:	Callemondah, Queensland	
Destination:	Ensham Mine, Comet, Queensland	
Persons on board:	Crew – 2	Passengers – 0
Injuries:	Crew – 0	Passengers – 0
Damage:	Substantial damage to 9 wagons	