



**Australian Government**

**Australian Transport Safety Bureau**



**ATSB TRANSPORT SAFETY REPORT**  
Rail Occurrence Investigation  
RO-2010-002  
Final

**Safeworking irregularity involving a  
freight train and an empty passenger train  
at Manildra, NSW  
10 February 2010**





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### Abstract

At approximately 1650 on 10 February 2010, empty passenger train WP46 was authorised to travel through Manildra Yard on the main line. However, at the same time a freight train was already standing on the main line, having recently completed shunting within the yard limits relating to preparation of train 8938.

The driver of WP46 heard radio chatter relating to the freight train, so he broadcast that train WP46 was approaching and was authorised to travel through Manildra on the main line. The crew of the freight train immediately replied that they were standing on the main line and advised train WP46 to stop. Train WP46 had already passed the yard limit board but the driver had sighted and reacted to a main line indicator (MLI) showing a red (stop) indication. Train WP46 stopped before passing the MLI, which was located more than 530 m before the track occupied by the freight train.

While a number of defences served to avoid a collision in this case, the event posed a serious safeworking irregularity where one train had been authorised to proceed over track occupied by a second train.

The investigation concluded that the ARTC network controller fulfilled a shunt order without entering information into the computer system identifying that both the main line and loop were occupied. The controller had later forgotten about the track occupancies when authorising train WP46 to travel through the Manildra Yard.

The ARTC, Pacific National and the Manildra Group have put processes in place to ensure shunt orders are not fulfilled unless all shunt operations have ceased and either the main line is clear or a form of train protection has been implemented in accordance with the network rules.

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# THE AUSTRALIAN TRANSPORT SAFETY BUREAU

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The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

## **Purpose of safety investigations**

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated. The terms the ATSB uses to refer to key safety and risk concepts are set out in the next section: Terminology Used in this Report.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

## **Developing safety action**

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes appropriate, or to raise general awareness of important safety information in the industry. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

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## TERMINOLOGY USED IN THIS REPORT

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**Occurrence:** accident or incident.

**Safety factor:** an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, current risk controls and organisational influences.

**Contributing safety factor:** a safety factor that, had it not occurred or existed at the time of an occurrence, then either: (a) the occurrence would probably not have occurred; or (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or (c) another contributing safety factor would probably not have occurred or existed.

**Other safety factor:** a safety factor identified during an occurrence investigation which did not meet the definition of contributing safety factor but was still considered to be important to communicate in an investigation report in the interests of improved transport safety.

**Other key finding:** any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which ‘saved the day’ or played an important role in reducing the risk associated with an occurrence.

**Safety issue:** a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.

**Risk level:** The ATSB’s assessment of the risk level associated with a safety issue is noted in the Findings section of the investigation report. It reflects the risk level as it existed at the time of the occurrence. That risk level may subsequently have been reduced as a result of safety actions taken by individuals or organisations during the course of an investigation.

Safety issues are broadly classified in terms of their level of risk as follows:

- **Critical** safety issue: associated with an intolerable level of risk and generally leading to the immediate issue of a safety recommendation unless corrective safety action has already been taken.
- **Significant** safety issue: associated with a risk level regarded as acceptable only if it is kept as low as reasonably practicable. The ATSB may issue a safety recommendation or a safety advisory notice if it assesses that further safety action may be practicable.
- **Minor** safety issue: associated with a broadly acceptable level of risk, although the ATSB may sometimes issue a safety advisory notice.

**Safety action:** the steps taken or proposed to be taken by a person, organisation or agency in response to a safety issue.

# 1 FACTUAL INFORMATION

## 1.1 Overview

At approximately 1650<sup>1</sup> on 10 February 2010, empty passenger train WP46 was approaching Manildra Yard and had been authorised to travel through the yard on the main line. However, at the same time a freight train was already standing on the main line, having recently completed shunting within the yard limits relating to preparation of train 8938. The driver of WP46 heard radio chatter relating to the freight train, so he broadcast that train WP46 was approaching and was authorised to travel through Manildra on the main line. The crew of the freight train immediately replied that they were standing on the main line and advised train WP46 to stop.

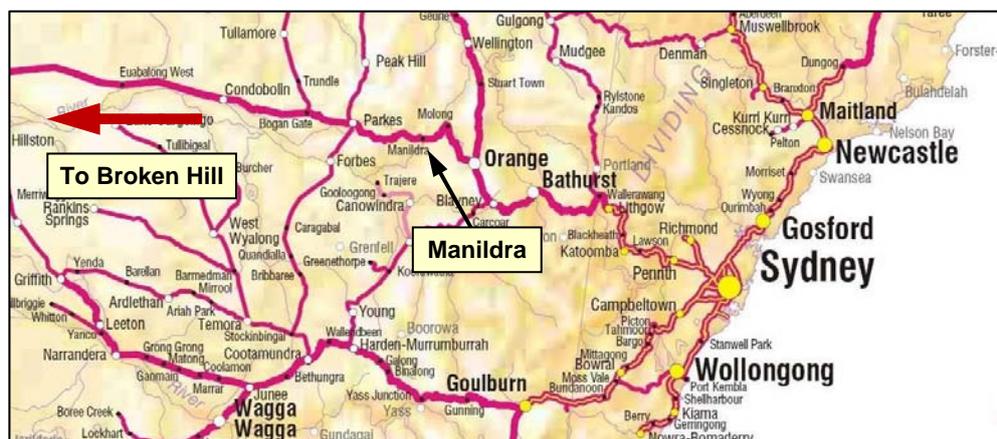
Train WP46 had already past the yard limit board, but the driver had also sighted and reacted to a main line indicator (MLI)<sup>2</sup> located more than 530 m before the track occupied by the freight train. The MLI was showing a red (Stop) indication and the driver brought train WP46 to a stop before passing the MLI.

While a number of defences served to avoid a collision in this case, the event posed a serious safeworking irregularity whereby one train had been authorised to proceed over track occupied by another.

## 1.2 Location

Manildra is located about 385 track kilometres<sup>3</sup> west of Sydney on the Defined Interstate Rail Network (DIRN) between Sydney and Broken Hill (Figure 1).

Figure 1: Location of Manildra, NSW

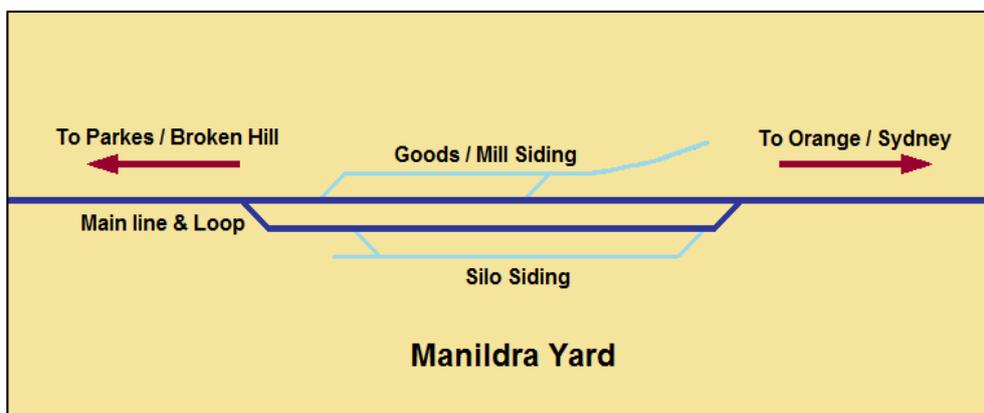


Map – Geoscience Australia. Crown Copyright ©

- <sup>1</sup> The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight Time (AEDT), as particular events occurred. Eastern Daylight Time was Coordinated Universal Time (UTC) +11 hours
- <sup>2</sup> Main line indicators advise rail traffic about the condition of points and level crossings, but are not intended to indicate if the line ahead is clear of rail traffic.
- <sup>3</sup> Distance in kilometres from a track reference point located at Sydney Central Station.

The track, managed by the Australian Rail Track Corporation (ARTC), is bi-directional single line with crossing loops (short sections of double track) provided at regular intervals to allow trains to cross (travelling in opposing directions) or pass (travelling in the same direction) each other. At the time of the occurrence, Manildra Yard consisted of a crossing loop with a siding off the main line accessing a flour mill and a siding off the loop accessing grain silos (Figure 2).

**Figure 2: Manildra yard layout**



The flour mill is owned and operated by Manildra Flour Mills Pty Ltd, a wholly owned company of The Manildra Group. Unlike many other locations, the mill employed qualified rail workers to conduct shunting and to operate their own private shunt locomotive for shunt operations within the Manildra Yard.

### **Network control**

The system of safeworking used to manage trains travelling through Manildra Yard is called train order working. Under train order working, written authorities for movements between locations are issued by network controllers and communicated to train crews via radio or telephone.

The network controllers are located at the ARTC Network Control Centre at Broadmeadow (New South Wales) and primary communication with train crews is achieved using the CountryNet communication system<sup>4</sup> and track workers via UHF radio or telephones. Train crews and track workers are required to comply with the network controller's instructions and any additional trackside indications.

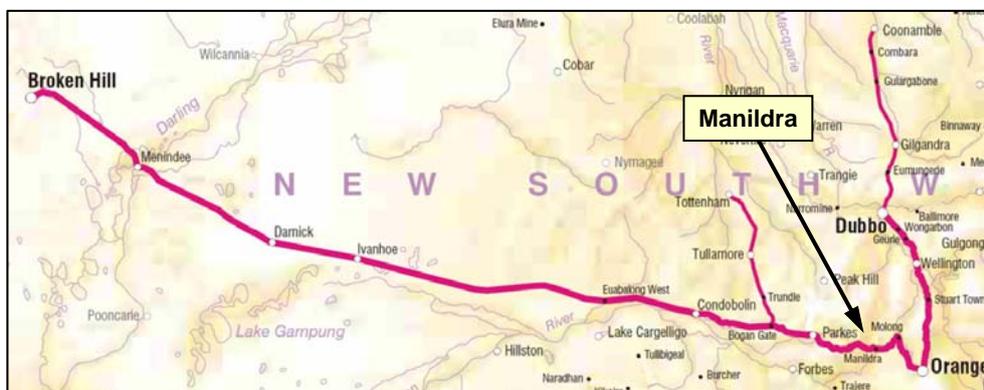
The passage of trains through Manildra is controlled by a network controller operating on the Train Order Control board. The area of responsibility for this board extends from Orange to Broken Hill, Orange to Coonamble and a branch line from Bogan Gate to Tottenham (Figure 3). In New South Wales, the train order system of safeworking is managed using a computer based system that electronically records authorities and verifies their compliance with the system's safeworking rules, thereby preventing conflicting train authorities.

The network controller had approximately 3 years experience as a network controller, before which he had been a signaller for several years. The network controller was appropriately qualified and had been assessed as competent for the

<sup>4</sup> The CountryNet communication system uses terrestrial radio and satellite communication systems to provide secure voice and data communications between train drivers and network controllers.

role after undergoing initial training in the use of the train order system, augmented by an ongoing training regime. The controller had regularly worked on each of the control boards, including the Train Order Control board.

**Figure 3: Area of responsibility – Train order control**



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## 1.3 Train information

### ***Freight train***

The freight train was owned and operated by Pacific National (PN) and had arrived at Manildra as train number 9837. At the completion of shunt operations at Manildra, the train was to be redesignated as train 8938 for its return journey. The train consisted of four locomotives (8137 leading, 8136, 8050 and X52) hauling 36 wagons. The train was carrying bulk freight from Manildra to Nowra, was 671 m long and weighed a total of 3680 t.

The crew of the freight train consisted of a driver, a trainee assistant driver and an acting driver trainer. The acting driver trainer had 27 years of rail experience, including 7 years as train crew. For the previous 18 months he had been an acting driver trainer and on the day of the incident was conducting an assessment of the trainee assistant driver. The driver had just over a year of train crew experience. All three of the train crew were appropriately qualified, medically fit and signed-on fit for duty.

### ***Manildra Mill shunt train MRA1***

Train MRA1 was a single locomotive (number MMO1) owned and operated by the Manildra Mill for shunt operations within the Manildra Yard. The mill employed qualified rail workers to drive the locomotive and conduct the shunting operations.

On the day of the incident, the Manildra Mill shunter had signed-on at 0700. The shunter had 22 years experience including 6 years at Manildra, was appropriately qualified and had been assessed as medically fit.

### ***Empty passenger train WP46***

Empty passenger train WP46 was an Xplorer train owned and operated by CountryLink, part of the NSW Government owned Rail Corporation, New South

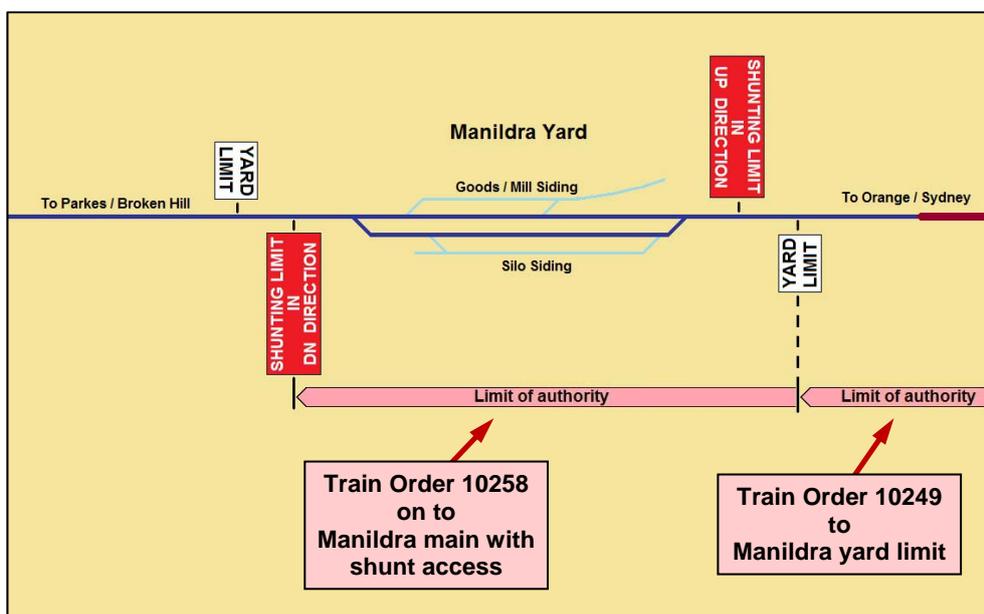
Wales (RailCorp). The train was the return intrastate passenger service from Broken Hill to Sydney, but was returning to Sydney a day late due to a network disruption caused by flooding. The train was not conveying passengers and was crewed by a driver and two operational staff. At the time of the incident, the train was comprised of three cars (EC2528, EB2513 and EA2508), was 75 m long and weighed a total of 183 t.

The driver of train WP46 had 26 years experience, was appropriately qualified, medically fit and had signed-on fit for duty.

## 1.4 The occurrence

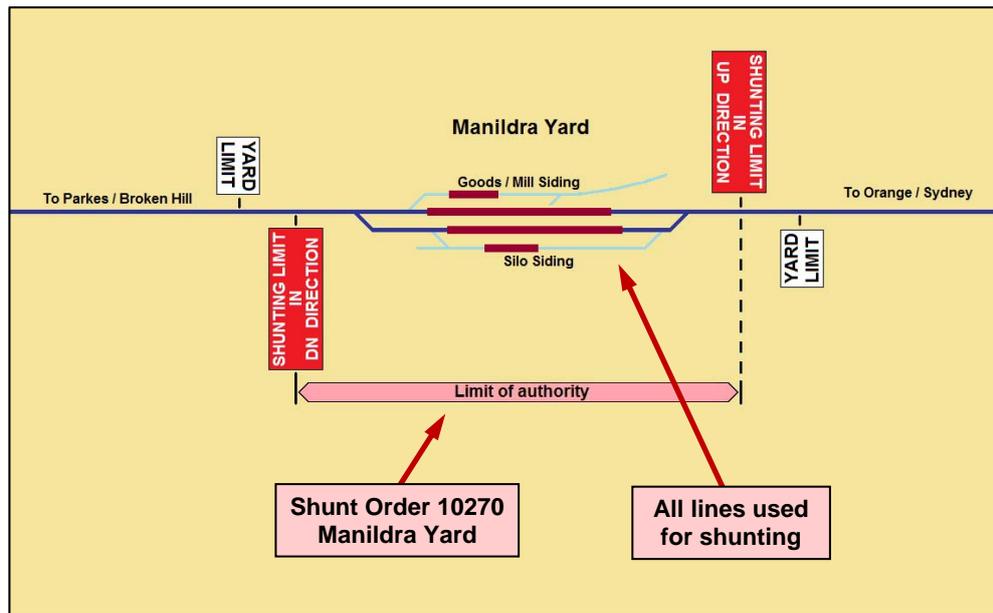
At 0845 on Wednesday 10 February 2010, a Pacific National train crew (one driver, one acting driver trainer and one trainee assistant driver) signed on duty at Parkes before travelling by car to Orange East Fork to relieve the crew of Pacific National freight train 9837. The train travelled to Manildra under the authorisation of train order 10249 and arrived at the yard limit board at about 1150. The crew received train order 10258 (with shunt access) at 1205, authorising them to enter the yard and undertake shunt operations within the yard. They continued shunting until about 1250 at which time the locomotives and wagons were positioned clear of the main line to allow train 8134 to pass through the yard. Figure 4 illustrates the limits of authority given to freight train 9837.

**Figure 4: Train 9837**



At 1333, the Manildra Mill shunter received shunt order 10270 authorising shunt operations to be carried out between the Manildra Yard shunt limits. For the purpose of this shunt order, the train was designated as train number MRA1 and the locomotive was number MMO1 (the Manildra Mill shunt locomotive). The Manildra Mill shunter proceeded to manage shunt operations within the yard, including directing the crew of train 9837 to undertake shunting when required. Figure 5 illustrates the limits of authority given for shunting within the Manildra Yard.

**Figure 5: Manildra yard shunting (Train MRA1)**



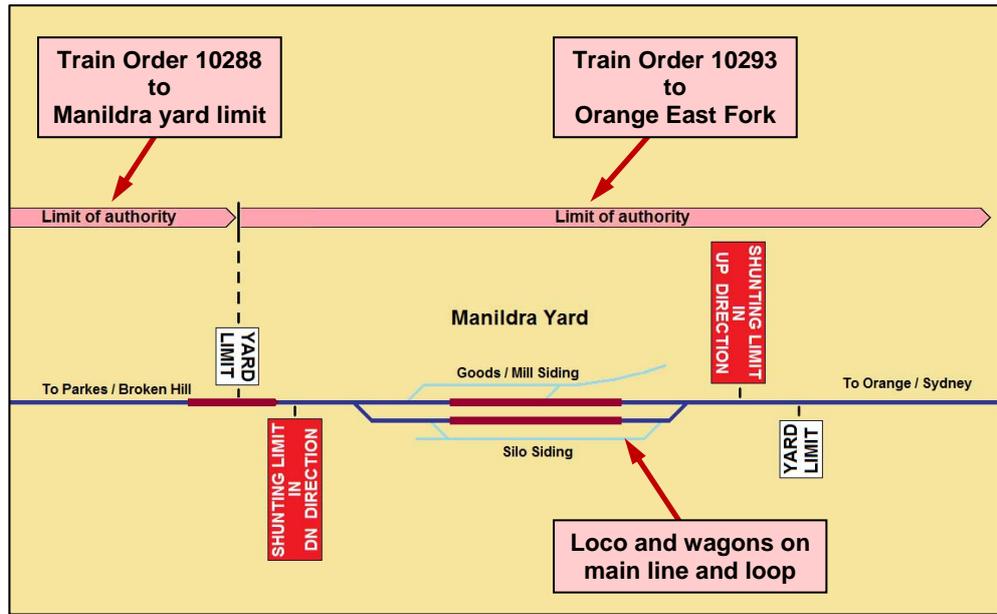
Shunt operations continued until about 1600 at which time the Manildra Mill shunter advised the PN crew that he was preparing to go home and would contact the ARTC network controller to fulfil<sup>5</sup> the shunt order. The drivers replied that they had almost finished preparing their train (new train number 8938) and it was sitting on the main line (wagons were also sitting on the loop). The Manildra Mill shunter fulfilled the shunt order at 1610. In doing so, the shunter advised the ARTC network controller that train 8938 was occupying the main line and that there were wagons occupying the loop, but the network controller did not enter the road occupancies (main and loop) into the train order computer system.

Train WP46 (an empty Xplorer passenger train) was travelling from Parkes, having received train order 10288 at 1554 authorising them to travel up to the Manildra yard limit board. At about 1630, the crew of train WP46 reported in at Bumberry (about 22 km before Manildra) and received new train order 10293 authorising them to pass through Manildra and continue to Orange East Fork. About 10 minutes later, while approaching the Manildra yard limit, the driver could hear radio chatter relating to preparation of train 8938 at Manildra. The driver broadcast, over the local radio<sup>6</sup>, an announcement that he had a train order for the main line at Manildra and was passing the yard limit board. The driver of the freight train immediately told him to 'Red Light' (stop) because their train was occupying the main line. Train WP46 had already passed the yard limit board, but the driver had also sighted and reacted to a main line indicator located more than 530 m before the track occupied by freight train. The MLI was showing a red (stop) indication and the driver brought train WP46 to a stop before passing the MLI. Figure 6 illustrates the limits of authority given to train WP46, even though the freight train was occupying the main line and there were wagons on the loop in Manildra Yard.

<sup>5</sup> When a train crew has completed all instructions on the train order and advised the network controller, the order is considered fulfilled.

<sup>6</sup> The local radio is an open channel UHF radio used for local communications between train crews, shunters, maintenance workers and other local rail personnel.

Figure 6: Train WP46



The drivers of both trains contacted the ARTC network controller who cancelled train order 10293 issued to WP46 and issued a shunt order to train 8938. After train 8938 had shunted back into the silo siding, the controller issued train WP46 with a new train order authorising it to continue its journey to Orange East Fork. Train 8938 remained in the siding while a second train (3YN2) passed through the yard, and departed Manildra at about 1915 under the control of a relief crew. The original crew of train 9837 (8938) drove back to Parkes (by car) and signed off duty at 2000.

The event sequence is based on a combination of witness statements, voice communication recordings and event data recorded by the Australian Rail Track Corporation's (ARTC's) computerised train order system.

Initial information indicated that a safeworking irregularity had resulted in a train being issued with an authority to travel over a section of track which was already occupied by another train. While the incident did not result in a collision, any safeworking irregularity has the potential to significantly increase the risk of collision. Consequently, the Australian Transport Safety Bureau (ATSB) commenced an investigation into the incident.

Investigators examined and photographed the incident site. Evidence was sourced from RailCorp, Pacific National, Manildra Mill and the ARTC. In addition, various witnesses were interviewed and recorded train control data (including voice and electronic data) was examined.

The key event, in the sequence of events, was the fulfilment of a shunt order without entering the road occupancies (main and loop) into the computerised train order system. Without road occupancies applied, the system permitted the network controller to issue a train order to train WP46, authorising it to travel through the Manildra yard even though both running lines were occupied. The risk of collision was very low because, in this instance, other defences remained in place to prevent such an occurrence.

## 2.1 System of safeworking

To develop a clear understanding of the events that contributed to the safeworking irregularity on 10 February 2010, it is essential to understand the function of the computerised train order system. The computer system used to manage train order working in New South Wales consists of a number of sub-systems:

- The Train Management and Control System (TMCS) provides the facility to compile and issue three types of orders to trains:
  - Train orders, which provide the basic functionality to allow a train to travel through train order territory.
  - Shunt orders, which give a train the authority to shunt at a single train order location for a period of time.
  - Mishap orders, which allow for exceptional circumstances such as train breakdown or other obstructions to running lines (not relevant in this case).

The system effectively records and maintains a series of 'Blocks'<sup>7</sup> on the sections of track over which a train has been authorised to operate.

The TMCS also provides the facility to authorise track occupation to allow for other track users and/or conditions. The authority types are:

- Track Occupancy Authorities for track maintenance and construction staff.

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<sup>7</sup> A 'Block' is a facility used to prevent the unintended issue of a proceed authority.

- Road Occupancies to indicate the position of rail vehicles within train order territory.
- Track Blocks, to highlight a hazard and temporarily restrict access to a location or section.
- The ‘GPS Watchdog’ is the safety system component of the computerised train order system. One of the main functions of the GPS Watchdog is to interact with the TMCS to verify that the safeworking rules are correctly applied in train order working territory. This is achieved by using GPS<sup>8</sup> data to ensure that train position is accurately recorded, before allowing allocation or releasing of blocking facilities during the train order management process. If the GPS Watchdog detects a breach of the safeworking rules, the TMCS is prevented from issuing an order or releasing a block.

The GPS Watchdog also checks that trains within train order territory are operating in a manner consistent with the train orders authorising their movements. Again, GPS data is used to check the proximity of a train to its authority limits (including if the train is ‘out of authority’), and the proximity of a train to other trains in the train order territory. If the GPS Watchdog detects a condition that may lead to a breach of safeworking rules then an alarm or warning is displayed to the network controller.

- The CountryNet communication system provides the facility for network controllers to communicate train orders to train drivers while also providing the facility to communicate data such as GPS location.

Any train operating over train order territory in New South Wales must be logged onto the CountryNet communication system to ensure voice and data communication is maintained. The train must then be logged onto the TMCS to facilitate the compilation and issuing of train orders. In simple terms, once a train is logged onto the system, a train order may be issued subject to the proposed order passing the relevant safeworking checks conducted by the GPS Watchdog. The computerised train order system then maintains a series of blocks over the limits of the order. A train order can also include ‘shunt access’, which authorises the train to conduct shunt operations at an intermediate or end location within the limits of the train order. A shunt order is similar to a train order, except the limits relate to a single specified location, allowing a train to carry out whatever shunting moves are necessary within the limits of that location.

When a train driver has completed the instructions on a train order or shunt order, the order is considered fulfilled. Train orders may be partially fulfilled<sup>9</sup> as the train travels between the limits of its authority or fulfilled if the train is at the end limit of its order. In each case, the network controller is required to enter the train location (in track kilometres) and a security code (originally provided to the train driver and read back when fulfilling or partially fulfilling an order). The GPS Watchdog performs checks to ensure the entered location is consistent with the trains GPS reported location.

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<sup>8</sup> The Global Positioning System (GPS) is a satellite-based global navigation satellite system that provides reliable location and time information.

<sup>9</sup> Partial fulfilment allows the progressive release of blocks to make track available to other rail traffic.

Entering the correct train location is critical because it is this that determines how the train order system will manage the blocking facilities when orders are fulfilled. For example:

- If the train remains within train order territory when its order is fulfilled (for example, on a main line or loop), the system generates a ‘lapsed order’ which retains a block over the occupied track section.
- If the train has moved clear of train order territory when its order is fulfilled (for example, onto a siding or into a signalled location), a lapsed order is not generated and blocks are free to be released.

If the order to be fulfilled is a shunt order or a train order with shunt access at its end location, the computerised train order system also considers the possibility that wagons may remain uncoupled on running lines within train order territory. The system provides the facility and prompts the controller to apply additional blocks to the relevant track sections to address this possibility.

## 2.2 Interface between technology and individuals

Train order working is a system of safeworking that relies on verbal communication between train crews and network controllers, plus accurate entry of information into the TMCS. There were four individuals or groups of individuals associated with this incident:

- the crew of Pacific National train 9837 which later became train 8938
- the Manildra Mill shunter operating the Manildra Mill shunt locomotive designated as train MRA1
- the crew of CountryLink passenger train WP46, and
- the ARTC network controller.

The actions of each individual or group of individuals were examined along with how the individual actions may have interacted with the computerised train order system.

### ***Freight train 9837***

Freight train 9837 had travelled to Manildra under the authorisation of train order 10249 and had arrived at the Manildra yard limit board at about 1150. At that point in time, the train order system maintained blocks on the track between Molong (about 25 km east of Manildra) and the Manildra yard limit board. The drivers contacted the network controller and received train order 10258 with shunt access at 1205, but did not fulfil train order 10249. Train 9837 entered the yard on the main line and continued shunting until about 1250, at which time they positioned train 9837 on western end of the loop and restored the yard ready for main line operation. The crew then contacted the network controller and fulfilled both train orders at 1310.

When fulfilling train order 10249, the network controller entered the correct security code and entered the location of train 9837 at the 385 km point. The GPS Watchdog verified that train 9837 was at, or beyond, the limits of train order 10249 (that is, the eastern yard limit board). The system then maintained a lapse order to protect the entire train length (entered as 561 m).

Fulfilment of train order 10258 occurred in two steps. Partial fulfilment was achieved when the network controller entered the correct 'Arrival code'<sup>10</sup> and entered the train as being at the 385 km point. The GPS Watchdog verified that train 9837 had completely entered the yard and allowed the release of the lapse order and blocks between Molong and the Manildra yard limit board.

The controller then proceeded to fulfil the order (10258) by entering the correct security code and the same train location (385 km point). At this point in time, the TMCS maintained a lapse order for the main line because train order 10258 originally authorised train 9837 to enter the yard on the main line. However, since train order 10258 also included shunt access, the TMCS required that the controller complete the road occupancy dialog. In this case, the controller entered train 9837 as standing clear of train order territory, even though the train was standing on the loop. With train 9837 entered as clear of train order territory, the TMCS released the lapse order from the main line, leaving both the main line and loop free of any blocks. Had the train location been entered as 'Loop', then a lapse order would have been generated by the TMCS, effectively placing a block over the loop to cover the track occupancy.

While document TOP/h310001, *Train Controllers User Manual* states that GPS Watchdog performs a check when fulfilling train orders, document TOP/h310004, *GPS Watchdog User Manual* states that it does not verify train position if the order to be fulfilled is a shunt order or a train order with shunt access at the end location. Irrespective, GPS Watchdog applies a tolerance of  $\pm 100$  m to all GPS positions, so it is unlikely that the system would discriminate between a train standing on the loop or standing on an adjacent siding.

As a consequence of fulfilling train order 10258, train 9837 was recorded as clear of train order territory and all blocks released, when in fact the train was occupying the loop and still within train order territory. The lack of blocking facilities on the loop at this point in time did not have a direct bearing on the safeworking incident being investigated since train WP46 was issued an order to travel over the main line. However, the incorrect entry of information into the TMCS does pose a safety risk because the train was occupying a running line but entered as clear of train order territory.

### ***Train MRA1 (Manildra Mill shunt locomotive)***

The network controller issued shunt order 10270 to the Manildra Mill shunter at 1333. This permitted the shunter to conduct shunt operations within the Manildra Yard, bounded by the Manildra shunt limit signs. The Manildra Mill shunter proceeded to manage shunt operations, including directing the crew of train 9837 to undertake shunting when required, noting that train 9837 would become new train 8938 at the completion of the shunting task.

Shortly before 1600, the Manildra Mill shunter had returned the Manildra Mill shunt locomotive to the mill siding. He then advised the PN crew (preparing train 8938) that he would contact the ARTC network controller to fulfil the shunt order (number 10270). The drivers replied that their train was sitting on the main line and asked the shunter to advise the network controller to put a block on the main line.

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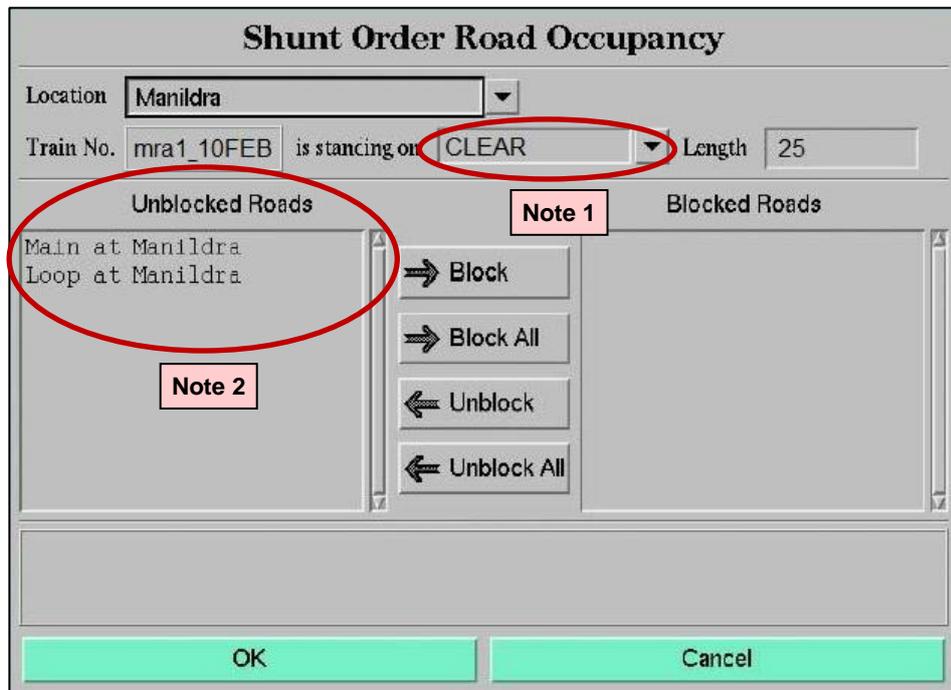
<sup>10</sup> The 'Arrival code' is used for train order's with shunt access, effectively advising that the train is wholly within the location and releasing tracks enabling other trains to approach the location while shunting is underway.

At that point in time, there was no requirement for the PN crew to contact the network controller because all movements within the yard had been conducted under the direction of the Manildra Mill shunter (who had been issued with the shunt order).

At about 1600, the shunter contacted the network controller to fulfil the shunt order. He quoted his fulfilment code, stated that the Manildra shunt locomotive was clear, and advised that new train 8938 was standing on the main line and that wagons were standing in the loop. The train control audio logs confirm that this information was communicated and acknowledged by the network controller.

When fulfilling shunt order 10270, the network controller entered the correct security code and entered train MRA1 at the 385 km point. Since train order 10270 was a shunt order, the TMCS required that the controller complete the road occupancy dialog. In this case, the controller entered train MRA1 as standing clear of train order territory, but did not apply a 'road occupancy' block to either the main line or loop, even though both lines were occupied (illustrated in Figure 7). The network controller then logged train MRA1 off the TMCS.

**Figure 7: TMCS - Shunt Order Road Occupancy**



Note 1: MRA1 set as 'standing on CLEAR'

Note 2: The loop and main lines set as 'Unblocked Roads'

The data log from the TMCS confirms that shunt order 10270 was fulfilled at 16:10:25 and released at 16:10:43. There is no record of any road occupancy blocks being applied at Manildra Yard between the shunt order being fulfilled and the approach of train WP46.

Once the shunt order was fulfilled, there were no additional actions required of the Manildra Mill shunter. Similarly, the crew of train 9837 expected that a block had been applied, so they had no intention of contacting the network controller until they were ready to obtain a train order (for new train number 8938) authorising them to begin their journey out of Manildra.

There was no evidence to suggest that any problem existed with communication between the Manildra Mill shunter and the network controller. However, it was noted that, at the time of this incident, the Manildra Mill shunt locomotive did not have a CountryNet communication system installed as required the New South Wales regulations<sup>11</sup>. Consequently, GPS data from the locomotive was not communicated to the GPS Watchdog.

According to documentation, it is possible that the GPS Watchdog does not perform a train location check when fulfilling shunt orders. Also, GPS Watchdog applies a tolerance of  $\pm 100$  m to all GPS positions, so it is unlikely that the system would discriminate between a locomotive standing on a running line or standing on an adjacent siding. It is likely that any GPS information transmitted from the Manildra Mill locomotive would only be relevant if the locomotive passed beyond the shunt or yard limits. While transmitted GPS data is an essential component of the safeworking system in New South Wales, the lack of GPS data from the Manildra Mill locomotive was considered to be a minor issue because the locomotive normally operated within the yard limits under the authority of a shunt order.

Regardless of GPS data being available or not, in this case train MRA1 was correctly entered as clear of train order territory, so the blocking facilities applied in relation to the shunt order were available to be released subject to any other blocks having been applied.

### ***CountryLink passenger train WP46***

Passenger train WP46 was travelling towards Manildra under train order 10288. At about 1630, the crew of train WP46 contacted the network controller and reported they had departed Bumberry (about 22 km west of Manildra). The network controller entered the correct security code and entered the train location as the 403 km point. The GPS Watchdog verified that train WP46 had completely passed the Bumberry yard limits and allowed the release of blocks between Parkes and Bumberry.

The network controller then issued train order 10293, authorising train WP46 to pass through Manildra and continue to Orange East Fork. The GPS Watchdog performed a number of checks during the process of issuing the train order. The GPS Watchdog verified the current position of train WP46, verified that the new order started at the end of the current order, verified that the proposed route was valid and verified that no existing orders or blocks conflicted with the proposed order. Without block facilities applied in Manildra Yard, the proposed order passed the GPS Watchdog checks and train order 10293 was issued at 1633, even though both running lines were occupied.

The crew of train WP46 played no part in creating the condition whereby the main line at Manildra was recorded as unoccupied even though train 8938 was occupying the main line.

### ***Network Controller***

It was evident that when fulfilling the shunt order (number 10270), the occupancy status of the running lines at Manildra were clearly communicated. However, the controller did not place a 'road occupancy' block on the loop and main lines by

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<sup>11</sup> NSW Rail Safety (General) Regulation 2008, Clause 47 – Train communications systems.

changing the roads from 'Unblocked Roads' to 'Blocked Roads' in the 'Shunt Order Road Occupancy' window of the TMCS (illustrated as Note 2 in Figure 7).

The network controller stated that he was surprised when advised that train 8938 was on the main and the loop was occupied, as he had never encountered this scenario before. However, train driver statements indicate that it was relatively common for a train to be positioned on the main line, before fulfilling the shunt order and obtaining a new order to go to Parkes. The train control audio logs were examined with respect to the conversation between the network controller and the Manildra Mill shunter. While the conversation did indicate some level of surprise on the part of the network controller, it also sounded as though the controller may have completed the fulfilment process on the TMCS before the issue of road occupancy was raised by the shunter. Regardless of how common a particular scenario is, the controller should always consider the issue of road occupancies before completing the shunt order fulfilment process.

The conversation between network controller and shunter also implied that the train (8938) was almost ready to depart. The network controller said he expected the crew to contact him almost immediately after the conversation with the shunter had ended, so their train could be logged onto the system. Train number 9837, which had come into Manildra earlier that day, was still logged onto the TMCS albeit recorded as clear of train order territory. It was only under the shunt order (managed by the Manildra Mill shunter) that the train was relocated to the main line in preparation of becoming train 8938. The network controller recognised that the act of logging the new train (8938) onto the TMCS would provide the opportunity to enter the location where the train was standing (clear, main or loop), thereby recording the occupancy and preventing authorisation of a movement through that location. However, the crew of new train 8938 believed that blocks had been applied to protect their track occupancy, so they did not intend to contact the network controller until they were ready to obtain an order to travel to Parkes.

At the time when the incident occurred, the Train Order Control board was busy. The network controller continued to answer calls, but none of them were from the crew of train 8938. At about 1630, train WP46 reported in and requested an order to continue through Manildra and onto Orange East Fork. The network controller stated that '...it was very, very busy at the time, and I just completely forgot he (train 8938) was on the main line' and he issued train WP46 with the requested order.

In hindsight, the controller acknowledged that he should have put a block on when fulfilling the shunt order.

### **2.2.2 GPS Watchdog alarms**

An examination of the GPS Watchdog data showed numerous alarms were displayed associated with the trains involved in the safeworking irregularity on 10 February 2010.

Most of the alarms were caused by a second CountryNet radio, located on one of the locomotives hauling train 9837. The radio had been left on and was transmitting GPS data, but had not been associated with that locomotive (or train) in the TMCS. This condition generated the following alarms:

- Unknown locomotive – This alarm was generated because GPS Watchdog received GPS data from a CountryNet radio that was moving within train order territory, but had not been associated with any locomotive or train logged onto the TMCS. The GPS Watchdog created a ‘ghost’ train and allocated the radio unit number (OT33) as the locomotive number.
- Trains too close – This alarm was generated because GPS Watchdog detected locomotive OT33 moving close to other trains operating within train order territory. By far the most common occurrence of this alarm was locomotive OT33 moving close to train 9837. GPS Watchdog assumed OT33 was a different locomotive operating near train 9837, even though the locomotive (and radio unit OT33) was in fact part of train 9837. This alarm was also generated when train 8134 passed through Manildra on the main line while train 9837 was standing on the loop.

The GPS Watchdog also generated a few alarms associated with the operation of train 9837 as it approached and operated within Manildra Yard. These alarms occurred because the drivers of train 9837 did not fulfil train order 10249 (Orange East Fork to Manildra yard limit board) until after they had also completed train order 10258 (Manildra yard limit board to Manildra main with shunt access).

- No departure report – This alarm was generated because GPS Watchdog detected that train 9837 had passed one of the ‘Report at’ locations specified in the train order, but the drivers had not yet contacted the network controller.
- Train overdue – This alarm was generated because GPS Watchdog detected that train 9837 had passed the end limit of its train order, but the drivers had not yet reported in at that location.

None of the alarms listed above were directly associated with train WP46 being issued with an order to travel over occupied tracks in Manildra Yard. The only alarms directly associated with train WP46 were a series of ‘Train too close’ alarms linked to ‘ghost’ train OT33. These alarms occurred as train WP46 approached Manildra Yard and were similar to the alarms generated when train 8134 had passed through Manildra without incident about three hours earlier. It is evident that the network controller acknowledged these alarms as he had before.

Almost all the alarms generated by the GPS Watchdog were a result of an operational, but non-associated, CountryNet radio located on one of the locomotives from train 9837. Had the radio been off, or had it been correctly associated with train 9837, then the alarms would not have occurred, including those associated with train WP46. However, the existence or non-existence of the alarms would in no way have influenced the events that contributed to the safeworking irregularity itself.

### **2.2.3 Summary – Interface between technology and individuals**

Train 9837 entered and shunted wagons within Manildra Yard under the authorisation of train order 10258. When fulfilling the order, the network controller entered train 9837 as standing clear of train order territory, even though the train was standing on the loop. Consequently, train 9837 was recorded as clear of train order territory and the blocks were released, when in fact the train was occupying the loop and still within train order territory.

The Manildra Mill shunter conducted shunt operations within the Manildra Yard under the authorisation of shunt order 10270. When fulfilling the shunt order, the network controller correctly entered MRA1 as standing clear of train order territory. However, the network controller did not apply a 'road occupancy' block to either the main line or loop, even though train 9837 was standing on the main line and wagons were standing on the loop.

The ARTC network controller expected the train crew (new train number 8938) to contact him and log their train onto the train control system, thereby recording its location in the TMCS. However, the crew of new train 8938 believed that blocks had been applied to protect their track occupancy, so they did not intend to contact the network controller until they were ready to depart Manildra. By the time train WP46 reported in (at about 1630), the network controller had forgotten about the track occupancies and provided the authorisation for train WP46 to travel through the Manildra Yard.

The crew of train WP46 played no part in creating the condition whereby the main line at Manildra was recorded as unoccupied even though a freight train was occupying the main line.

The GPS Watchdog provides a checking function to ensure that train positions are accurately recorded. However, it is possible (according to documentation) that GPS Watchdog does not perform a train location check when fulfilling a shunt order or a train order with shunt access at the end location. Regardless, GPS Watchdog applies a tolerance of  $\pm 100$  m to all GPS positions, so it is unlikely that the system would discriminate between a train standing on a running line or standing on an adjacent siding.

Without block facilities applied in Manildra Yard, the computerised train order system allowed an order to be issued to train WP46 which authorised it to travel through Manildra Yard, even though both running lines were occupied.

## **2.3 Control measures**

In general terms, a railway system of safeworking is combination of rules, procedures and technical solutions implemented to ensure the safe operation of multiple train movements over a rail network. A key principle for any safeworking system is to maintain separation between rail traffic (both opposing and following movements) and/or any other rail vehicles or track workers that may be occupying or working on the running lines.

The train order system of safeworking, in its most basic form, relies heavily on human actions. Train locations, track occupancies and network condition are all verbally communicated to the network controller by train drivers and field based personnel. Similarly, the network controller uses verbal communication to authorise trains to move between specific locations or for any other work to be conducted on the rail network. The network controller keeps written records of all train locations, track occupancies, network conditions and authorities (train orders).

To help reduce the risk of human error, various control measures are put in place both in the field and in the network control centre. The most basic level of control measures are documented rules and procedures. Additional measures include various technical solutions implemented to further reduce the risk of human error

by providing automatic checking functions and by reducing the workload on critical personnel.

In this case, the TMCS and GPS Watchdog provide checking functions and recording facilities at the network control centre. In the field, Manildra Yard has main line indicators installed to provide information to train drivers regarding the condition of track infrastructure ahead.

The systems were examined to identify any deficiencies that may have contributed to, or increased the risk associated with, the safeworking incident that occurred at Manildra on 10 February 2010.

### ***TMCS and GPS Watchdog***

The TMCS provides the facility to record, compile and issue train orders while GPS Watchdog provides the checking function to verify that the safeworking rules are correctly applied. When orders are issued and/or fulfilled, the network controller enters the location of the train into the TMCS. GPS data received via the CountryNet communication system is used by the GPS Watchdog to check that the entered data is correct and to track the train as it travels over the authorised section of track. However, the GPS Watchdog applies a tolerance of  $\pm 750$  m to position reports entered by the controller and a tolerance of  $\pm 100$  m to position reports obtained from GPS data.

In most cases, a train order is authorising a train to travel over a single defined route between two specific track locations, usually many kilometres apart. Since reporting points for train position are many kilometres apart, a system applied tolerance of  $\pm 100$  m or  $\pm 750$  m is acceptable. However, at a loop or siding location, trains may be positioned on one of a number of parallel tracks. In this case, it is critical that the network controller enters the correct data as it is unlikely that the GPS Watchdog could discriminate between a train standing on a main line, loop or siding.

A shunt order authorises an unknown number of train movements within a multi-route location where any track could remain occupied at the completion of the shunt operations, either by a train or unattached wagons. Since the track occupancy status at the completion of shunting could be different to that when the order was issued, the TMCS provides the facility for the controller to enter track occupancies when fulfilling shunt orders. However, the *Shunt Order Road Occupancy* form defaults to the condition that existed when the order was originally issued, requiring positive action by the network controller if they have been advised of any changes. In this case, it is suspected that the system allowed the controller to skip the 'blocked roads' section of the form and exit by pressing the 'OK' button (bottom of the form). Not having considered or questioned the occupancy of the main line or loop allowed the default condition (roads clear) to remain in the TMCS, thereby allowing other orders to be issued over the section of track. This highlights how critical it is that the network controller enters the correct data, since the safety verification component of the computerised system (GPS Watchdog) is unlikely to be capable of verifying road occupancy status when shunt orders are fulfilled.

An alternative approach for the *Shunt Order Road Occupancy* form could be for the system to assume the tracks are occupied (blocks applied by default). The blocks would then require removal if advised by the operator that the tracks are clear. This approach would force an additional step into the fulfilment process for shunt orders.

That is, blocks on the main line and loop would require removal before other orders could be issued through the yard. While this approach is unlikely to prevent a controller from removing blocks and exiting the form as a matter of habit, it does force an additional step into the process that may prompt a controller to consider, and question field personnel about the issue of road occupancy.

The error that set the conditions allowing an order to be issued over an occupied track occurred when fulfilling shunt order 10270. That is, the road occupancy window was not used to apply blocking facilities to the main line and loop, even though this condition was communicated to the network controller. However, the controller made a second data entry error (about 3 hours earlier) when he fulfilled train order 10258. The network controller incorrectly entered train 9837 as standing clear of train order territory, even though the train was standing on the loop. While this error did not directly impact on the incident being investigated, it too highlights a condition whereby a running line was incorrectly recorded as clear.

Since this issue was not directly associated with the incident being investigated, the exact communication was not examined. However, driver statements often used the term 'clear' to describe when their train is clear of a specific location on the track. For example, with respect to fulfilling train order 10258, the driver stated '... once in the clear on the loop at the western end we locked up all frames and fulfilled our train order ...' It is possible that when communicating with train control, the drivers used the term 'clear' to describe the train as clear of the main line, prompting the network controller to select 'clear' when entering the train's location in the TMCS Shunt Order Road Occupancy window. However, the action recorded the train as standing clear of train order territory when it should have been recorded as standing on the loop.

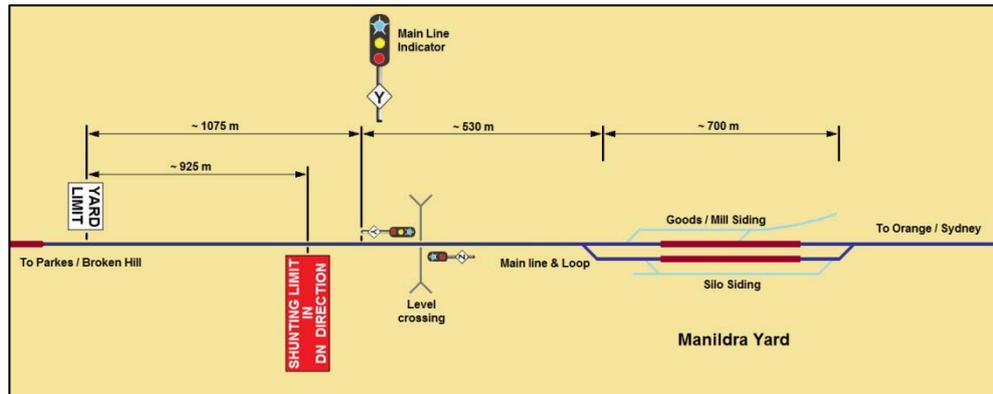
### ***Manildra Yard – Main line indicators***

The Manildra Yard was not a signalled location, but it did incorporate main line indicators. In train order territory, main line indicators are normally installed where trains are likely to stop or shunt within the approach to a level crossing. A main line indicator provides information to rail traffic about the condition of points and level crossings. The intent of the main line indicator is not to provide a system of train protection or provide authorisation for a train to proceed, but to be part of a system used to prevent unnecessary operation of a level crossing while shunt operations are in progress. Trains are required to stop if a main line indicator is displaying a stop (red light) indication, but may pass the stop indication under the conditions documented in the safeworking rules and if the train driver holds a valid authority to travel the track section. While main line indicators usually only provide information regarding the condition of points and level crossings, at Manildra the main line was track circuited<sup>12</sup>, so in this case the main line indicators also indicated if the main line ahead was clear of rail traffic.

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<sup>12</sup> A track circuit is a system used to detect the presence of a train or an item of rolling stock that may be occupying a section of track.

**Figure 8: Manildra Yard main line indicators and signs**



Note: similar configuration for the indicators and signs exists on the Sydney side of the yard

A train approaching Manildra from Parkes will pass the yard limit board about 1075 m before reaching a main line indicator (Y MLI) located immediately before the Kiewa Street level crossing (Figure 9). This main line indicator will only display a proceed indication if the level crossing warning equipment is operating correctly, the Manildra Yard points are set for the main line and the main line is clear of rail traffic. The ARTC document ANSG-610 *Passing indicators at STOP* (dated September 2004) states that rail traffic must not pass main line indicators at stop unless the level crossing warning equipment is operating correctly and the points are set for the correct route.

When considering the incident sequence, train WP46 had authorisation to travel up to the Manildra yard limit board and continue through Manildra Yard towards Orange (train orders, 10288 and 10293). In this case, the driver of train WP46 received warning from the drivers of the freight train via radio communication. However, had that communication not occurred, it is likely that train WP46 would have continued past the yard limit board unaware that all routes through the Manildra Yard were occupied.

Since the main line was occupied by the freight train, the main line indicator (Y MLI) would have been displaying a red stop aspect, regardless of the condition of the points or level crossing equipment. A train driver is able to sight the main line indicator from about 670 m away, about the same point that the level crossing warning equipment would begin to operate. While drivers may expect the indicator to change to a proceed aspect as they approach, they must also consider the possibility that the indicator remains at red and stop accordingly. Even if a train was unable to stop before passing the main line indicator, there is at least a further 530 m before the train would pass over the points and onto the track where the freight train was sitting. It is very unlikely that a collision would have occurred under the conditions that were present in this incident, even if a warning had not been communicated by radio.

The investigation also considered the risk of collision had a train had been located just within the Manildra Yard shunt limits (about 925 m past the yard limit board) as train WP46 approached the yard. However, for a train to be located at the extremities of the shunt limits, it would probably be operating under the authorisation of a shunt order. If this were the case, then the safeworking system would not have permitted authorisation of another train to pass the Yard Limit board and continue through the yard.

### ***Safeworking rules and procedures***

The ARTC document ANSY-502 *Train Order System* prescribes the rules for using the train order system of safeworking within train order territory in New South Wales. The documented rules refer to and underpin the functionality of the computerised system (in this case, the TMCS). However, the rules also state that if the computerised system fails, network controllers revert to a manual method of recording and issuing train orders.

The computerised system had been designed to minimise the risk of complete failure, had operated reliably since its implementation and was operational at the time of this incident. However, the possibility still existed that a manual method of managing train order working could have been in place. Consequently, the investigation examined the rules relevant to a manual method of managing train order working, with respect to the event conditions that existed for this incident.

The safeworking rules for the ARTC rail network in New South Wales are distributed over a number of documents. The documents prescribe the rules that are applicable to specific conditions and locations. In this case, the rules of interest related to train operations occurring within and through Manildra rail yard, with the system of safeworking being train order working.

The ARTC document LAU-266 *Local Appendix – Manildra* provides instructions related to shunting Manildra Yard. The document states that ‘... a qualified worker must be on duty to take charge of shunting operations’. Once a shunt order is issued to the qualified worker, the network controller must ensure that no other (conflicting) movements are authorised to enter the yard. Furthermore, the document states that if another train is required to shunt the yard, ‘... the other train will shunt on the authority of the shunt order issued to the qualified worker’. In this case, the network controller issued shunt order number 10270, authorising the Manildra Mill shunter to conduct shunting within the Manildra Yard. The drivers of train 9837 (8938) conducted shunting under the direction of the Manildra Mill shunter, as per LAU-266.

At the completion of shunting operations, the qualified worker is required to ‘fulfil’ the shunt order by reporting back to the network controller. The ARTC document ANSY-502 *Train Order System* prescribes the rules with respect to fulfilling train orders. Manildra Yard is considered to be a crossing location, so the relevant rule states that to fulfil a shunt order, rail traffic must be:

- stationary between clearance points, or
- clear of the main line or loop.

With respect to the incident at Manildra on 10 February 2010, the shunt order was fulfilled when train MRA1 (the Manildra Mill private shunt locomotive) was on the Mill Siding, new train 8938 was on the main line and some uncoupled wagons were on the loop. In this case, MRA1 was clear of running lines and all vehicles on the running lines were stationary between the clearance points. Consequently, the conditions that would allow the shunt order to be fulfilled were satisfied.

While the ARTC rules (document ANSY-502) clearly state that train orders and movements must be recorded, the document does not specifically state when, if or how track occupancies on running lines must also be recorded. The ARTC documentation also includes ANTR-420 *Shunting and marshalling*, prescribing the rules for making safe shunting movements on the ARTC rail network in New South

Wales. The document states that rail vehicles may be ‘stabled’<sup>13</sup> on running lines with the authority of the network controller.

In this case, information provided to the ATSB suggested that stabling of rail vehicles on the loop at Manildra was relatively common. However, there was no evidence that the stabled vehicles in the loop (which is a running line) had been authorised or recorded by the network controller using the computerised system (TMCS). If it was common practice to stable vehicles on the Manildra Yard loop but not record the occupancy using the computerised system, then it is also possible that the occupancies may not be recorded under a manual method of managing train order working.

While it was noted that the ARTC rules do not specifically state when, if or how track occupancies are recorded when fulfilling a shunt order, it is also recognised that a basic principle of safeworking is to prevent authorisation of train movements over track occupied by other rail vehicles. Consequently, any track occupancy should be recorded as normal practice.

### ***Safeworking rules and procedures – other areas of the ARTC rail network***

The computerised train order system (TMCS) was unique to the New South Wales rail network. However, it is possible that the operational conditions that existed at Manildra on 10 February 2010 could have occurred elsewhere in the ARTC rail network where the train order system of safeworking may also be in place. The ARTC does not have a consolidated set of safeworking rules and procedures that are relevant to their entire rail network throughout Australia. Recognising that the existing ARTC rules for Victoria, South Australia and Western Australia may differ from those in New South Wales, they too were examined to determine if they addressed the risks associated with a scenario similar to what occurred in Manildra on 10 February 2010.

In general, the rules governing train order working in Victoria, South Australia and Western Australia were similar to those in New South Wales, in that they implied that rail vehicles were prohibited from occupying running lines without written authorisation. However, this was not clearly stated in the documentation, especially in relation to shunt operations in train order territory. For example:

- The rules that apply in most areas of Victoria are documented in the *ARTC Code of Practice for the Victorian Main Line Network* (document TA20). Section 12 of the document describes the rules for shunting. While one clause states that running lines must be clear, another clause provides instructions if vehicles are left standing on running lines. In both cases, the document makes reference to signallers, which is not relevant at unmanned locations operating under train order working. Section 18 discusses the train order system, but does not clearly describe the procedures for shunting within train order territory.
- The rules that apply in western Victoria, South Australia and Western Australia (to a point near Kalgoorlie) are covered in an *ARTC Annotated Version of the Code of Practice for the Defined Interstate Rail Network*. The document is a little clearer in that it states, when fulfilling a shunt order, that the train crew ‘... shall, on completion of the shunt, report clearance to the train controller ...’ However, the term clearance is not defined. Clearance could mean that rail

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<sup>13</sup> Stabling a rail vehicle refers to parking the vehicle at a location, without a crew.

vehicles are clear of all running lines (that is, the main line and loop) or the vehicles are within the clearance points at a crossing location.

If the intent of the rules is to allow running line occupancy after an authorisation has been fulfilled, then the rules do not provide clear instruction on how running line occupancies are to be recorded.

### ***Draft consolidated rules***

While the ARTC may not currently have a consolidated set of safeworking rules and procedures, a project has been implemented to develop a single operating rule book for its entire network, based on a suite of rules developed by the Rail Industry Safety and Standards Board (RISSB). The RISSB suite of rules is titled the Australian Network Rules and Procedures (ANRP). The proposed timeframe for this significant project is implementation by late 2011. The RISSB suite of rules and their application to the ARTC consolidated safeworking rules project were also examined with respect to the incident scenario that had occurred at Manildra on 10 February 2010.

Document ANRP-5017 *Manual Train Order Working* prescribes the rules for the system of safeworking where written authorities are verbally communicated to train crews and recorded in written form. ANRP-5017 states that the purpose of the rules ‘... is to prevent more than one rail traffic movement being in a single line section at the same time’.

In the context of the incident at Manildra, ANRP-5017 specifies rules for a shunt authority and fulfilling an authority, but does not specifically address the issue of track occupancy at the completion of shunting. However, unlike the existing rules, ANRP-5017 includes a general rule that states that the Network Control Officer (or in the case of the ARTC, the Network Controller) must ‘...record occupancies’ and ‘... avoid occupancy conflicts’. In addition, ANRP-4013 *Shunting and marshalling* includes a rule for stabling traffic on running lines. The rule states that rail traffic may be stabled on running lines if ‘...it has been authorised by the Network Control Officer’.

While the ANRP may not provide specific instruction regarding how track occupancies are recorded, it clearly states that occupancies must be recorded.

## **2.3.2 Summary of control measures**

Even though a computerised system aims to reduce the workload of network controllers and is used to reduce the risk of human error by providing automatic checking functions, the system still relies heavily on human actions. When fulfilling shunt orders, it is critical that the network controller enters the correct data for train position and track occupancy. GPS data is either unlikely to exist (unattached wagons) or unable to discriminate between a train standing on a parallel main line, loop or siding.

When fulfilling an order, the TMCS requires the network controller to enter the position of the train. At a crossing location such as Manildra, the system provides three options; main, loop, or clear. It is possible that a train driver’s use of the term ‘clear’ to describe a train as clear of the main line may prompt a network controller to select ‘clear’, even though the train may be standing on the loop.

The main line indicators at Manildra Yard advise rail traffic about the condition of the points, level crossings and track occupancy of the main line. While drivers may expect the indicator to change to a proceed aspect as they approach, they must drive appropriately so as to stop if the indicator remains red. It was considered very unlikely that a collision would have occurred under the conditions that were present in this incident, even if a warning had not been communicated by radio.

While it was suggested that stabling of rail vehicles on the loop at Manildra was relatively common, there was no evidence that the stabled vehicles in the loop (which is a running line) had been authorised or recorded by the network controller using the computerised system (TMCS).

While there appeared to be some minor omissions with respect to the wording of the current safeworking rules, the ARTC had commenced a project to develop a single operating rule book for its entire rail network. The draft consolidated rules use a suite of rules developed by RISSB as its template which, in general addresses the minor deficiencies in the existing rules. Irrespective of any changes to the safeworking rules, train order working still relies heavily on human action and effective implementation of processes (including entering data into computerised systems) to reduce the safety risk associated with train operations within train order territory.

## **2.4 Fitness for work**

The term ‘fit for work’ is a generic phrase that encompasses a number of considerations such as medical fitness and fatigue. Some elements that influence fitness for work are directly controllable by a rail organisation. For example, preparing work rosters with consideration of fatigue issues, conducting medical assessments to ensure safety critical workers are medically fit and testing to ensure employees are not under the influence of drugs or alcohol. However, other factors such as an employee’s home life can also influence fitness for work, but are not directly controllable by the rail organisation. The ARTC have a number of policies and procedures that combine to manage an employee’s fitness for work.

The ARTC human resource policy HR07-004 *Medical Standards & Health Assessments* documents the guidelines for the assessment and monitoring of the health and fitness of all ARTC employees, including employees performing rail safety work. In general, the policy states that the ARTC ‘... will ensure that the health and fitness of all employees is assessed and monitored appropriate to the requirements of the work performed’.

With respect to elements that are not directly controllable by the rail organisation, the ARTC policies and procedures place a level of responsibility on the individual to assess their own condition in relation to fitness for work. Each employee has an obligation to manage their lifestyle, such that personal factors outside the workplace do not affect their ability to perform their work safely. If an employee has any concerns regarding a temporary or ongoing condition that may change their ability to work safely, the employee is required to notify their manager. Managers have an obligation to ensure employees are aware of their obligations, aware that the ARTC has systems in place to help employees (counselling and support services) and encourage individuals to seek help if required. In the event that an employee was considered temporarily unfit for safety critical duties, the ARTC state they would endeavour to provide suitable alternative duties.

In this case, the network controller had been medically assessed, in accordance with the ARTC's policy, as fit to conduct safety critical work. On the day of the incident, the network controller signed on at 1500 to work an overtime shift after having been rostered off for the previous 10 days. Consequently, fatigue with respect to the work roster was not considered a factor, particularly as he only been on duty for about 90 minutes when the error was made. With respect to performance impairment due to drugs and alcohol, the network controller was tested, post incident, as required by the ARTC drug and alcohol policy. The testing returned zero readings for both drugs and alcohol.

However, the investigation found that the network controller had been managing a number of personal issues in his home life that had the potential to affect his fitness for work. The controller stated that, when asked to work the shift, he had considered how he felt and concluded that he was fit for work. However, the controller did state that, in hindsight, his mind may not have been focused completely on the job at all times.

The events that occurred in this case are consistent with the errors that can occur if a worker is not 'fit for work'. While it was possible that the network controller may not have been fit for work and that his ability to perform safety critical work may have been impaired, it was not possible to verify if this condition contributed directly to the incident. Notwithstanding this, it seems that the network controller may have erred in his self assessment of his fitness for work. The employee subsequently took advantage of the ARTC's Employee Assistance Program and expressed positive comments that counselling had assisted his management of the issues.

## 2.5 Post incident actions

Following the safeworking incident that occurred at Manildra on 10 February 2010, the New South Wales Independent Transport Safety Regulator (ITSR) served 'Prohibition Notices' on Pacific National and the Manildra Group. The prohibition notices required that shunt operations be conducted in compliance with ARTC documents ANSY-502 *Train Order System* and LAU-266 *Local Appendix – Manildra*. In addition, the Manildra Group were required to ensure they not fulfil a shunt order unless all shunt operations had ceased and either the main line was clear or a form of train protection had been implemented in accordance with the network rules.

Both Pacific National and the Manildra Group accepted the requirements documented in the notices and have put processes in place to ensure they comply with the provisions of ANSY-502 and LAU-266. The Manildra Group have also implemented a work procedure, in relation to shunt operations, to ensure that they comply with the requirements documented in the notice.

ITSR also served an 'Improvement Notice' on the ARTC. The improvement notice required the ARTC to ensure shunting operations at Manildra were undertaken in accordance with LAU-266 and to ensure controllers cannot fulfil a shunt order while running lines are occupied unless a lapse order is maintained. In addition, the notice required the ARTC to review their procedures to ensure all trains operating on the ARTC network have a working train radio installed in compliance with the New South Wales transport safety legislation.

The ARTC responded that they had issued a 'Safety Alert' to all its network controllers reinforcing the process required when fulfilling shunt orders and reminding them of the train radio requirements. In addition, the ARTC would write to each rail operator that held access agreements for operations in New South Wales reminding them of their obligations under the New South Wales transport safety legislation.

ITSR advised that they were satisfied that the combination of actions taken by the ARTC, Pacific National and the Manildra Group would reduce the risk of recurrence to as low as reasonably practicable.

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## 3 FINDINGS

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### 3.1 Context

At approximately 1650 on 10 February 2010, an empty passenger train WP46 had been authorised to travel through Manildra Yard on the main line. However, at the same time, a freight train (8938) was already standing on the main line having recently completed shunting within the yard limits. While a collision was avoided, the event posed a serious safeworking irregularity whereby one train had been authorised to proceed over track occupied by a second train.

From the evidence available, the following findings are made with respect to the safeworking irregularity at Manildra and should not be read as apportioning blame or liability to any particular organisation or individual.

### 3.2 Contributing safety factors

- The ARTC network controller fulfilled a shunt order without entering road occupancy information into the train management and control system (TMCS), even though both the main line and loop were occupied.
- The ARTC network controller expected the train crew to contact him and log train 8938 onto the train control system soon after the shunt order was fulfilled, but the crew had no requirement to contact the network controller until they were ready to depart Manildra.
- The ARTC network controller had forgotten about the track occupancies when authorising train WP46 to travel through the Manildra Yard.

### 3.3 Other safety factors

- When fulfilling a train order with shunt access, the ARTC network controller incorrectly recorded the train as clear of train order territory, even though the train was standing on the loop.
- Authorisation had not been provided for rail vehicles to be stabled on a running line, as required by the rules documented in ANTR-420 *Shunting and marshalling*.
- At the time of the incident, the network controller had been managing a number of personal issues in his home life that had the potential to affect his work performance and may have erred in his self assessment of his fitness for work.
- The Manildra Mill shunt locomotive did not have a CountryNet communication system installed as required by the New South Wales *Rail Safety (General) Regulation 2008*. [*Minor Safety Issue*]

### 3.4 Other key findings

- The ARTC issued a ‘Safety Alert’ to all its network controllers reinforcing their obligation to follow the documented rules and procedures, thereby ensuring that lapse orders or road occupancies are maintained over occupied running lines when shunt orders are fulfilled.
- The ARTC had commenced a project to develop a single operating rule book for its entire rail network, with implementation proposed for late 2011. In general, the draft consolidated rules address the minor deficiencies identified in the existing rules.
- The main line indicators at Manildra Yard remain at red if the main line is occupied by rail vehicles. Even if a warning had not been communicated by radio (as was the case with train WP46 in this occurrence), it is likely that train drivers would sight the red indication and stop at the main line indicator, and thereby avoid a collision.
- Subsequent to the incident the ARTC network controller took advantage of the ARTC’s Employee Assistance Program and expressed positive comments that counselling had assisted his management of personal issues.
- Irrespective of any changes to the safeworking rules, train order working still relies heavily on human action and effective implementation of processes (including entering data into computerised systems) to reduce the safety risk associated with train operations within train order territory.
- Following the safeworking incident that occurred at Manildra on 10 February 2010, the New South Wales Independent Transport Safety Regulator (ITSR) served ‘Prohibition Notices’ on Pacific National and the Manildra Group, plus an ‘Improvement Notice’ on the ARTC. Each organisation addressed the issues identified in their respective notices. It is considered that the combination of actions taken by the ARTC, Pacific National and the Manildra Group would reduce the risk of recurrence to as low as reasonably practicable.

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## 4 SAFETY ACTION

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The safety issues identified during this investigation are listed in the Findings and Safety Actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety action, rather than to issue formal safety recommendations or safety advisory notices.

Depending on the level of risk of the safety issue, the extent of corrective action taken by the relevant organisation, or the desirability of directing a broad safety message to the rail industry, the ATSB may issue safety recommendations or safety advisory notices as part of the final report.

### 4.1 Australian Rail Track Corporation

The investigation did not identify any organisational or systemic issues that might adversely affect the future safety of rail operations.

### 4.2 Manildra Flour Mills Pty Ltd

#### 4.2.1 CountryNet communication system

##### ***Minor safety issue***

The Manildra Mill shunt locomotive did not have a CountryNet communication system installed as required by the New South Wales *Rail Safety (General) Regulation 2008*.

##### ***Action taken by Manildra Flour Mills Pty Ltd***

A CountryNet communication system has been installed into the Manildra Mill shunt locomotive. (RO-2010-002-NSA-003)

##### ***ATSB assessment of response***

The radio system installed into the Manildra Mill shunt locomotive now complies with the requirements of the New South Wales *Rail Safety (General) Regulation 2008*.



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## APPENDIX A : SOURCES AND SUBMISSIONS

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### Sources of Information

Australian Rail Track Corporation

Manildra Flour Mills Pty Ltd

Pacific National

RailCorp / CountryLink

### References

*ARTC Annotated Version of the Code of Practice for the Defined Interstate Rail Network*

*ARTC Code of Practice for the Victorian Main Line Network* (document TA20)

*Australian Network Rules and Procedures* (ANRP) published by the Rail Industry Safety and Standards Board (RISSB).

Safeworking rules for the ARTC rail network in New South Wales:

*Train Controllers User Manual* for the ARTC computerised train management and control system

### Submissions

Under Part 4, Division 2 (Investigation Reports), 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. Section 26 (1) (a) of the Act 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:

- Australian Rail Track Corporation
- Independent Transport Safety Regulator
- Manildra Flour Mills Pty Ltd
- Pacific National
- RailCorp / CountryLink /

Submissions were received from the Australian Rail Track Corporation, Pacific National, RailCorp and the Independent Transport Safety Regulator. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly

Safeworking irregularity involving a freight train and  
an empty passenger train at Manildra, NSW  
10 February 2010