Railway Accident Investigation Unit Ireland



INVESTIGATION REPORT

Signal Passed at Danger, Killarney Junction,

8th February 2025

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Report Description

Report publication

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Report structure

This report is written to conform as closely as possible to the structure set out in the "Commission Implementation Regulation (EU) 2020/572 of 24 April 2020 on the reporting structure to be followed for railway accident and incident investigation reports" having regard to "Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety".

Reader guide

All dimensions and speeds in this report are given using the International System of Units (SI Units). Where the normal railway practice, in some railway organisations, is to use imperial dimensions; imperial dimensions are used, and the SI Unit is also given.

All abbreviations and technical terms (which appear in italics the first time they appear in the report) are explained in the glossary.

Descriptions and figures may be simplified in order to illustrate concepts to non-technical readers.

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Preface

The RAIU is an independent investigation unit within the Department of Transport which conducts investigations into accidents and incidents on the national railway network including the Dublin Area Rapid Transit (DART) network, the LUAS light rail system, heritage and industrial railways in Ireland. Investigations are carried out in accordance with the Railway Safety Directive (EU) 2016/798 enshrined in the European Union (Railway Safety) (Reporting and Investigation of Serious Accidents, Accidents and Incidents) Regulations 2020; and, where relevant, by the application of the Railway Safety (Reporting and Investigation of Serious Accidents, Accidents and Incidents Involving Certain Railways) Act 2020.

The RAIU investigate all serious accidents. A serious accident means any train collision or derailment of trains, resulting in the death of at least one person or serious injuries to five or more persons or extensive damage to rolling stock, the infrastructure or the environment, and any other similar accident with an obvious impact on railway or tramline safety regulation or the management of safety. During an investigation, if the RAIU make some early findings on safety issues that require immediate action, the RAIU will issue an Urgent Safety Advice Notice outlining the associated safety recommendation(s); other issues may require a Safety Advice Notice.

The RAIU may investigate and report on accidents and incidents which under slightly different conditions might have led to a serious accident.

The RAIU may also carry out trend investigations where the occurrence is part of a group of related occurrences that may or may not have warranted an investigation as individual occurrences, but the apparent trend warrants investigation.

The RAIU investigation shall analyse the established facts and findings (i.e. performance of operators, rolling stock and/or technical installations) which caused the occurrence. The analyses shall then lead to the identification of the safety critical factors that caused or otherwise contributed to the occurrence, including facts identified as precursors. An accident or incident may be caused by *causal, contributing* and *systemic factors* which are equally important and should be considered during the RAIU investigation. From this, the RAIU may make safety recommendations in order to prevent accidents and incidents in the future and improve railway safety.

It is not the purpose of an RAIU investigation to attribute blame or liability.

Summary

On the 8th February 2025, an Iarnród Éireann (IÉ) driver (Driver A309) signed on duty at Mallow, Driver A309 had been feeling unwell that morning and on the previous few days but felt they were okay to sign on for duty. Driver A309 worked the 11:25 hrs Mallow to Tralee passenger service without incident. Immediately before departing Tralee, for the return working of the 13:05 hrs Tralee to Mallow passenger service (Train A309), Driver A309 mobilised the cab incorrectly by inputting the *Train ID* as Train A307 and not Train A309.

During the journey, between Rathmore and Banteer, an overspeed event occurred, with Train A309 reaching 79 miles per hour (mph) (127 kilometres per hour (km/h)) where the permissible speed is 70 mph (113 km/h). Driver A309 later stated that they had been aware of the overspeed but did not report it, as required, instead became focussed on complying with the speed restrictions for the remainder of the journey.

At 14:32:24 hrs Train A309 entered the area fitted with the *Continuous Automatic Warning System* (CAWS) and received a green in-cab indication. Twenty seconds later, a *CAWS downgrade* was received to a caution indication (single yellow) as Train A309 approached Signal MWR813. Driver A309 acknowledged the caution. At 14:32:56 hrs Train A309 passed Signal MWR813 showing a caution (single yellow) aspect.

At 14:33:47 hrs Train A309 passed Signal MW813 at danger (red) without authority whilst travelling at a speed of 43 mph (69 km/h). A 40 mph (64 km/h) permanent speed restriction commences at Signal MW813.

Train A309 continued onto the Cork to Dublin mainline through Points MW564 which were not set for the movement, resulting in damage to components, before continuing as far as Signal MW821 which was displaying a danger (red) aspect where Driver A309 brought the train to a stop. The total distance of the *signal overrun* was approximately 1,340 metres (m).

During the time between Train A309 passing Signal MW813, which activated the SPAD alarm in Centralised Traffic Control (CTC), and Train A309 stopping, the Mainline CTC Signalman was unable to successfully contact Driver A309. The Mainline Signalman could not connect a direct call with Train A309, in the first instance, as the incorrect Train ID had been inputted, the Mainline CTC Signalman then made either a *General Call* or a *Rail Emergency Call* (REC). However, as the Mainline CTC Signalman did not press the Press to Talk (PTT) button during the call, the message was not broadcast to Driver A309.

The signal passed at danger (SPAD) risk ranking (SRR) was subsequently scored 23 (on a scale between 0 and 28) making it a *High Risk SPAD* as the movement exceeded the *overlap.*

Train A309 passed Signal MW813 at danger without authority and subsequently ran through Points 564. The SPAD was as a result of the following causal factors:

- CaF-01 – Driver A309 did not respond appropriately to Signal MWR813 displaying a caution (yellow) aspect, by reducing speed; and, by failing to respond appropriately to Signal MW813 displaying a danger (red) aspect by stopping their train.

After the SPAD, the Mainline CTC Signalman was unable to contact Driver A309 as a result of the following causal factors:

- CaF-02 – Driver A309 had inputted the incorrect Train ID (Train A307) meaning the Mainline CTC Signalman was unable to make a direct call to Train ID A309;
- CaF-03 – Mainline CTC Signalman did not press the PTT to allow the broadcast of a General Call and/or REC in the cab of Train A309, and all trains in the selected area.

The following contributory factors were identified, in terms of the actions of Driver A309:

- CoF-01 – Driver A309 had been feeling unwell in the days leading up to the incident and became increasingly unwell during their duty. This is likely to have contributed to a number of their actions on the day. The following actions contributed to the SPAD:
    - Driver A309 was involved in an overspeed event at Rathmore, resulting in Driver A309 becoming transfixed with the particular task of maintaining speed for the remainder of their duty;
    - Driver A309 stopped using the risk triggered commentary techniques that they had consistently applied for a decade on the day of the incident, this resulted in Driver A309, not maintaining concentration resulting in loss of situational awareness. As a result, Driver did not react appropriately to the CAWS or the aspect displayed on Signal MWR813 and Signal MW813;
- CoF-02 – Driver A309 could not recall previously being stopped at Signal MW813 and may therefore have expected it to display a proceed aspect;
- CoF-03 – An issue with the auto-routing meant that the route was not automatically set for Train A309 and the signals were not cleared.

The following systemic issues were identified, in relation to the train protection:

- SF-01 – The absence of a functional train protection system at the location and on the train created the conditions for the incident to occur, placing reliance on the actions of drivers to respond to the lineside signals and CAWS;
- SF-02 – The absence of opportunities for signalmen to train, refresh and be assessed on making RECs using real equipment was a likely factor in the failure to contact Driver A309 and stop Train A309 before the conflict point;
- SF-03 – The Professional Drivers Handbook (PDH), while providing guidance on lifestyle factors, did not provide clear guidance on actions to be taken by drivers when they are feeling unwell.

The RAIU have not made safety recommendations related to train protection systems, radio systems or driver non-technical skills as a result of measures currently in progress with Iarnród Éireann-Infrastructure Manager (IÉ-IM) and Iarnród Éireann-Railway Undertaking (IÉ-RU).

Although not a factor to the incident, the RAIU makes the following additional observation:

- AO-01 – IÉ-IM has not risk assessed the risks associated with Signal MW813 to identify the hazards and risks associated with these signals and, in turn, determine appropriate control measures.

As a result of the causal, contributing and systemic factors; and, the additional observation, the RAIU make the following safety recommendations:

- Safety Recommendation 2026004-01 – IÉ-RU to review the PDH, and other relevant documentation, on the possible impact of ill-health when performing safety critical duties to ensure that there is clear guidance for drivers to take when feeling unwell;
- Safety Recommendation 2026004-02 – IÉ-IM to provide simulation facilities that permit the simulation of RECs and incorporate the use of these in the routine competency assessment of signalmen;
- Safety Recommendation 2026004-03 – IÉ-IM should identify and assess, through proportionate risk assessments undertaken in accordance with the relevant requirements of IÉ-IM's Safety Management System (SMS), the operational risks associated with SPADs at individual junctions. IÉ-IM should implement risk control measures where required, including interim measures where train protection is not yet provided, and demonstrate that the associated safety risks have been reduced to a level that is as low as is reasonably practicable and conform with the risk acceptance criteria set out in IÉ-IM's SMS.

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RAIU Investigation and its context

Decision & motivation to investigate this occurrence

1 On the 8th February 2025, the RAIU on-call investigator received a notification of a SPAD at Killarney Junction (near Mallow) on the Cork to Dublin mainline.

2 The RAIU conducted a preliminary examination and the RAIU's Chief Investigator made the decision to conduct a full investigation into the incident, given its impact on railway safety (*Article 20* (2)(c) of Directive (EU) 2016/798, Article 20, Obligation to Investigate), as under slightly different circumstances the incident may have led to serious accident with the potential for a fatality or serious injuries, due to the risk of Train A309 colliding with another train[1].

Scope & limits of investigation

3 The investigation examined the circumstances leading to the SPAD and the subsequent attempts by the Mainline CTC Signalman to stop Train A309. The scope included the operation of the train, the rolling stock and the infrastructure, including the provision of warning and train protection systems. The investigation considered the roles, responsibilities, competence, supervision, and communication between the personnel involved, including the Driver A309 and Signalmen. Human and organisational factors, including decision-making and the adequacy of training, procedures, guidance, and risk assessments relating to activities, were also considered.

4 The RAIU have established the scope and limits of the investigation as follows:

- Establish the sequence of events leading up to, during and after the incident;
- Identify any other precursors which led to the incident;
- Establish, where applicable, causal, contributing and systemic factors;
- Examine the communications equipment of available to signalmen at CTC.

[1] The actual risk was low as the risk at the time of the occurrence was from a train coming from the Cork direction and the two trains colliding. The signal was not cleared for the train from Cork so therefore the train from Cork would also have to have SPAD a signal for a collision to take place. The potential risk was extremely high, and this is reflected in the final risk ranking score. The potential risk was for the train involved in the SPAD to collide with another passenger train at Killarney Junction.

Technical capabilities & investigation methods

5 The RAIU's Acting Chief Investigator allocated RAIU Senior Investigators, trained in accident investigation, to conduct this investigation, as appropriate.

6 During the investigation, the RAIU visited the accident site and later collated evidence through the submission of Requests for Information (RFIs) to the IÉ-IM Safety Department and formal interviewing of relevant staff. Related to this investigation, the RAIU collated and logged evidence related to the works on-site (CCTV, statements and interviews). The RAIU also reviewed documentation from IÉ-IM and IÉ-RU, for a full list of documentation reviewed and referenced, see the References section of this report.

Communications & evidence collection

7 Communications were conducted through established processes (such as RFIs).

8 Relevant stakeholders were issued the draft investigation report for comment, comments were reviewed and responses on their comments returned. In this instance the stakeholders were: IÉ-IM, IÉ-RU and the Commission for Railway Regulation (CRR)[2].

9 All relevant parties co-operated fully with the RAIU investigation; with no difficulties arising.

[2] The CRR is the National Safety Authority (NSA) for the Republic of Ireland and is responsible for the regulatory oversight of the SMS and enforcement of railway safety in the Republic of Ireland in accordance with the Railway Safety Act 2005 and the European Railway Safety Directive.

Description of the occurrence & background information

Description of the occurrence type

10 The incident involved an operational irregularity with a passenger train on the 8th February 2025. In terms of categorisation, the EU Agency for Railways categorisation for this occurrence is an: Incident – Traffic Operations and Management.

Background to the occurrence

11 The operational irregularity occurred at Killarney Junction, located to the south of Mallow Station in County Cork, see Figure 1. The location is the junction between the branch to Tralee and the Cork mainline.

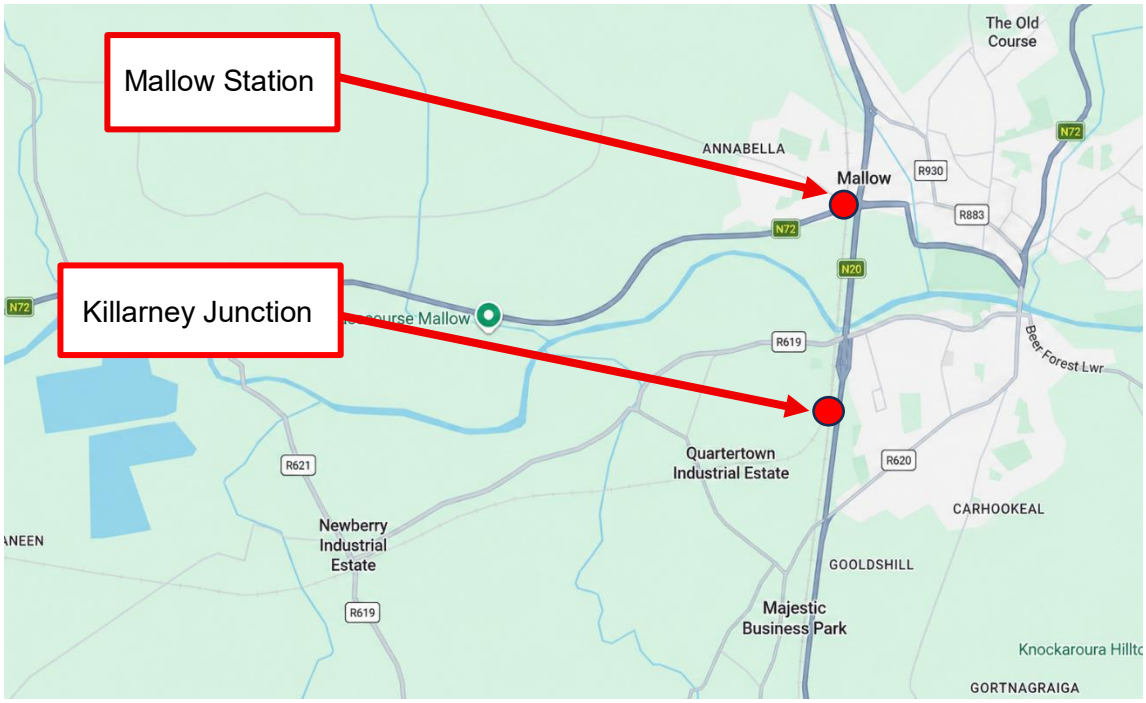


Figure 1 – Location of the incident

12 The weather at the time of the incident was dry and there was no reported sun glare on the signal heads or cab instruments.

Deaths, injuries & material damage

13 There was damage to Points MW564 caused by Train A309 having run through them, which was costed at €3,065.32. Points MW 564 were out of commission for twenty-seven and a half hours, preventing movements on the Tralee line.

Other consequences as a result of the incident

14 There was forty-eight minutes primary delay to Train A309 and 604 minutes secondary delay to other services. The damage to Points MW564 resulted in nineteen train cancellations and their substitution by bus at a cost of €4,100.

Parties and roles associated with the incident

Parties involved in the incident

IÉ-RU

15 IÉ–RU is the railway undertaking who operated Train A309. IÉ-RU also employed Driver A309 and maintained all the rolling stock involved. The IÉ-RU operates under a Safety Certificate issued by the CRR. The IÉ-RU Safety Certificate was renewed on 23rd March 2023 for a period of five years (valid at the time of incident).

IÉ-IM

16 IÉ–IM is the infrastructure manager who owns, maintains and operates the railway infrastructure in Ireland and operates under a Safety Authorisation Certificate issued by the CRR. The IM Safety Authorisation is issued in conformity with Directive (EU) 2016/798, S.I. No 476 of 2020 and Commission Regulation (EU 2018/762). The authorisation was renewed on the 24th March 2022 for a period of five years (valid at the time of the incident).

17 The IÉ-IM departments involved in the incident and relevant to this investigation are:

- Operations Department – Operates the signalling system and network and provides the first level of response to incidents;
- Signalling, Electrification and Telecommunications (SET) Department – Maintains the signalling system and level crossing equipment.

Roles involved in the incident

18 The IÉ-IM roles involved, directly and indirectly in the incident, are as follows:

- Mainline CTC Signalman – The signalman who operates the signalling system for the Mainline CTC Workstation and was certified competent under the IÉ-IM operations competence management system;
- Waterford and Tralee Line CTC Signalman – The signalman who operates the signalling system for the Tralee Workstation, located immediately adjacent to the Mainline CTC Workstation.

19 The following IÉ-RU role was involved in the incident:

- Driver A309 – Driver of Train A309 (13:05 hrs passenger service from Tralee to Mallow); certified competent under IÉ-RU's competence management system and issued with a valid train driving licence and complementary certificate.

Rolling stock

General description

20 Train A309 was formed of a *four-piece* Class 22000 intercity railcar (ICR) no. 22, formed of 22222 (leading), 22522, 22422 and 22322. The Class 22000 ICR is a type of diesel multiple unit (see Figure 2).



Figure 2 – 22000 Class ICR

21 The maximum permitted speed of a four-piece Class 22000 ICR is 100 mph (160 km/h), with a laden weight of 244 tonnes and length of 94.8 m.

22 Class 22000 ICRs are equipped with an On Train Data Recorder (OTDR) which records key measurements such as speed, power applied and brake pressures and horn use; and are fitted with Forward-Facing Closed-Circuit Television (FFCCTV).

23 The Class 22000 ICR is equipped with a CAWS (discussed in paragraphs 24 to 27) and a train radio system (see paragraphs 56 to 59), see Figure 3.



Figure 3 – Class 22000 ICR driving cab layout

Continuous Automatic Warning System Aspect Display Unit

24 Class 22000 ICRs are equipped with CAWS[3].

25 The CAWS works by repeating the aspects shown by the lineside colour light signals on an Aspect Display Unit (ADU) inside the driver's cab (see Figure 4). The ADU continuously displays the aspect that was shown by the previous signal until updated approximately 350 m before the next signal. The ADU then displays the aspect shown by that signal. Each time a signal showing a restrictive aspect (double yellow, single yellow or red) is encountered on a fitted route, an audible warning is sounded which must be cancelled by the driver. The audible alert is the same for double yellow, single yellow and red signals.



Figure 4 – CAWS ADU

26 On routes not fitted with CAWS, there is no in-cab reminder of the previous signal aspect and no audible warnings. The last warning received on the display (a red when leaving the CAWS area) must be disabled (extinguished) by the driver on exit from a CAWS area to avoid any in-cab display conflict with the signals being observed using a toggle switch. This is known as the ‘disable’ function. Before re-entering the CAWS area, a driver must use the toggle switch to return the CAWS to ‘normal’, otherwise they will be unable to cancel any subsequent warnings, resulting in a brake demand.

27 On entry to a CAWS fitted area, before the berth for the first signal fitted with CAWS, a short section of infrastructure is installed with track code that results in a green in-cab indication. This is the case approaching Signal MWR813 where the driver receives a ‘green’ then approximately twenty seconds later the CAWS display updated for the aspect shown on Signal MWR813 ahead, in this case caution (single yellow).

[3] It should be noted that CAWS alerts the driver to restrictive signals but it does not intervene to stop the train once the warning has been acknowledged. At the time of the incident, no Class 22000 ICRs were equipped with an *automatic train protection (ATP)* system authorised for use. Consequently, there is no speed supervision below the vehicles maximum speed and no supervision of braking for signals or *Permanent Speed Restriction* (PSRs).

Infrastructure

Description of the location

28 Killarney Junction is located south of Mallow Station at 145 ¼ Mile Post (MP)[4] on the Dublin to Cork mainline where the line to Killarney and Tralee joins the route.

29 The line from Killarney Junction to Tralee is single track, bi-directional throughout. There are stations located at Banteer, Millstreet, Rathmore, Killarney, Farranfore and terminating in Tralee at 61 ½ MP[5]. There are passing loops at Banteer, Millstreet, Rathmore and Farranfore Stations (Figure 5).



Figure 5 – Stations (in red) on the route

30 Approaching Killarney Junction on the single line from Tralee, the permissible speed is 60 mph (97 km/h) for passenger trains, with a PSR of 40 mph (64 km/h) commencing just before Signal MW813 for movements over Killarney Junction.

[4] The MP datum for the Dublin to Cork mainline is 0 MP at Heuston.

[5] The MP datum for the Tralee line is 0 MP at Killarney Junction.

Killarney Junction and Points MW564

31 The track layout at Killarney Junction is a *single lead* junction where the single-track line to Tralee diverges from the double track Dublin to Cork mainline[6]. Points MW564 at Killarney Junction are shown in Figure 6.



Figure 6 – Points MW564 at Killarney Junction

[6] The junction layout does not incorporate *trap points* or *flank* protection to mitigate against conflicting movements at the location, but the design of track circuits and the interlocking is intended to detect and mitigate a signal overrun/ SPAD by almost immediately replacing signals to danger on the other converging route. The current IÉ-IM document I-SIG-2062 Train Protection Principles (Clause 4.2.3) requires that the provision of trap points in conjunction with an acceptable arresting arrangement may be used as an alternative to a signal overlap. Such applications must be subject to risk assessment of the *secondary hazards* of derailment at the trap points and within the arresting arrangement. At Killarney Junction the location of the railway on an embankment increased the potential consequences had a derailment occurred.

Signalling

General description

32 The signalling at Killarney Junction and Mallow is three and four aspect colour light signalling controlled under Track Circuit Block regulations.

33 Mallow Station and the relevant section of the Cork mainline is controlled by Mainline CTC; this includes the approach to Killarney Junction from the Tralee line.

34 The Mallow to Tralee route was re-signalled in 2004/5 as part of a larger Mini-CTC project which involved: updating the signalling from mechanical signalling to colour light signalling using solid-state interlocking; installing axle counter train detection equipment between stations; removing local signal cabins with control being transferred to CTC; and the upgrading of level crossings.

35 The Cork mainline is equipped with CAWS, including Mallow Station. CAWS is also fitted to the Tralee line on the approach to Killarney Junction only, commencing on the approach to Signal MWR813.

Mainline CTC Workstation

36 Control of train movements is carried out from CTC at Dublin Connolly Station.

37 The Mainline CTC Workstation control area includes west of Inchicore (Dublin) to the north of Cork on the Cork Mainline; and controls movements on and off the Tralee line; it also jointly controls movements towards Banteer with the Waterford and Tralee Line Workstation (located adjacent to the Mainline CTC Workstation).

38 The Mainline CTC Workstation is equipped with the auto-route functionality, which automatically operates points and requests signals when certain parameters are met for trains in the Working Timetable (WTT) using their Train ID information. At the time of the incident, there was a fault with the auto-route system which required a manual intervention to set the route and clear the signals. The auto-route functionality is not safety critical and the Mainline CTC Workstation can be operated without it.

Signals associated with the incident

Signalling layout overview

39 Figure 7 gives an overview of the signalling layout at Killarney Junction and Mallow, showing the relevant signals. The route taken by Train A309 is shown in blue, with the train travelling left to right.

40 All of the signals shown in Figure 7, on the following page, are fitted with CAWS.

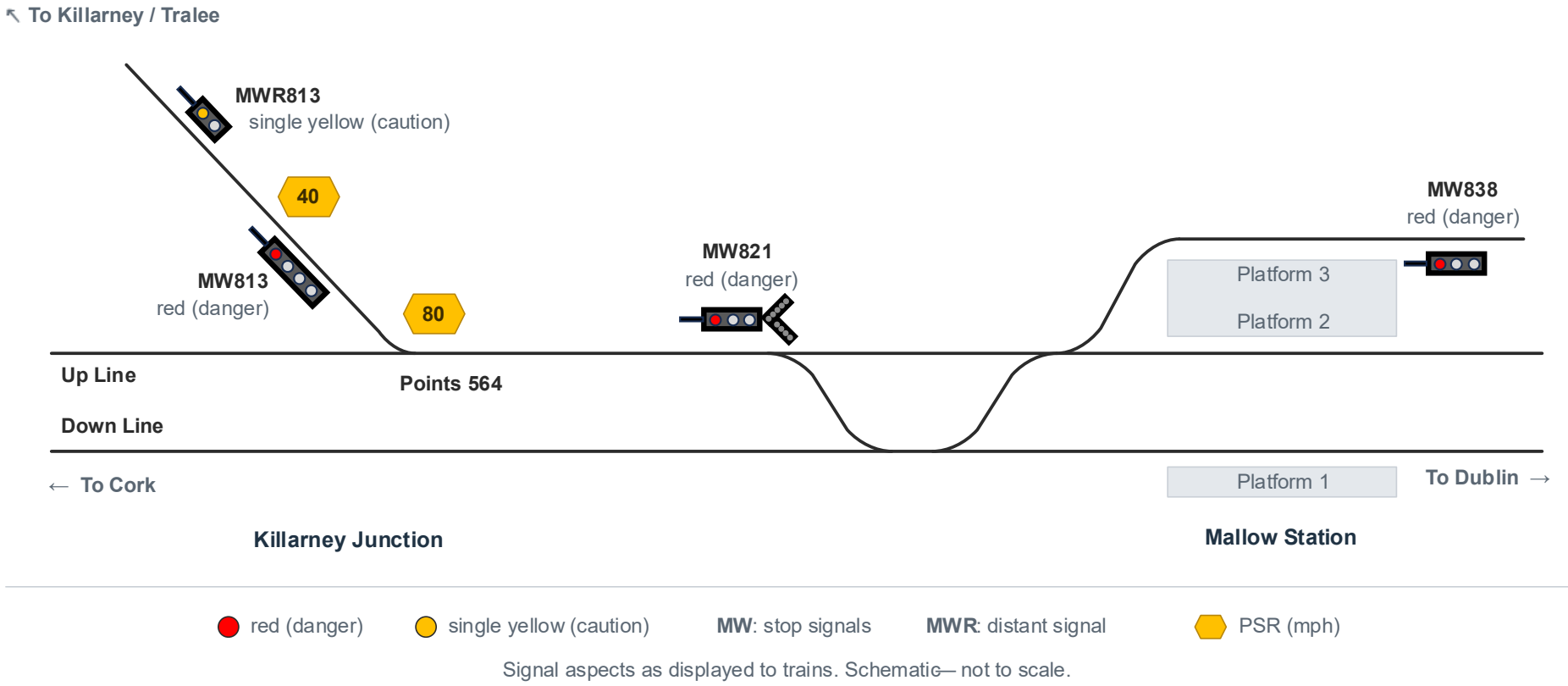


Figure 7 – Track layout of the area with relevant signals only

Signal MWR813

41 Signal MWR813 is a *distant signal* located 1,050 m before its associated stop signal, Signal MW813 (see Figure 8); it is capable of showing only a Caution (single yellow) or Clear (green) aspect. If Signal MWR813 is showing Clear (green), it indicates that the signal ahead (Signal MW813) is showing a proceed aspect (Clear /green, Preliminary Caution / double yellow, Caution / yellow). If Signal MWR813 is showing Caution (yellow), it indicates that Signal MW813 is displaying a danger (red) aspect.

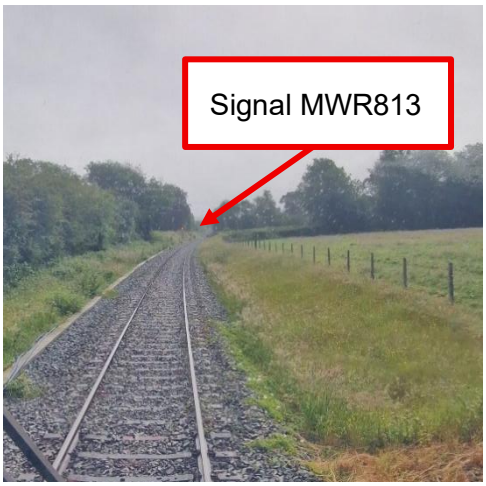


Figure 8 – Signal MWR813

42 Signal MWR813 is on a curving approach and is visible for a distance of approximately 375 m, where the required reading distance[7] was calculated to be 350 m (based on a speed of 80 mph (129 km/h) at the location)[8] meaning that the required *reading time* of nine seconds is exceeded.

[7] Appendix B2 of I-SIG-2043 Lineside Signal Sighting and Spacing defines that this is calculated by being visible for more than eight seconds on approach at the maximum permitted line speed before other factors are added (e.g. 40 mph (64 km/h) PSR sign).

[8] The actual permissible speed approaching Signal MWR813 is 60 mph (97 km/h), but an achievable speed of 80 mph (129 km/h) was used for the calculation in the Sighting Form.

Signal MW813

43 Signal MW813 is the last signal on the Tralee to Mallow line before exiting on to the main Cork to Dublin line. It is a four-aspect stop signal capable of showing red, single yellow, double yellow or green aspects (see Figure 9). It is the protecting signal for Killarney Junction, preventing conflicting movements on the Up mainline. Signal MW813 is 700 m from the junction.

44 Signal MW813 is visible for a distance of approximately 400 m on approach, exceeding the required reading distance. It is positioned on the right-hand side[9] of the line to improve sighting on approach but has a simple background and is easily located[10].

45 Also seen in Figure 9 is the PSR board for 40 mph (64 km/h).

46 Signal MW813 had no recorded SPAD history.



Figure 9 – Signal MW813

[9] Signals are normally located on the left-hand side of the line except where re-positioning will improve sighting or improve the driver's perception of association with the correct line.

[10] No signal sighting form exists for Signal MW813 as its installation pre-dated the documented calculation of minimum reading time and distances.

Signal MW821

47 Signal MW821 is positioned on the Up main after Killarney Junction. Signal MW821 is a three aspect stop signal that protects movements for the platforms at Mallow Station, see Figure 10 which is displaying a single yellow.

48 Signal MW821 also has a *junction indicator* (displaying inclined rows of white lights above the signal), which displays the diverging routes into Platforms 1 and 3, Figure 10 which is illuminated for Platform 3.

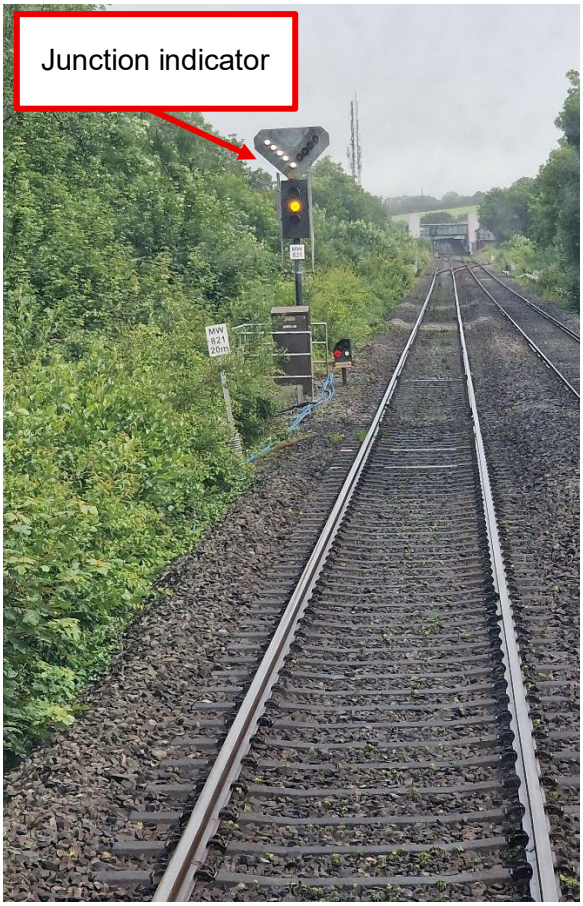


Figure 10 – Signal MW821

49 For movements routed into Platforms 1 or 3 at Mallow Station a lower speed approach applies and Signal MW821 has an approach release[11] arrangement. This means that MW821 is maintained at red on approach to ensure that the train receives a cautionary aspect at the previous signal, reducing its approach speed.

50 Signal MW821 did not have any recorded SPAD history since its installation.

Signal MW838

51 Signal MW838 is positioned on the platform end of Platform 3 in the Up direction at Mallow and normally displays a danger (red) aspect for trains terminating in Platform 3.

[11] Approach release signalling is utilised where a train diverges onto a slower route. Its main purpose is to prevent a train from encountering a signal cleared for a route that requires a reduced speed before the driver has adequate warning. This ensures that trains do not approach diverging routes too quickly, maintaining safety and operational efficiency.

Signalling sequence into Mallow Station Platform 3 (no conflicting movements)

52 When there are no conflicting movements, the signal sequence a driver would normally receive from the Tralee line into Mallow Station Platform 3 are as follows (see Figure 11), in order of approach:

- Signal MWR813 (Distant Signal for Signal MW813) – Clear (green);
- Signal MW813 (Protecting Signal) – Caution (single yellow);
- Signal MW821 – Danger (red); then caution (single yellow) with Junction Indicator;
- Signal MW838 – Danger (red).

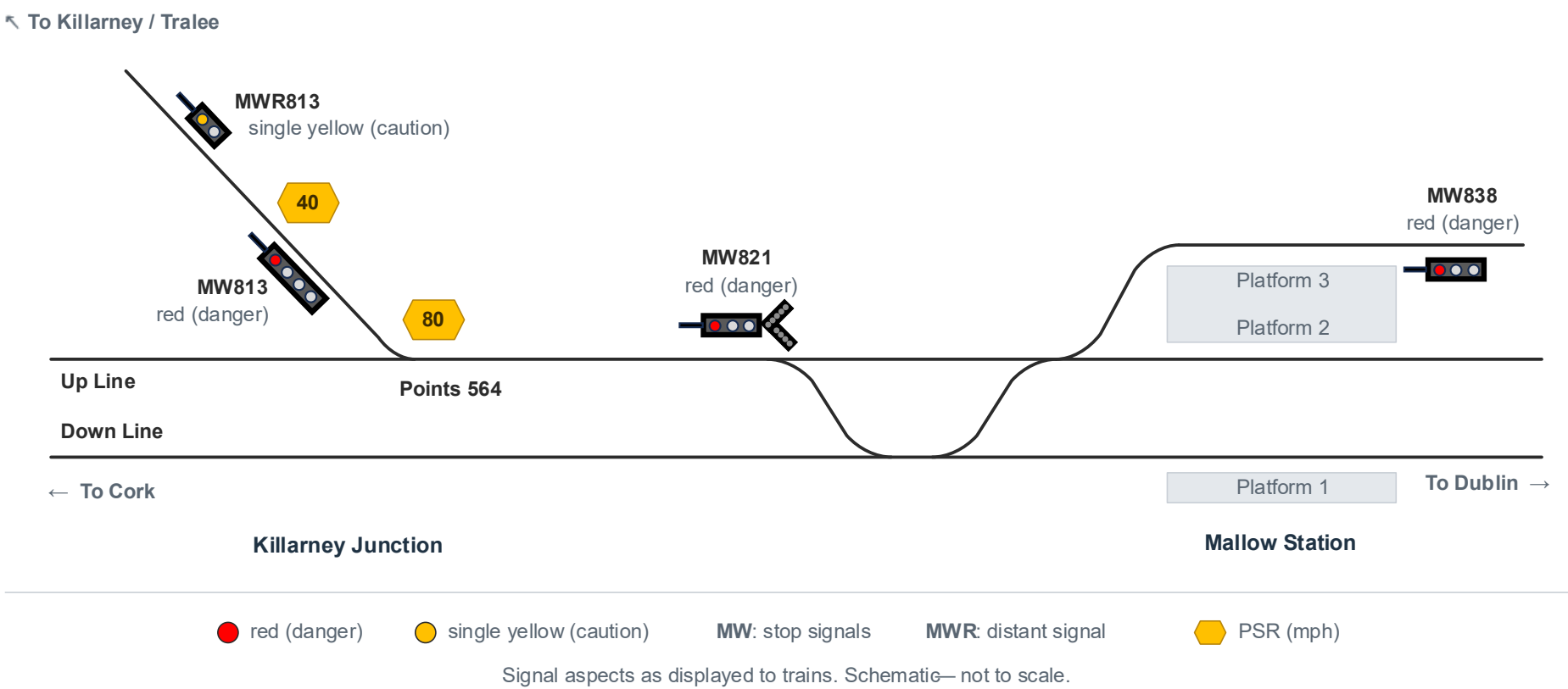


Figure 11 – Signal sequence with no conflicting movements and auto-route operational

Instructions for Infrastructure Operations

Train Signalling Regulations and General Instructions to Signalmen

53 Train Signalling Regulations and General Instructions to Signalmen, Section 9, Drivers Inadvertently passing Signals at Danger; details, that in the event of a SPAD that the signalman must take immediate action to prevent danger arising (Section 9.1).

54 The Train Signalling Regulations and General Instructions to Signalmen does not state which type of call should be used to stop a train in the event of a SPAD (i.e. an emergency call) or if this is dependent on the situation.

Communications

Introduction

55 This section outlines the radio system and the requirements of the IÉ Rule Book, the training and competency arrangement for signalmen, in particular using the radio in the case of an emergency are outlined in paragraphs 99 to 108.

Radio Systems

56 The existing radio system between Killarney Junction and Tralee is an analogue radio system[13].

57 The Mainline CTC Workstation is equipped with a Frequentis DICORA Communications Terminal, which is a touch-based dispatcher terminal to manage audio integration and critical communications by integrating train radio and fixed telephone lines (see Figure 12). The functions of the system and how to use it are described in the integrated communications terminal manual.

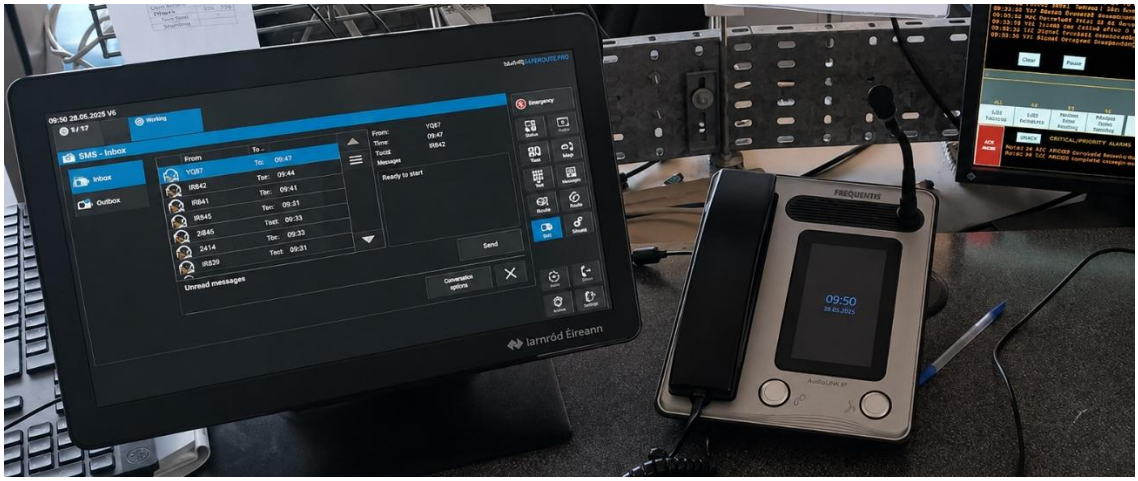


Figure 12 – Frequentis DICORA Communications Terminal

[13] The existing analogue radio system is outdated and becoming more challenging to maintain. Recognising this, IÉ-IM have for the past number of years been rolling out a new digital radio system, Global System for Mobile Communication – Railway (GSM-R), which will replace the analogue system. GSM-R is currently operational on the DART network only. The trackside equipment for GSM-R is installed but not certified on the Cork mainline and Tralee line. No rolling stock used on the Tralee line is currently fitted with operational GSM-R.

58 This terminal permits the signalmen to make a direct call to a train (using the Train ID); to make a General Call to all train radios in that radio area or to make an REC (this is an REC that broadcasts to all analogue train radio units tuned in to particular train radio lines chosen by the person making the call[14]). To make a REC call, this is selected from the General call menu. An REC overrides all pre-existing train radio connections on these lines including established General Calls[15]. A high-pitched tone is transmitted for a REC call, before the call connects[16]. When advising drivers of any emergency, the REC function must be used. The signalman must then say ""THIS IS AN EMERGENCY CALL, all drivers in 'XXX' area, please stop your train(s) immediately".

59 Analogue RECs are outgoing broadcasts only. In order to enable the microphone, the PTT key must be pressed and held whilst speaking (two PTT keys are provided, one on the telephone cradle and one on the telephone headset, see Figure 13). The message will only be broadcast whilst the PTT key is pressed and continually held throughout the broadcast



Figure 13 – PTT Buttons

[14] Section 10.2, Integrated Communications Terminal Manual a Rail Emergency Call (REC).

[15] There is no tone or alert received in cab when only a General Call is made.

[16] When making a REC function using GSM-R, a high-pitched two-tone alarm sounds in the driver's cab for five seconds along with a flashing text message saying, 'INCOMING RAILWAY EMERGENCY' before the signalman broadcasts their message, via the PTT button or key.

Operation of Trains (Train Driving)

General description

60 Trains towards Dublin are described as being in the Up direction, with movements towards Cork and Killarney / Tralee being in the Down direction.

61 The Up mainline of the Dublin to Cork mainline between Mallow station and Killarney Junction is bi-directional to allow trains from the Tralee line to access any of the three platforms at Mallow Station. The single-track railway between Banteer and Killarney Junction, is used by trains in both directions (bi-directional).

62 The maximum permissible speed on the Tralee and Killarney line is 70 mph (113 km/h) with a permanent speed restriction of 60 mph (97 km/h) before Signal MWR813 and a further PSR of 40 mph (64 km/h) at Signal MW813.

63 The maximum permissible speed is 80 mph (129 km/h) on the Up mainline between Killarney Junction and Mallow Station for services headed in the Up direction towards Dublin, but for services terminating at Mallow, the achievable speed is lower when complying with the restrictive signal aspects available for routes to Platforms 1 and 3. Further PSRs apply on the crossovers to Platforms 1 and 3.

IÉ operational instructions and procedures

Introduction

64 The relevant rules and instructions relating to the SPAD event and the subsequent actions are detailed within the following publications:

- IÉ Rule Book – The core operational publications for the safe operation of trains that applies to all railway operating personnel and those requiring engineering access. Relevant to this incident are Section C – Signals; and, Section H – Operation of Trains;
- Professional Driving Handbook (PDH) – Prescribes the standards of professionalism and driving techniques to be applied by IÉ-RU drivers.

IÉ Rule Book

65 IÉ Rule Book Section C, Signals, states that in terms of observance of signals, one of the principles is that the aspect/ indication of each signal must be obeyed by the driver of the train to which it applies. The driver must understand the main aspects i.e. a red aspect is a danger aspect meaning stop; one yellow light is a caution aspect and means the driver must be prepared to stop at the next signal; and, a green aspect is a clear signal and means the next signal is displaying a proceed aspect (Clause 3.1.1, What you must understand by main aspects).

66 IÉ Rule Book Section H, Clause 3.5.2 Observance of signals and speed restrictions requires that drivers must obey all signals and speed restrictions applying to your train; apply defensive driving techniques; keep a good lookout and be alert for handsignals or any indication of something untoward.

The Professional Driving Handbook

Introduction

67 The PDH comprises of five sections, with the following sections being relevant to this investigation:

- Section One – Professional Driving Policy – Prescribes core principles and supporting instructions to be applied by all IÉ train drivers. These are mandatory and form part of normal assessment and monitoring;
- Section Two – Guidance and supporting information – Contains guidance and supporting information on such items as non-technical skills, situational awareness and risk triggered commentary which can assist drivers to reduce the likelihood of error, manage lifestyle, plus guidance on competence management;
- Section Three – General Operating Instructions – Contains additional information to support the IÉ Rule Book and other operating instructions.

Section One, Professional Driving Policy

68 Key Principle 1, Acting Professionally, details key attributes of an IÉ driver; these include the ability to raise attention levels and switch attention to focus on priorities where necessary.

69 Key Principle 2, Managing lifestyle and personal issues, provides guidance and core professional techniques on managing lifestyle and personal issues. In terms of understanding the risk, it PDH states “There are a wide range of issues that can impact on performance at work e.g. tiredness, medication and home life. It is vital to remember that the importance of your role demands that you take personal responsibility to come to work in a fit state, both physical and mentally. If you do not, the likelihood of error through fatigue or lack of focus on the job greatly increases”.

70 It continues by outlining typical errors and factors which can lead to incidents, examples include, coming to work not properly rested; and not recognising the danger signs of drowsiness when driving trains and not taking measures to raise alertness and maintain full concentration.

71 Key Principle 4, Professional driving during normal operations, details the core professional techniques for train movements during normal operations. A number of key techniques to reduce error are included, with further supporting guidance provided within Section 2; these are based on techniques which drivers have found beneficial in minimising error, such as non-technical skills, commentary driving and risk triggered commentary (discussed in paragraphs 80 to 86).

72 Section 4.2, Driving under restrictive signal aspects, outlines typical errors when running under restrictive aspects, including:

- Assuming that a signal will upgrade to a less restrictive aspect;
- Not taking positive action to reduce the train speed;
- Subconsciously responding to CAWS warnings;
- Lack of concentration between the caution (yellow) and danger (red) signal;
- Over-reliance on previous experience, as well as mitigating techniques that can be applied.

73 To minimise errors, the following techniques when running under restrictive signal aspects, includes a number of techniques, relevant to this incident are:

- Take positive action according to the operating conditions. This will involve planning ahead and will involve reducing / shutting off power, coasting or applying the brake;
- "Switch on" to routes not fitted with CAWS… using techniques such as risk triggered commentary;
- Always expect the next signal to be displaying a red aspect. It is important not to allow yourself to become distracted. Concentrate on the job in hand – stopping at the red signal;
- If you are unsure about the aspect you received in the previous signal… always apply the brakes and be prepared to stop at the next signal.

74 Section 4.3, Stopping at red signals, identifies SPADs as a risk, and includes the following typical error, focusing attention on other issues rather than the 'red signal ahead'. Techniques to avoid SPADs include adopting the 15 x 20 Rule which is no more than 15 mph (24 km/h) at the CAWS downgrade and where practicable; stop 20 m from the signal.

75 Section 4.12, Minimising the risk of excess speed, outlines that the risk of excess speed can cause damage to the track and derailments. An example of errors or violations leading to excess speed is failing to control distraction at critical times. Techniques to avoid excess speed incidents include knowing the locations of all speed restrictions on your routes; and controlling distractions at critical times when approaching and braking for speed restrictions – focus on the primary task of slowing the train

76 The section also contains the following instruction: "If you are involved in an excess speed incident for whatever reason, report it immediately so the track can be examined. The incident may have been caused by an error, but non-reporting is a serious violation".

Section Two, Guidance and supporting information

Fatigue and Lifestyle

77 There is a section on fatigue and lifestyle, which addresses fatigue, alertness and drowsiness which extensively covers the topic, in terms of: how to stay alert, including increasing and maintaining alertness; the PDH specifically mentions risk triggered commentary (further discussed in paragraphs 85 and 86) as a technique for maintaining alertness.

78 There is no reference to what actions drivers should take when they are feeling unwell.

Management of Drivers' Competence

Competence Standards

79 The PDH summarises the relevant competency management system standards, which are discussed in paragraphs 89 to 91.

Non-technical skills

80 Non-technical skills are the actions and behaviours which complement technical skills[18]. Train drivers apply these skills all the time through the identification of hazards and risk and systematically self-checking their actions, controlling distractions at critical times and prioritising the most important tasks. Good non-technical skills are the key to professional driving. They are potentially the greatest factor in ensuring most drivers are never involved in an operating incident.

81 During the course of training and assessments, trainers, mentors and assessors will assess whether drivers are not only carrying out tasks in accordance with the rules, but also the actions and techniques to reduce the likelihood of error. For assessing non-technical skills there are defined positive and negative indicators to measure drivers against.

82 There are also non-technical skills associated with managing distraction and refocusing.

[18] From a train driving perspective, an example of a technical skill is having the knowledge and competence to operate the driving controls of a train effectively, such as how to energise a cab and start a train (taken from PDH).

Situational awareness

83 Situational awareness is a key non-technical skill for train driving that comprises of: perception of the hazards in the environment; the comprehension of their meaning taking into account rules, traction, route knowledge; the projection of their status in the near future (anticipation of future events).

84 The PDH suggests techniques on how to remain alert when driving, such as: continually scanning the cab and the environment ahead, switching attention to maintain an overall view; filtering the important and unimportant information; allocating attention to the relevant information; not becoming transfixed on a particular object or task.

Risk Triggered Commentary

85 The risk triggered commentary technique which, whilst not mandatory, can be applied by train drivers to help stay focused when carrying out a movement or a task that carries a high level of risk of error. It uses the process of verbal commentary and repeating back the risk and action to take and is aimed at ensuring that essential information remains in your short-term memory. An example listed of when risk triggered commentary may be used is on approach to cautionary /red signals. This technique promotes repeating essential information (the red aspect) on a risk or hazard until the train has stopped or the signal clears.

86 This reflects the fact that very little information is retained in the short-term memory beyond a time between eight and eighteen seconds. In the example given, the signal aspect is visible on approach and present in the short-term memory but as soon as the signal is passed, the image of the signal fades and the action required may be forgotten by the time eighteen seconds has elapsed if no action is taken to refresh this or reinforce it.



Figure 14 – Risk triggered commentary

Training and Competency Management

Driver Training and Competence Management

Introduction

87 Driver training is undertaken internally within IÉ-RU. This includes theory training at the Inchicore or Mallow training centres, then practical training before final qualifying assessment.

88 IÉ-RU has a documented competency management framework to maintain safety. At the time of the incident, key requirements relevant to driver competence were detailed in the procedure Ops-SMS-3.1, Competence Management System – Train Drivers.

Ops-SMS-3.1, Competence Management System – Train Drivers

89 Ops-SMS-3.1 is the principal standard for managing driver competence. This standard is designed to ensure persons who drive trains consistently achieve the standards of competence required for their work; it also determines: how and by who competence is assessed; and the frequency and the records that need to be kept of those assessments.

90 Following its re-issue in February 2024, Ops-SMS-3.1 also incorporated the arrangements for developing or improving competence where additional support had been identified through involvement in incidents or through assessment. This was previously defined in the separate document Ops-SMS-3.2 Driver Development and Support System.

91 The assessment process normally runs over a two-year time period and includes formal workplace assessments such as cab rides, unannounced monitoring such as OTDR, questioning, simulation and a review of supporting records. The assessment process also includes a grading of one to five to measure levels of competence and application of non-technical skills. Clause 9.3.1 details the assessments over the two-year cycle, which must include:

- Four formal driving assessments (FDA) when a practical assessment is undertaken;
- Two OTDR downloads;
- Four safety critical communication assessments;
- One interim review;
- One summary assessment;
- Safety briefing and update days (SBUDs).

The Competence of the Driver A309

92 Driver A309 first qualified on the 21st March 2012 and was based at Cork Depot.

93 Cork drivers are competent on the route between Mallow and Tralee, but do not work over it on a weekly basis in the base roster. Once qualified on the route, drivers are required to work over a route in both directions, at a minimum once every six months[19].

94 Driver A309's two-year assessment cycle commenced on the 21st March 2024. The following assessments had been undertaken within the competency cycle in compliance with Ops-SMS-3.1:

- 13th July 2024 – FDA on the Cobh and Midleton line;
- 20th May 2024 – Unannounced driving assessment;
- 21st May 2024 –Safety critical communications (unannounced);
- 17th January 2025 – FDA on the Heuston route including a safety critical communications assessment.

95 In addition, the following additional assessments took place:

- Unspecified date – FDA on the Tralee route;
- 14th August 2024 – Download assessment;
- 10th November 2024 – FDA for shunting in Mallow;
- 5th February 2025 – FDA for light engine and traction assessment.

96 There were no issues for review identified on the assessments. The most recent assessment took place only three days before the incident.

97 Driver A309 had one previous high risk SPAD (SRR of 21) approaching Millstreet on the 8th December 2013, whilst still a Post Qualification Assessment (PQA)[20] driver. After this incident, Driver A309 was placed on a Driver Development and Support System plan, this included the use of *commentary driving* as an error prevention technique.

98 Driver A309 was not on any development or support plan at the time of the incident.

[19] The cross covering of work between Cork and Mallow Depots creates additional opportunities over and above the base roster to drive over the route i.e. they are likely to drive over the routes more than once every six months.

[20] After qualifying, a driver enters a minimum two-year PQA period.

Training and Competency of Signalmen

Introduction

99 Training of signalmen is undertaken internally by IÉ-IM and is divided into classroom Part One training, followed by Part Two practical training in the workplace before final qualifying assessments. After qualification, signalmen are then periodically re-assessed in the workplace. The relevant documents detailing the competency system are:

- IMO-SMS-030 Competence Management – Signallers, Level Crossing Controllers and Gatekeepers;
- Professional Signallers Handbook –Signallers Non-Technical Skills and Competence Standards (Section 3).

100 In addition to assessments, safety training and update days (STUD) days are run on a recurring cycle for all signalmen. In 2024, the STUD included a briefing /discussion item on managing a SPAD.

IMO-SMS-030

101 IMO-SMS-030 states that once the certificate of competence has been issued, the candidate must be briefed on the assessment plan and assessed/monitored over a twenty-four-month continuous assessment cycle (Clause 9.2.1). The continuous assessment structure (Clause 9.2.2) for signalmen requires that over a period of two years:

- Four workplace assessments – one every six months;
- Interim assessment within the 11th or 12th month to review progress; and
- Summary Assessment within the 23rd or 24th month.

Professional Signallers Handbook

102 The criteria against which signalmen are assessed are detailed in the Professional Signallers Handbook. The assessments themselves are recorded on paper records or using an online tool.

103 Element 5.2, Deal with an emergency affecting infrastructure and trains, contains a list of criteria that must be demonstrated, including (relevant to this incident): responding to a train proceeding without authority and implementing relevant controls; and making emergency calls.

104 The required action for an emergency call can also be assessed in Element 7.2, Communication using phone and radio systems, the signalman must demonstrate that they (relevant to this incident): understands how and when to communicate with the available communication system; and the core requirements for effective communication using phone and train radios and different types of calls that can be made.

Training and Assessment of RECs

105 IÉ-IM has a basic simulator facility and can undertake simulation of some events. However, the simulators do not have functional Frequentis DICORA terminals for simulating communications calls, including the making of RECs. The only way to currently assess a REC call that includes using the PTT button is to make an REC on the live railway. The IÉ internal investigation identified a previous practice of signalmen carrying out test general calls in the DART area once weekly, this ceased in the 1990s and pre-dated the use of the emergency function on the analogue radio system.

106 At the time of the incident, signalman training only covered the procedure of initiating a REC in theory.

The Competence of the Mainline CTC Signalman

107 The Mainline CTC Signalman first qualified on the 29th September 2022 and had last been assessed on the 2nd September 2024, within the required time range. A valid certificate of competence was issued on the 28th September 2023.

108 As outlined above (in paragraph 106), the Mainline CTC Signalman on duty had not been practically assessed carrying out a REC on actual equipment.

Route Risk Assessment & Train Driver Risk Register

109 The IÉ-RU Route Risk Assessment did not specifically mention the risk associated with Signal MW813 but did cover a generic risk associated with the Killarney Junction including collision with a train.

110 IÉ-RU maintain a Train Driver Risk Register (last reviewed on the 21st February 2024) which was originally developed with IÉ-IM[21]. The relevant hazards are as follows:

- Hazard 91 – Driver does not respond to the first cautionary signal resulting in SPAD derailment or collision;
- Hazard 92 – Driver does not adjust approach to any signal not normally stopped at when it is showing a red aspect resulting in SPAD, derailment or collision.

111 Each of the hazards identified above has an undesirable risk rating but are considered *As Low As Reasonably Practicable* (ALARP) based on the following controls: ATP (DART); CAWS; driving training; Issuance of Train Driving Competence Standards Booklet ("Stop trains at signals") and PDH (Section 1, Key Principle 4); SBUDs; monitoring and assessment (Ops-SMS-3.1).

112 The additional risk controls column states that the "introduction of European Train Control System (ETCS) Level 1 will, in normal conditions, mitigate the risk of overspeed, collision/ derailment resulting from a SPAD and mitigate the risk from a buffer stop collision by reducing train speed to <10 km/h on approach". It further states the system provides speed supervision and train trip protection ensuring that the train stops before the end of the overlap, except where there are very short overlaps, but cannot ensure that it is stopped before the signal.

[21] No evidence was found that IÉ-IM had assessed the specific operational risks of an overrun or SPAD at Signal MW813, or other safety critical signals, taking account of the physical infrastructure and the routing of trains over their infrastructure at the time of the incident. IÉ-IM did not maintain their own Risk Register. The RAIU considers this matter to be an additional observation, AO-01 (paragraph 174) which warrants a safety recommendation, Safety Recommendation, 2026004-03 (paragraph 204).

Events before, during and after the incident

Events before the incident

113 In the days prior to the incident the Driver A309 reported feeling unwell, with a head cold and blocked sinuses, but had not been working on the two previous days.

114 On the day of the incident, Driver A309 stated that when they got up, they had a headache but after taking paracetamol and having a shower felt better and considered that they were fit for work. They were also conscious of other drivers being off work or looking for time off that day and did not want to disrupt their colleagues.

115 Driver A309 booked on at 10:25 hrs at Mallow Station[22]. The booking on of drivers at Mallow and Cork are supervised by the Station Controller who carries out visual fitness for duty checks. Nothing of concern was observed by the Station Controller on the day of the incident[23]. Driver A309 was based at Cork but was covering a Mallow driver depot turn[24].

116 Driver A309 worked 11:25 hrs Mallow to Tralee (Train A304) without incident and no issues were identified in the analysis of the OTDR. The scheduled layover before the return journey was eight minutes, although Train A304 arrived two minutes early.

[22] The fatigue and risk from Driver A309's shift for the day of the occurrence and for the fourteen and thirty days previous was assessed by IÉ-RU using the Fatigue and Risk Index Calculator. The Fatigue Index is the estimated probability (expressed as a percentage) that a person working a particular shift pattern will experience a high level of sleepiness (very fatigued) at some point during the shift (measured between 1 and 100, the average being 20.7). The Risk Index is an estimate of the relative risk of an incident occurring compared with a reference shift pattern (the reference pattern is assigned a Risk Index of 1.0). The values were calculated for a fourteen-day roster and thirty-day roster. The fourteen-day roster outputted a Fatigue Index of 6.2 and Risk Index of 0.860. The thirty-day roster outputted a Fatigue Index of 8.4 and a Risk Index of 0.840. The outputs indicate that the roster and work pattern was not contributory.

[23] IÉ-RU has both supervised and unsupervised locations for booking on.

[24] This is an official arrangement to meet service requirements and balance manpower availability, with Cork based drivers having the necessary route and traction competencies to cover Mallow turns of duty. Cross covering of turns between Depots is not an uncommon occurrence.

117 As well as changing ends and setting up the cab, Driver A309 felt they needed to visit the toilet and get a coffee.

118 Before departure from Tralee at 13:05 hrs as Train A309, Driver A309 incorrectly set up the radio with Train ID as A307, instead of A309 having misread the Train ID on the WTT[25].

119 Train A309 departed Tralee at 13:05 hrs, on-time[26].

120 At Killarney, trains are required to carry out a reversal to enter the station; this involves the driver changing cabs to enter Killarney Station and again before departure from Killarney, which occurred at approximately 13:42 hrs. Driver A309 did not however need to re-enter the Train ID on the radio as part of this process.

121 Driver A309 said that, after leaving Tralee, they began to feel increasingly unwell. As a result, Driver A309 stopped using the risk triggered commentary techniques that they normally used consistently (paragraphs 85 and 86), following their previous SPAD, eleven years previous (paragraph 97). On this occasion Driver A309 said that “things started to go out of the window”.

122 At 14:03 hrs, Train A309 departed Rathmore Station. After leaving Rathmore, Train A309 accelerated above the PSR of 70 mph (113 km/h) which is the maximum permitted speed between Tralee and Killarney Junction, reaching a peak of 79 mph (127 km/h).

123 Train A309 travelled for approximately twenty-four seconds above the permitted speed before Driver A309 braked for the 60 mph (97 km/h) PSR for Millstreet. Driver A309 was aware of this overspeed event but did not report it to CTC[27]. Driver A309 subsequently became very focussed on maintaining the correct speed for the remainder of the journey. Driver A309 later attributed the overspeed error to feeling increasingly unwell.

[25] Some IÉ depots produce diagram sheets showing the Train IDs and timings for that turn of duty, but this is not normal practice at either Mallow or Cork depots.

[26] The timings on the train OTDR were noted to be 1 min 48 seconds fast relative to the times recorded in the signalling interlocking. As a result, all timings have been adjusted to align with the latter.

[27] The non-reporting of the overspeed event is violation to IÉ-RU instructions, (paragraph 76).

124 At 14:22 hrs, entering Banteer Station at 24 mph (39 km/h), Driver A309 made a full-service brake application (brake Position 6[28]) before releasing the brake for one second before re-applying the brake. Driver A309 had no recollection for this action and the FFCCTV did not identify any reason for its application.

125 As Train A309 departed Banteer Station the auto-routing, which would normally set the route for the train for Mallow at Killarney Junction, did not due to an intermittent fault[29].

[28] There are six brake positions, between Position 1 (initial brake) and Position 6 (full service).

[29] At this point in time the Mainline CTC Signalman was occupied in setting the route and applying signal reminders for an On Track Machine (OTM) elsewhere on the Mainline CTC Workstation and manually routeing trains at Limerick Junction where a platform was out of use for engineering work.

Events during the incident

126 At 14:32:24 hrs, Train A309 enters the CAWS fitted area whilst travelling at 58 mph (93 km/h). The CAWS display initially showed a green indication and a warble tone as designed.

127 As Train A309 approached Killarney Junction the actual aspects displayed were as follows: Signal MWR813, the distant signal displayed a Single Yellow (caution), while the remaining signals Signal MW813, Signal MW821 and Signal MW838 were displaying Red (danger) aspects (see Figure 15).

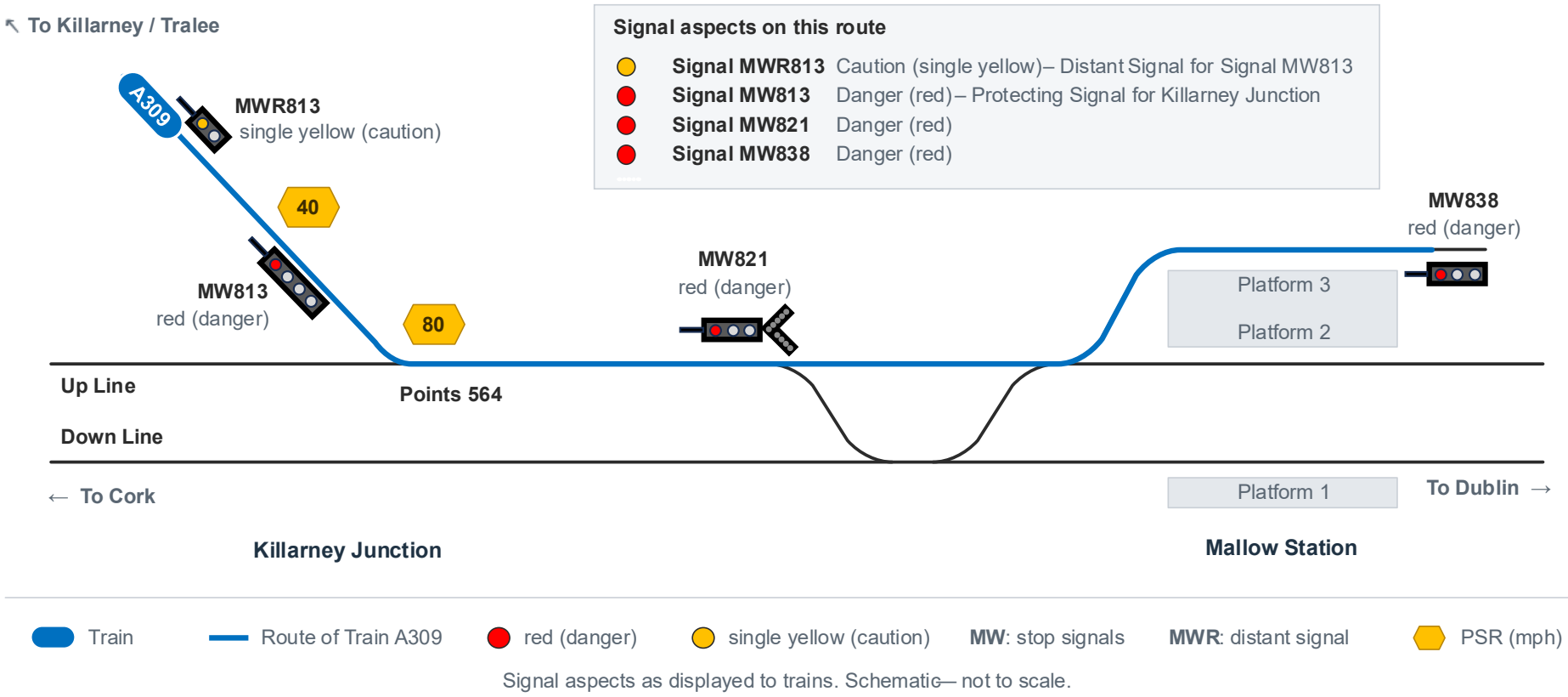


Figure 15 – Signal sequence for Train A309's approach to Mallow Station

128 At 14:32:44 hrs Train A309 receives a CAWS downgrade with a continuous audible beep to single yellow (for Signal MWR813). Driver A309 acknowledged the CAWS audible warning as required to avoid a *penalty brake application*; this may have been a subconscious response (paragraph 72) as Driver A309 did not make an appropriate response by making an appropriate braking application.

129 At 14:32:56 hrs, Train A309 passes Signal MWR813 showing a single yellow aspect as confirmed on the forward-facing CCTV (FFCCTV), indicating that the next signal is a Stop (red) aspect.

130 During a subsequent interview, Driver A309 acknowledged that they did not apply any error prevention techniques on the approach to or after passing the distant signal, Signal MWR813. These included *risk triggered commentary*, a technique they normally applied.

131 Between 14:33:27 hrs and 14:35:30 hrs Driver A309 places the brake controller into brake Position 1 before releasing the brake again. The speed reduces from 51 mph (82 km/h) to 48 mph (77 km/h), consistent with braking for the 40 mph (64 km/h) PSR ahead, but not for a signal with a danger (red) aspect ahead.

132 Driver A309 stated after the incident that they could not recall having seen Signal MW813 or any other aspect other than a proceed aspect in the previous thirteen years and that “it was in my head, forty and the yellow”. It is normal for Tralee to Mallow services to pass Signal MW813 at proceed as there is a scheduled connections with other services at Mallow.

133 At 14:33:31 hrs the CAWS downgraded to a red for Signal MW813. Driver A309 again acknowledged the CAWS audible warning and selected brake Position 2 for three seconds before releasing the brake. Driver A309 could not explain why they acknowledged the CAWS (again, this could have been a subconscious response to the CAWS (paragraph 128)) but Driver A309 did not register the red display or signal aspect ahead other than their expectation was that Signal MW813 would be at yellow.

134 Driver A309 further said that they became focussed on regulating their speed for the 40 mph (64 km/h) PSR, given their earlier overspeed (this is consistent with Driver A309 becoming transfixed on a particular task i.e. maintain speed (paragraph 84) rather than responding to the signals, suggesting Driver A309 had lost situational awareness (paragraph 84). The 40 mph (64 km/h) PSR is located immediately before Signal MW813, but on the opposite of the line.

135 At 14:33:47 hrs Train A309 passed Signal MW813 at danger while still travelling at 43 mph (69 km/h), 3 mph (5 km/h) over the permitted speed; Driver A309 did not react to passing the signal at danger.

136 The critical alarm for the SPAD activated in CTC almost immediately after the SPAD.

137 At 14:34:30 hrs Train A309 passes through Points MW564 which were set against the movement at 35 mph (56 km/h). Train A309 forced through the points, damaging the point blades and the operating mechanism. Driver A309 did not notice anything unusual, travelling through Points MW564 at the time as "you usually feel it no-matter what".

138 At 14:34:35 hrs Driver A309 commences braking in brake Position 3.

139 The Mainline CTC Signalman attempted to make seven direct radio calls to stop Train A309 but was unable to contact Driver A309 as the incorrect Train ID had been inputted by Driver A309 (paragraph 118).

140 The Mainline CTC Signalman then attempted to make either a General Call or REC which would broadcast to all trains in the selected area; however, this was not broadcast as the Mainline CTC Signalman did not press the PTT button (paragraph 59). The Waterford and Tralee Line Signalman moved over to the Mainline CTC Workstation to assist the Mainline CTC Signalman.

141 The Mainline CTC Signalman then called on the on-call District Traffic Executive (DTE) to advise them of the situation, who advised them to keep trying.

142 At 14:36:11 hrs, Train A309 stopped at Signal MW821, displaying a danger (red) aspect.

143 At approximately 14:36 hrs Driver A309 contacted the Mainline CTC Signalman by train radio (Train ID A307) to ask why they were detained at Signal MW821.

144 The Mainline CTC Signalman advised them that a SPAD indication had been received and not to move and that information would need to be obtained.

145 The Mainline CTC Signalman also contacted the Driver of the 14:25 hrs Cork to Heuston passenger service (Train A219) to ensure that they would stop at Signal MW809[30] protecting Killarney Junction on the Up line; this signal was already at danger and had not been cleared for Train A219.

146 At 14:46 hrs Train A219 approached and stopped at Signal MW809.

[30] Signal MW809 is the first controlled signal in the Mallow area for Up direction movements from Cork.

Events after the incident

147 The Mainline CTC Signalman contacted the relevant parties, such as the Traffic Regulator to inform them of the SPAD.

148 Following the SPAD, Train A309 was detained at Signal MW821 until a relief driver could be deployed to the train to drive it into Mallow Station.

149 Arrangements were made for Driver A309 to be tested for drugs and alcohol at Mallow; the result was negative.

150 After the incident, the DTE observed the Mainline CTC Signalman carry out a test REC, arranged to test the system, and saw that the PTT button was not being pressed. Realising that this could explain the failure to transmit the message, the DTE reported this to the CTC Duty Manager. The CTC Duty Manager requested the DTE to have a professional (coaching) discussion with the Mainline CTC Signalman.

151 The SET Department were also deployed to Killarney Junction to assess the damage to Points MW564.

152 After the incident, the SPAD was assessed using the IÉ SRR tool. This takes account of a range of infrastructure factors and the circumstances at the time of the incident, including the location of other trains. The outcome of the SRR was a score of 23 out of 28, categorising it as High Risk[31].

[31] The actual risk was low as the risk at the time of the occurrence was from Train A219 coming from the Cork direction and the two trains colliding. Signal MW809 was not cleared for Train A219 so therefore Train A219 would also have to SPAD Signal MW809 for a collision to take place. The potential risk was ranked extremely high, with the potential for Train A309 to collide with another passenger train at Killarney Junction.

Previous occurrences

Trend in SPAD occurrences

153 The CRR actively monitor SPAD events, the CRR's 2025 Annual Report, states "SPADs are a precursor event that the CRR monitors at its Safety Performance Review Meetings with IÉ-RU. These SPADs are also reviewed in separate individual post occurrence activity review meetings with IÉ-RU where required based on individual SPAD occurrences. The trend in recent years up to the end of 2024 had seen a decline in this precursor for the past 5+ years, however, with the inclusion of the 2025 SPAD figures this positive trendline has now reversed. The 10-year trendline is shown within [Figure 16]. There was a total of 15 SPADs on the network which is a 10-year high for IÉ-RU. The last instance where 15 SPADs were recorded on the IÉ network was in 2015. Normalised train km of this recent SPAD trend will be progressed by the Compliance Supervision and Enforcement department with IÉ-RU to review this area further in 2026. The Compliance Supervision and Enforcement currently review in detail each notified SPAD and as a result of the 10-year high and subsequent trendline reversal further focus will be assigned to this area in 2026".

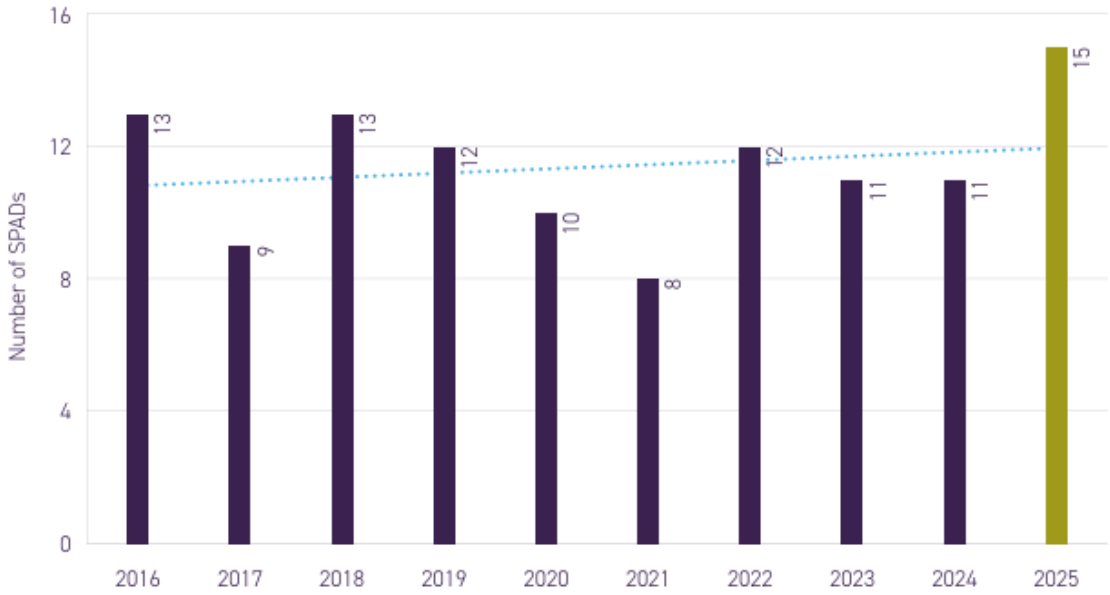


Figure 16 – CRR Annual Report graph showing SPADs numbers from 2016 to 2025

154 However, in 2025, the number of SPAD events increased to 15. The number is not normalised for train miles / km operated and represents total events.

Other incidents of a similar nature

155 The RAIU reviewed SPAD events over a ten-year period before the incident to identify any other SPADs of running movements where trains had reached a junction conflict point on running lines[32]:

- On the 10th February 2023 Train J720 passed Signal HK213 protecting Cherryville Junction in the Down direction with the route set and cleared for a train on the mainline. Train J720 reached the conflict point (the junction) after the other train had passed clear (i.e. following it);
- On the 17th July 2023 Train P216 passed Signal HN277 at danger approaching Heuston Station and ran through Points 737. The driver had anticipated the clearance of the signal.

156 After the SPAD at Signal MW813 on the 8th February 2025, the following similar SPAD occurred:

- On the 26th July 2026 Train A792 passed the protecting signal, Signal GL421 at Danger and entered Ennis Station. It was later determined that the radio signal on the analogue system prevented a successful emergency call.

[32] Excluding shunt movements and those where technical factors and Low Rail Adhesion (LRA) were a significant cause of the incident SPADs, these were excluded as train protection systems cannot fully mitigate against these types of SPADs. Similarly, shunt movement are not typically supervised by ETCS but are typically undertaken on lower speed infrastructure, partially mitigating collisions.

Analysis

Track and Signalling Infrastructure

157 No issues were identified with the signalling or position of signals (paragraphs 41 to 51) and the provision of CAWS on approach to Signal MWR813 and Signal MW813 (paragraph 40). The intermittent fault with the auto-routing meant the route was not automatically set (paragraph 38).

Train Protection and Warning Systems

158 The absence of a train protection system on the route (footnote 3) and the rolling stock (paragraph 24) meant that there was no speed supervision below the maximum speed and no supervision of braking for signals or PSRs (footnote 3). The presence of a train protection system would have meant that there would have been an intervention to slow and stop Train A309 after passing Signals MWR813 and MW813.

Training, Competency Management and Instructions for Driving

159 The training and competency management for drivers is extensive, in terms of initial training, PQA and continuous assessment; with Driver A309 having undergone the full suite of training and competency management; with no issues identified with Driver A309 at the time of the incident (paragraphs 87 to 98).

160 The PDH is a comprehensive guidance document and provides clear guidance on driving under restrictive aspects, typical driving errors (individually addressing typical errors associated with SPADs) and the use of and relevant techniques for drivers to apply to maintain focus, re-focus after distraction and maintain situational awareness (paragraphs 67 to 76).

161 The PDH, while addressing lifestyle and personal issues (including fatigue), it did not address actions to be taken by driver's when feeling unwell (paragraph 77 and 78); although noting that Driver A309 was very conscientious in terms of not having another driver having to cover their duty (paragraph 113) and may have made the decision to work.

Actions of Driver A309

162 Driver A309 had been feeling unwell for several days before the incident but reported for duty on the day of the incident. During Train A309's journey, Driver A309:

- Entered the incorrect Train ID (paragraph 118);
- Accelerated above the permitted line speed (paragraph 122);
- Failed to report the overspeed, which is a serious violation, instead was transfixed on controlling the speed (paragraph 123);
- Made an inexplicable full-service brake application, entering Banteer Station (paragraph 124);
- Failed to react to Signal MWR813 at caution (yellow), but acknowledged the CAWS indications and audible warnings (paragraph 127);
- Failed to react to Signal MW813 showing a danger (red) aspect (paragraph 135);

163 The overspeed and heavy braking stopping at Banteer indicates that Driver A309 was distracted or unable to maintain situational awareness.

164 The braking and speed profile was consistent with Driver A309 being focussed on driving to the 40 mph (64 km/h) PSR and not the signal aspects (paragraph 131). Driver A309 had become transfixed on the task of maintaining speed rather than re-focussing and re-acting to the signals (paragraph 134). At this stage, Driver A309, who normally diligently applied error prevention techniques, such as risk triggered commentary, had stop using these techniques due to feeling increasingly unwell (paragraph 120).

165 As Driver A309 stated that they could not recall being stopped previously at Signal MW813 (paragraph 137), it is possible that Driver A309 developed an incorrect expectation that they would receive a proceed aspect at Killarney Junction.

Communications

166 Driver A309 inputted the incorrect Train ID (A307 instead of A309) at Tralee (paragraph 139); as a result, the Mainline CTC Signalman could not contact Driver A309 through a direct call; this would not have been immediately apparent to the Mainline CTC Signalman.

167 As Train A309 continued after the SPAD, it is unclear whether a General Call, or the more appropriate REC, was selected after the unsuccessful attempts to make direct calls. However, the Mainline CTC Signalman did not press the PTT button (paragraph 139), so no spoken message was transmitted through either call function. If a General Call were selected, the analogue radio system would not have provided a separate audible alert to notify the driver that the call was in progress.

Competence and Training of the Signalman

168 RECs have not been practised in live service for some time and there is currently no facility to practise or simulate making these calls on equipment outside the live environment during training.

169 The inability to practice this task on simulators also increased the potential for skill fade and reflects a systemic issue in the competency management of signalmen (paragraphs 105 to 106).

Conclusions

Causal, contributing, and systemic factors

170 Train A309 passed Signal MW813 at danger without authority and subsequently ran through Points 564. The SPAD was as a result of the following causal factors:

- CaF-01 – Driver A309 did not respond appropriately to Signal MWR813 displaying a caution (yellow) aspect, by reducing speed; and, by failing to respond appropriately to Signal MW813 displaying a danger (red) aspect by stopping their train (paragraph 162).

171 After the SPAD, the Mainline CTC Signalman was unable to contact Driver A309[33] as a result of the following causal factors:

- CaF-02 – Driver A309 had inputted the incorrect Train ID (Train A307) meaning the Mainline CTC Signalman was unable to make a direct call to Train ID A309;
- CaF-03 – Mainline CTC Signalman did not press the PTT to allow the broadcast of a General Call and/or REC in the cab of Train A309 (paragraph 139), and all trains in the selected area.

172 The following contributory factors were identified in terms of the actions of Driver A309 on the day of the incident:

- CoF-01 – Driver A309 was feeling unwell in the days leading up to the incident, and, Driver A309 became increasingly unwell during their duty (paragraph 121), this is likely to have contributed to a number of actions taken by Driver A309 on the day. Contributing to the SPAD are the following actions:
    - Driver A309 was involved in an overspeed event at Rathmore, resulting in Driver A309 becoming transfixed with the particular task of maintaining speed for the remainder of their duty (paragraph 134);
    - Driver A309 stopped using the risk triggered commentary techniques that they had consistently applied for a decade on the day of the incident, this resulted in Driver A309, not maintaining concentration resulting in loss of situational awareness. As a result, Driver did not react appropriately to the CAWS or the aspect displayed on Signal MWR813 and Signal MW813 (paragraph 162);

[33] Whilst a successful call would not have prevented the SPAD, it is possible that a call could have prevented Train A309 reaching the conflict point (paragraph 167).

- CoF-02 – Driver A309 could not recall previously being stopped at Signal MW813 and may therefore have expected it to display a proceed aspect (paragraph 165);
- CoF-03 – An issue with the auto-routing meant that the route was not automatically set for Train A309 and the signals were not cleared (paragraph 157).

173 The following systemic issues were identified, in relation to the train protection:

- SF-01 – The absence of a functional train protection system at the location and on the train created the conditions for the incident to occur, placing reliance on the actions of drivers to respond to the lineside signals and CAWS (paragraph 158).
- SF-02 – The absence of opportunities for signalmen to train, refresh and be assessed on making RECs using real equipment was a likely factor in the failure to contact Driver A309 and stop Train A309 before the conflict point (paragraph 169);
- SF-03 – The PDH, while providing guidance on lifestyle factors, did not provide clear guidance on actions to be taken by drivers when they are feeling unwell paragraph 161).

Additional Observations

174 Although not causal, contributing or systemic to the incident, the RAIU makes the following additional observation in relation to the IÉ-IM Risk Register for safety critical signals:

- AO-01 – IÉ-IM has not risk assessed the risks associated with Signal MW813 to identify the hazards and risks associated with these signals and, in turn, determine appropriate control measures (footnote 21, paragraph 110).

Measures taken since the incident

Safety Alerts and Briefings

175 A Safety Alert outlining the details of the SPAD was issued by the IÉ-RU Safety Department to drivers, shown in Figure 17.

Iarnród Éireann Irish Rail — **RU Safety Department**

Reference No.	RU Ops SA109
Status	Live
Issue No.	1.0
Date of Issue	13/02/2025
Prepared by	Kevin Corkery
Checked by	Nora Balfe Michael O'Regan
Approved by	Joseph Sullivan

Preliminary Safety Alert

SPAD

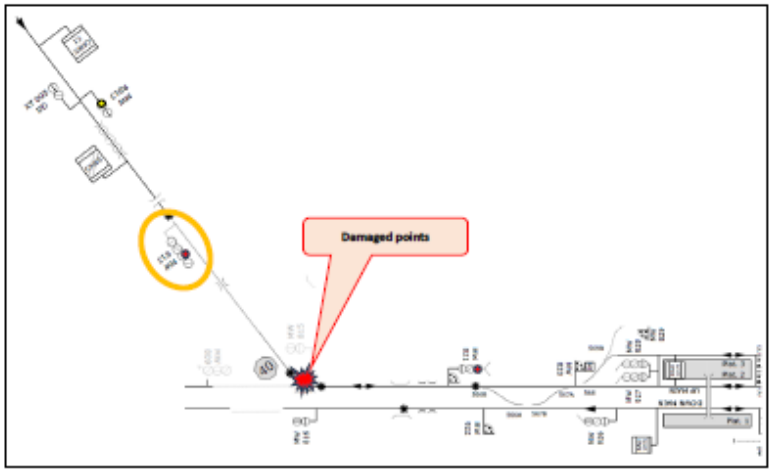
Date/Time:	8th February 2025 14:33	**Location:**	MW813 Killarney Junction

What happened?

(Based on available details)

- A309 13:05 Tralee to Mallow passed signal MW813 at Danger.
- MW813 is the protecting signal for Killarney Junction where the Tralee line meets the main Cork to Dublin line.
- MW813 is a four-aspect signal positioned on the right-hand side of the track.
- A309 was signalled normally up to signal MW813.
- CAWS starts prior to the previous signal (MWR813)
- A309 travelled 1.3 km past MW813, trailing through the points, and stopped at the next signal (MW821)
- The wrong ID was input resulting in the signalman being unable to contact the driver directly.





The content of this alert is based on the information currently available.
The Incident is under investigation

RU Operating Procedure 1: Development, issuing and display of RU Safety Alerts		
Local Reference No	Date Posted:	Time Posted:
No. of weeks to be posted	5 weeks or if superseded	
Date of Withdrawal or transfer:	Transferred to:	

This notice is confidential and for the attention of railway employees only

Figure 17 – SPAD Alert RU Ops SA 109

176 The IÉ-IM issued notice IMO-BD-25/003 on the 4th March 2025 to all signalmen detailing how to make a REC and reminding them of the importance of use the PTT button, see Figure 18. All signalmen in CTC were also individually re-briefed on how to make a REC.

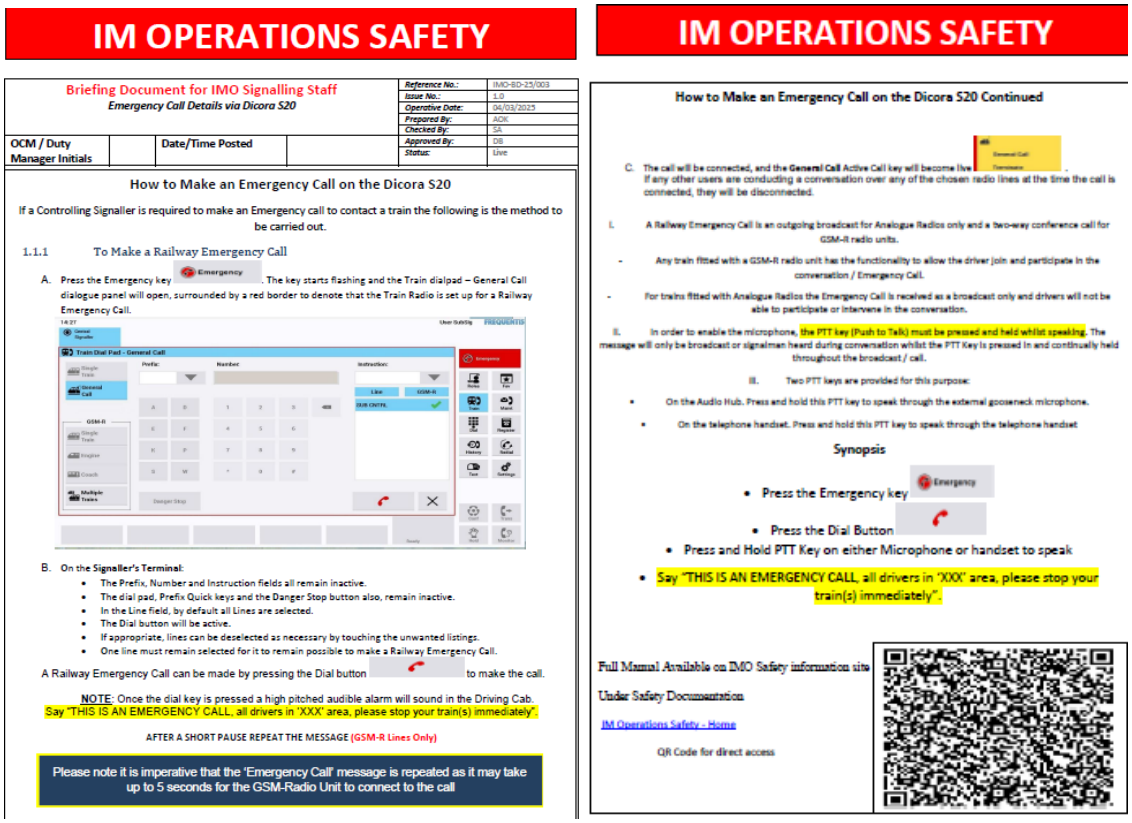


Figure 18 – IÉ-IM Operations safety bulletin

177 Transferable lessons from the incident are also to be incorporated into the Safety Training and Update Days.

Actions taken with Driver A309

178 Driver A309 received a medical examination on the 18th February 2025 by IÉ-RU's occupational health specialist. No underlying health issues were identified and Driver A309 was certified medically fit to drive trains once again.

179 Driver A309 remained off driving duties until a post-incident learning review with OPC[34] was undertaken as part of the post incident actions in line with the requirements of Ops-SMS-3.1. Driver A309 then returned to operational duties.

[34] OPC are a specialist supplier to IÉ-RU, providing independent reviews.

Route Risk Assessment & Train Driver Risk Register

180 The IÉ-RU Route Risk Assessment was updated after the occurrence to include a reference to Signal MW813.

181 An additional hazard was added to the Train Driver Risk Register, namely: Driver does not adjust approach to signal protecting mainline junction when it is showing a red aspect resulting in SPAD, derailment or collision.

182 A review is underway to review SPAD profiles over the last five years to consider if a similar event to the SPAD at Signal MW813 could occur or be likely to occur elsewhere on the network.

IÉ-IM Signalman REC Simulation

183 It is noted, as part of the move to the new National Train Control Centre (NTCC), a simulator will be in place that allows for practical simulation of RECs.

184 Information provided by IÉ-IM during the investigation into an Operational Irregularity at Clontarf Road stated that migration to the new purpose-built National Traffic Control Centre (NTCC) includes a simulator suite capable of replicating each of the individual workstations to be provided on site. This will have the capability to simulate more complex scenarios and permit simulations that are closer to the workload of the busier workstations. This will be available for both initial training and the subsequent assessment activity of experienced Signalmen.

185 However, due to challenges by IÉ-IM's contractor in commissioning equipment and functionality associated with the NTCC workstations, only a partial transfer of train control or staff to NTCC from CTC had taken place by November 2026. The new simulator suite remains unavailable at the time of publishing this report, with it planned to implement the signalling simulator in quarter two of 2027, with this incorporating a Frequentis Dicora communications interface.

Internal Investigation Report

186 An internal investigation into the incident was carried out by IÉ-RU investigators against a remit set by IÉ-IM (Report of Investigation: Train A309 SPAD at MW813 and damage to points MW564, Report No: R1304-2025-47, published 5th December 2025), making four recommendations to the IÉ-IM:

- IÉ-IM should conduct a review to identify possible technical solutions to mitigate the risk and reduce the potential consequences associated with a SPAD at a junction. The review should include but not be limited to the following:
  - Installation of a Train Protection System (TPS);
  - Installation of SPAD Indicators / Announcers;
  - *Approach release signals*[35].
- The IÉ-IM Infrastructure Manager Operations should put a process in place to ensure that all Signalmen have practically placed an emergency call as part of their training[36].
- The IÉ-IM Head of Health & Safety should consider developing an IM Risk Register for the operational outputs / effects of its assets[37].
- The Chief Engineer SET (IÉ-IM) to arrange for a review of the auto-routing strike in point for Signal MW813 to ascertain if changes are required[38].

[35] IÉ-IM have noted that this recommendation is in progress.

[36] IÉ-IM have noted that this recommendation is in progress.

[37] IÉ-IM have noted that this recommendation is in progress.

[38] IÉ-IM SET have noted that this recommendation is now closed.

Safety Recommendations

Introduction to safety recommendations

187 In accordance with the European Union (Railway Safety) (Reporting and Investigation of Serious Accidents, Accidents and Incidents) Regulations 2020), RAIU safety recommendations are addressed to the NSA, the CRR, and directed to the party identified in each safety recommendation.

Absence of safety recommendations due to measures in progress

Train Protection System

188 The RAIU previously made the following safety recommendation, 2016-001, in 2016: IÉ-IM must introduce an adequate train protection system on all of the IÉ network for the protection of trains; this system should be robust and to an acceptable standard within Europe; and have the appropriate ATP and speed supervision functionality[39][40]. At the time of publication of this report, the safety recommendation remains open.

189 In response to European requirements in Article 18 of the TEN-T regulations (2024/1679) to implement the ETCS Level 1[41] on all TEN-T corridors, IÉ has stated it is moving forward with a program to install ETCS on the network, although this regulation is not binding on the Irish network. However, adoption of ETCS reflects that, unlike other European systems, with the exception of the DART network, there is no legacy train protection system installed. A revised Implementation plan was issued in 2024, which reflects that ETCS Level 1 will be installed as part of other infrastructure upgrades and programmes.

[39] This was published in the RAIU's Investigation Report, Investigation into SPADs on IÉ Network, from January 2012 to June 2015, Report No. R2016-R001, published on the 11th April 2016.

[40] Reference to this recommendation was also made in the RAIU report in the Signal Passed at Danger at Keelogues Level Crossing 13th August 2024, RAIU Report 2026-R002.

[41] There are multiple levels of ETCS trackside installation and functionality. ETCS Level 1 is an overlay on existing lineside signalling.

190 At the time of publication of this report approximately 120 km of trackside infrastructure has been installed in the Dublin and Cork areas, with these works being carried out in association with other infrastructure upgrades. In the case of Killarney Junction and Mallow, this is included within the scope of the Cork re-signalling project.

191 However, the installation of ETCS on the complete Cork to Dublin mainline and Tralee Line routes is dependent on national infrastructure funding. A tender was issued for the national rollout in October 2024 with an estimated value of €60 million, with contract award expected in 2027.

192 In September 2025, the first Head of Series fitment for a Class 22000 ICR (the type of train involved in the Killarney Junction SPAD) with ETCS achieved assessment body certification. The fitment to the remainder of the class is covered by a contract signed on the 13th October 2026 between IÉ and Alstom, which also covers the Class 2600 DMU fleet used on the Tralee line. Until trackside and on-board ETCS fitment is completed, it is not possible to state when full train protection may be achieved for all movements at Killarney Junction.

193 It is improbable that further significant reductions in operational risk can be achieved without investment in a train protection system. As the existing RAIU safety recommendation, 2016-001 (paragraph 188), remains open, another safety recommendation is not warranted on train protection systems.

GSM-R

194 The GSM-R radio system is closely related to the ETCS rollout as the system is required to transmit and receive key data for it, but it is capable of being used as a standalone system without ETCS. This is currently the case on the DART network.

195 However, when making a REC using GSM-R, this does result in a distinct and very intrusive two-tone alert and the flashing text display “Incoming Rail Emergency Call”, even before the Signalman broadcasts their message. Had GSM-R been operational and a REC call made it is possible that Driver A309 could have been alerted and Train A309 could have been stopped before the conflict point / junction, even allowing for a signalman omitting to use the PTT button.

196 GSM-R radio trackside equipment has been installed between Mallow and Tralee (ETCS Implementation Plan, 2024) and is undergoing certification. Pre-installation fitment of the Class 22000 ICR and Class 2600 Diesel Multiple Unit rolling stock used on the route has also been undertaken and is currently underway.

197 The Frequentis DICORA S15 terminals can also be used for GSM-R, with the same PTT feature of the existing radio system for emergency calls.

198 As a result, as the GSM-R programme is progressing, no further RAIU safety recommendation is warranted.

Non-Technical Skills

199 The RAIU note the recommendation made in IÉ's internal report into the Signal Passed at Danger at Keelogues Level Crossing on the 13th August 2024, namely: The Head of Human Factors to conduct research into methodologies to enhance attention and vigilance and reduce the potential of drivers forming a false mental model when driving.

200 This recommendation recognises the ongoing interim risks of drivers not reacting to cautionary aspects whilst driving routes and traction without functional CAWS or ETCS.

201 As a result, the RAIU makes no further recommendation in relation to non-technical skills for drivers as this is addressed in the IÉ recommendation.

Safety recommendations as a result of this incident

202 Driver A309, feeling unwell, is likely to have affected their performance, in that they stopped using error prevention techniques (specifically risk triggered commentary) as they progressively felt worse during the shift (paragraph 172). It is noted that while the PDH references fatigue, etc, it does not address sickness (paragraph 161). As a result, the RAIU make the following safety recommendation to address CoF-01 (paragraph 172) and SF-03 (paragraph 173), as follows:

Safety Recommendation 2026004-01

IÉ-RU to review the PDH, and other relevant documentation, on the possible impact of ill-health when performing safety critical duties to ensure that there is clear guidance for drivers to take when feeling unwell.

203 After the SPAD, the Mainline CTC Signalman was unable to contact Train A309 via a REC as they did not press the PTT; this was likely to have been influenced by the type of training given and the low frequency of performing the task (paragraphs 168 and 169). Whilst the IÉ-IM recommendation partially addresses this in training (paragraph 186), the RAIU considers that repeated opportunities to carry out the task is likely to achieve a reliable performance. As a result, the RAIU make the following safety recommendation to address CaF-03 (paragraph 171) and SF-02 (paragraph 173) as follows:

Safety Recommendation 2026004-02

IÉ-IM to provide simulation facilities that permit the simulation of RECs and incorporate the use of these in the routine competency assessment of signalmen.

Safety recommendations as a result of additional observations

204 Although IÉ-RU had considered the route characteristics and risks from an individual drivers' perspective. IÉ-IM had not, at the time of the incident, assessed and collated the operational risk profile of individual signals and junctions along the route from a system perspective. Such an assessment could inform future changes which may be relevant to future changes such as timetable change and infrastructure enhancements (e.g. line speed increases) (paragraph 174). Consequently, the RAIU make the following safety recommendation to address AO-01 (paragraph 174), as follows:

Safety Recommendation 2026004-03

IÉ-IM should identify and assess, through proportionate risk assessments undertaken in accordance with the relevant requirements of IÉ-IM's Safety Management System (SMS), the operational risks associated with SPADs at individual junctions.

IÉ-IM should implement risk control measures where required, including interim measures where train protection is not yet provided, and demonstrate that the associated safety risks have been reduced to a level that is as low as is reasonably practicable and conform with the risk acceptance criteria set out in IÉ-IM's SMS.

Additional Information

List of abbreviations

ADU	Aspect Display Unit
ALARP	As Low As Reasonably Practicable
AO	Additional Observations
ATP	Automatic Train Protection
CaF	Causal Factors
CAWS	Continuous Automatic Warning System
CCE	Chief Civil Engineer
CCTV	Closed Circuit Television
CoF	Contributory Factors
CRR	Commission for Railway Regulation
CTC	Centralised Traffic Control
DTE	District Traffic Executive
ETCS	European Train Control System
EU	European Union
FDA	Formal Driving Assessment
FFCCTV	Forward Facing Closed Circuit Television
GSM-R	Global System for Mobile Communications – Railway
hr	hour
ICR	Intercity Rail Call
IÉ-IM	Iarnród Éireann Infrastructure Manager
IÉ-RU	Iarnród Éireann Railway Undertaking
km	kilometre
km/h	kilometres per hour
m	metre
MP	Milepost
mph	miles per hour

NSA	National Safety Authority
OTDR	On-Train Data Recorder
OTM	On Track Machine
PDH	Professional Driving Handbook
PQA	Post Qualification Assessment
PSR	Permanent Speed Restriction
PTT	Press to Talk
RAIU	Railway Accident Investigation Unit
REC	Rail Emergency Call
RFI	Request For Information
SBUD	Safety briefing and update days
SET	Signalling, Electrification and Telecommunications
SMS	Safety Management System
SPAD	Signal Passed at Danger
SRR	SPAD Risk Ranking
STUD	Safety training and update days
WTT	Working Timetable

Glossary of terms

Accident	An unwanted or unintended sudden event or a specific chain of such events which have harmful consequences. For heavy rail, the EU Agency for Railways divides accidents into the following categories: collisions, derailments, level-crossing accidents, accidents to persons caused by rolling stock in motion, fires and others.
Approach release signals	An interlocking provided where trains are required to take a lower speed diverging route, which prevents clearance of the junction signal until the train has had a restrictive signal sequence, with the intention of reducing the speed of approach.
Article 20 of Directive (EU) 2016/798, Obligation to investigation	Article 20 (1) Member States shall ensure that an investigation is carried out by the investigating body referred to in Article 22 after any serious accident on the Union rail system. The objective of the investigation shall be to improve, where possible, railway safety and the prevention of accidents. Article 20 (2) The investigating body referred to in Article 22 may also investigate those accidents and incidents which under slightly different conditions might have led to serious accidents, including technical failures of the structural subsystems or of interoperability constituents of the Union rail system. The investigating body may decide whether or not an investigation of such an accident or incident is to be undertaken. In making its decision it shall take into account: (a) the seriousness of the accident or incident; (b) whether it forms part of a series of accidents or incidents relevant to the system as a whole; (c) its impact on railway safety; and (d) requests from infrastructure managers, railway undertakings, the national safety authority or the Member States.
As Low As Reasonably Practicable	The principle is that the residual risk shall be reduced as far as reasonably practicable. For a risk to be ALARP, it must be possible to demonstrate that the cost involved in reducing the risk further would be disproportionate to the benefit gained. As applied to SPADs in IÉ, this is the reduction of likelihood and consequences of a SPAD to a level below which the costs and/or constraints of further mitigation measures outweigh their benefit.

Auto-route	A computer system capable of setting routes for train based on Train ID, WTT information and traffic regulating rules. The system can operate without the intervention of the Signalman or it can be used to suggest routes which the Signalman then authorises. It can also be disabled.
Causal Factor	Any action, omission, event or condition, or a combination thereof that if corrected, eliminated, or avoided would have prevented the occurrence, in all likelihood.
Cautionary Aspect	A single yellow or double yellow aspect.
Consist	The term used for the make-up of the train formation, usually listed vehicle by vehicle in the direction of travel.
CAWS Downgrade	When the Continuous Automatic Warning System in-cab indication changes to reflect a more restrictive signal aspect ahead (e.g. yellow to red) accompanied by an audible warning.
Contributing Factor	Any action, omission, event or condition that affects an occurrence by increasing its likelihood, accelerating the effect in time or increasing the severity of the consequences, but the elimination of which would not have prevented the occurrence.
Commentary Driving	An error prevention technique where drivers vocalise signal aspects and other safety critical information to assist in the retention in the working memory.
Distant Signal	A signal (not itself a stop signal) capable of displaying a cautionary aspect. It informs the driver about the state of the signals ahead, usually on the approach to a stop signal.
Down direction	In this incident, trains travelling to Cork or Tralee are travelling in the Down direction.
Flank protection	Flank protection ensures that a train moving along a safeguarded route is not endangered by another train approaching from a conflicting direction. It acts as a backup safety measure in case a train passes a red signal (signal passed at danger, SPAD) or moves without authority, preventing side collisions at junctions or points.

General call	A radio call initiated by the Signalman which is broadcast to all trains in the selected area(s).
High Risk SPAD	A SPAD event with a SPAD risk ranking of seventeen or above.
Incident	Any occurrence, other than an accident or serious accident, associated with the operation of trains and affecting the safety of operation. For heavy rail, the EU Agency for Railways divides incidents into the following categories: infrastructure; energy; control-command & signalling; rolling stock; traffic operations & management and others.
Interlocking	The railway signalling term given to a system composed of signal apparatus (mechanical, electrical or coded logic) that prevents trains encountering conflicting moves through only allowing trains to receive an authority to proceed, when routes have been set, locked and detected in safe combinations.
Investigation	A process conducted for the purpose of accident and incident prevention which includes the gathering and analysis of information, the drawing of conclusions, including the determination of causes and, when appropriate, the making of safety recommendations
Junction Indicator	An indicator provided on a main aspect signal to show when a train is signalled onto a diverging route.
Milepost	Marks distances.
Non-technical skills	Non-technical skills are those that underpin and enhance technical skills by helping persons to anticipate (prepare for), identify (be aware of) and mitigate (take action to prevent) risks.
Overlap	The section of line beyond a stop signal that must be unoccupied and, where necessary, locked before and during a signalled running movement on the approach to a signal.
Penalty Brake Application	A brake application initiated as a result of a lack of response to an alarm or alert in the driving cab.
Permanent Speed Restriction	A speed restriction applied permanently to a length of track because it had a maximum permissible speed lower that the line speed for that route.

Rail Emergency Call	An emergency radio call broadcast to all train radios in a defined radio area, which is preceded by warning alert tone and automatically connects on both analogue and digital (GSM-R) systems.
Reading time	The time required for a driver to read and process the information being presented by a signal. This must not exceed the sighting time for the same signal at the highest permissible speed.
Required Reading Time	The time required for a driver to read and process the information being presented by a signal. This must not exceed the sighting time for the same signal at the highest permissible speed.
Restrictive aspect	Any aspect (red, yellow or double yellow) other than a green.
Secondary hazard	A hazard created by the application of measures to prevent or mitigate an existing hazard.
Serious Accident	Any train collision or derailment of trains, resulting in the death of at least one person or serious injuries to five or more persons or extensive damage to rolling stock, the infrastructure or the environment, and any other similar accident with an obvious impact on railway safety regulation or the management of safety. For heavy rail, the EU Agency for Railways divides serious accidents into the following categories: collisions, derailments, level-crossing accidents, accidents to persons caused by rolling stock in motion, fires and others.
Signal Overrun	The distance travelled beyond a signal maintained at danger.
Signal Passed at Danger	An event where a part of a train proceeds its authorised movement.
Stop Signal	Any main signal which can show a danger (red) aspect or indication.
Systemic factor	Any causal or contributing factor of an organisational, managerial, societal or regulatory nature that is likely to affect similar and related occurrences in the future, including, in particular the regulatory framework conditions, the design and application of the safety management system, skills of the staff, procedures and maintenance.
Train ID	An alpha-numeric code used to identify individual services. This is used by staff and by the signalling system.

Trap points	Facing points provided at an exit from a siding or converging line to derail an unauthorised movement and so protect the adjacent running line.
Up direction	In this incident, trains travelling to Dublin or Mallow are travelling in the Up direction.
Up line	Up line is term used to describe the normal direction of traffic on railway routes. Each route has an “Up” and “Down” direction which are to or from a specified location - in this accident for Dublin Heuston station.

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